

# ***Considerations when selecting the means for the development of the muscular force in the sport*** ***Consideraciones al seleccionar los medios para el desarrollo de la fuerza muscular en el deporte***

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## ***ABSTRACT***

The muscular force, one of the capacities is considered but important that the sportsman needs to reach an integral preparation and with it, to assure the achievement of important sport results. Therefore, this thematic one during years, it has required the attention of the trainers, mainly, when determining what means they must use in the different structures that it demands the sport preparation. The present work, based on the revision of the specialized, reflective literature some methodological approaches that, for their importance, they become in relating to keep in mind to select the means appropriately for the development of the muscular force.

## ***RESUMEN***

La fuerza muscular, es considerada una de las capacidades mas importantes que necesita el deportista para alcanzar una preparación integral y con ello, asegurar el logro de importantes resultados deportivos. Por tanto, esta temática durante años, ha requerido la atención de los entrenadores, sobre todo, al determinar qué medios han de emplearse en las diferentes estructuras que demanda la preparación deportiva. El presente trabajo basado en la revisión de la literatura especializada, refleja algunos criterios metodológicos, que, por su importancia, se convierten en referentes a tener en cuenta para seleccionar adecuadamente los medios para el desarrollo de la fuerza muscular.

## ***Keywords***

It forces; It forces muscular; Means; Sport.

## ***Palabras clave***

Fuerza; Fuerza muscular; Medios; Deporte.

## INTRODUCTION

When conceptualizing the preparation of the athlete, says Matveev L. P. (2003), we must consider it as a specialized pedagogical process of long-term teaching-learning, which obeys general didactic and educational regularities, in which, based on the interrelation that is established between the coach and the athlete, the systematic transmission and assimilation of certain knowledge is carried out and the formation and perfection of skills and habits required in the sphere of sport is acquired, along with the education of physical, volitional, moral and other qualities. of the individual.

From Didactics, Morales Ferrer A. M. (s/a), refers that the teaching-learning process is a socialization process in which the student is inserted as subject and object of his learning, assuming an active and responsible position in his learning process. training, configuration of their knowledge, skills, values that foster the formation of their scientific conception of the world, constituting, according to the author, a process of creation and analysis of cultural patterns historically constructed by humanity guided by the teacher through different individual and group activities, which implies that he scientifically directs the teaching activity.

For Addine F., Rico P. and Silvestre M. (s/a), the teaching-learning process today has been conceived as an integrated whole, in which the leading role of the student is highlighted, where it is revealed as a determining characteristic, the integration of the cognitive and the affective, of the instructive and the educational, as essential psychological and pedagogical requirements, having as its essential objective to contribute to the integral formation of the personality of this, which, the authors add, has a systemic structure and functioning, that is, it is made up of closely interrelated elements or components (problem, objectives, methods, means, forms of organization, evaluation).

Teaching aids, according to Labarrere G. and Valdivia G E. (1995), constitute different images and representations of objects and phenomena that are made especially for teaching, which are used as a source of knowledge and make the contents of the teaching more objective. each subject of study and, therefore, achieve greater efficiency in the process of assimilation of knowledge by students, creating the conditions for the development of capacities, habits, skills and the formation of convictions.

In this sense, Álvarez de Zayas C. M. (s/a), considers that the teaching media, together with the methods and form, is a component that characterizes the teaching-educational process. This author refers to being the component of the teaching-educational process that manifests the method in the development of said process, that is, the method is the internal configuration of the process as we have studied and is dialectically linked to the external environment through the media.

In this regard, Fátima Addine and others express that the teaching aids are the facilitating elements of the process that answer the question "With what?", which are made up of a set, in the nature of a system, of real objects, whose representations and instruments They serve as material support to achieve the objectives. A teaching media system is understood as the unit or set of media characterized by their function.

The appropriate use of teaching aids, Labarrere G. and Valdivia G E. (1995) refer, increases the effectiveness of the pedagogical-methodological work and perfects the cognitive and assimilation activities of the students, in the different stages of the teaching process-learning.

The means in sports training occupy an important place to achieve the objectives that are defined in the preparation of the athlete.

For Matveev L. P. (1983) the main specific means and methods of sports training are represented by the exercise system, which includes competitions and some complementary factors that intensify the influence of training or accelerate the recovery of work capacity, whose effects, the author refers, can be expressed under certain conditions in the teaching of rational ways of executing actions and in the development of the physical and psychological properties of the individual, which are expressed in the performance of actions, and in the increase, conservation and recovery of the level of capacity to act.'

According to Platonov V. N. (2001), the means of sports preparation are the various physical exercises that directly or indirectly influence the improvement of sports mastery, which are formed considering the particularities of the sport.

For Vasconcelos A. (2000), the means are called physical exercises, considering them the most important resource to improve sports performance and a functional load for the nervous, central, circulatory and endocrine systems, which influence the entire metabolism of the athlete. Forteza A. (2008) considers that the preparation means is a set of exercises that will be repeated systematically and in a dosed manner in the preparation of the athlete.

The classification of motor actions, physical exercises or training means is a topic widely discussed in specialized literature by authors such as D. Harre (1983), N. G. Ozolin (1989), A. Morales (s/a), L. Rubalcaba and W. Loaiza (2001), A. Vasconcelos Raposo (2000), L. P. Matveev (1983, 2001, 2004), J. Weineck (1994), V. N. Platonov (2000), E. Romero (2006). According to the above, physical exercises are classified into competition exercises (those that are totally identified with the actions and movements of the practiced modality), distinguishing between competitive exercises specific to competition and competitive exercises specific to training; the special preparation exercises (those that are partially identified with the actions and movements of the practiced modality), which can be

approximation and development, the auxiliary exercises (semi-special) presuppose motor actions that create a special foundation for subsequent improvement in this or that sporting activity, and finally, the general preparation exercises (those that are not identified with the actions and movements of the practiced modality), among which those that coincide and differ from the special preparation exercises are differentiated. .

## **DEVELOPMENT**

Without a doubt, physical preparation, subdivided into general and special, is one of the most important components of the sports training process, which focuses attention on the development of motor capabilities: strength, resistance, speed, flexibility, agility, coordination, etc.

When talking about strength preparation, it is essential to start from its fundamental objective, which is to develop power and muscular resistance or both at the same time, depending on the competitive activity in the chosen sport. Therefore, to the extent that we optimally formulate the training method, load planning will become more effective, based on the fact that they manage to relate a set of exercises that are repeated in a systematic and dosed manner.

As is known, the development of strength, like other motor capabilities of athletes, is based on advances in science, technology and technological innovation, in correspondence with the contemporary competitive demands of sport, which demands methodological optimization. of the sports preparation process; where the improvement of its methods and content acquires great importance; where the media become an indispensable factor to raise the levels of training and therefore this capacity.

Among the variables to take into account when creating a strength program or plan, the definition of the number or quantity of exercises has an important meaning. Sports practice has shown some insufficiencies in the selection, by coaches, of the means for the development of this capacity, which, due to excess or deficiency of exercises, ultimately results in an inadequate program that generates strength disadaptation. Therefore, in order to achieve an adequate development of this capacity, based on an effective selection of strength exercises, trainers, according to Bompa T. O. (2002), must take into account: age and level of preparation, the needs and phases of the training, the order of the exercises, the number of repetitions and their pace of execution, the number or quantity of series, the rest intervals or rest breaks (between series and training sessions), and the activity to be done during the break or break

Therefore, in said programming, the selection of exercises is considered the first step, which is carried out taking into account the characteristics of the sport, the needs of the athlete, which may depend on the athlete's background, his individual strengths and weaknesses. , and the phases of training, which

are characterized, beginning with the transit period by the generalized predominance of general preparation strength exercises, followed in the following period (preparatory) in its first stage by Anatomical Adaptation, depending on of the stimulation of the majority of the muscle groups, in order to build, with a multilateral character, the basis of strength work, which, the closer it gets to the competitive phase, becomes more specific, selecting those exercises that stimulate the muscles that are specifically involved in the athlete's competitive activity. On the subject, Román I. (1996) points out to perform the repetitions of the exercises, taking into account the preparation periods, the type of force (strength speed, strength resistance) and the components of the load of the work with weights (exercises for training, sets per exercise, repetitions per set, repetitions per month, sets per month), as shown in the following table:

|             | Exercises for training |                 | Exercise sessions |                 | Batch repetitions |                 | Repetitions per month |                 | Batches per month |                 |
|-------------|------------------------|-----------------|-------------------|-----------------|-------------------|-----------------|-----------------------|-----------------|-------------------|-----------------|
| Periods     | Force-Speed            | Force-Endurance | Force-Speed       | Force-Endurance | Force-Speed       | Force-Endurance | Force-Speed           | Force-Endurance | Force-Speed       | Force-Endurance |
| Preparatory | 7-10                   | 12              | 4-7               | 10              | 3-5               | 10              | 1500-1080             | 1800            | 300-420           | 460             |
| Competitive | 4-5                    | 7               | 3-4               | 7               | 3-5               | 10              | 360-500               | 650             | 100-140           | 180             |

In this sense, the regulation of the load (exercises) as proposed by Forteza A. (2008) should be carried out based on the following table of distribution of magnitudes and effort:

| WEIGHTS        | Repetitions | Percentages (%) |
|----------------|-------------|-----------------|
| Maximum        | 1           | 100             |
| Submaximal     | 2-3         | 90-95           |
| Big            | 4-8         | 80-89           |
| Moderate-large | 9-12        | 60-79           |
| Half           | 13-18       | 40-59           |
| Little         | 19-25       | 25-39           |
| Very small     | +25         | -25             |

On the subject, Román I. (1996) proposes planning exercises with weights aimed at developing different types of strength based on the following table:

| Types of force   | % of maximum result | Repetitions per batch | Execution speed |
|------------------|---------------------|-----------------------|-----------------|
| Maximum strength | More than 90        | 1-3                   | Medium-slow     |
| fast force       | 60-89               | 1-5                   | Fast            |
| Resistance force | less than 60        | More than 6           | Half            |

According to Matveev L. P. 1983), strength exercises serve as fundamental means of education of strength abilities in the training process, which are characterized, with some exceptions, by a more considerable degree of muscular tension than in the fulfillment of competitive exercises.

There are numerous classifications of exercises used to develop muscle strength. According to Harre D. (1983), competitive exercises, special exercises (full and partial body) and general exercises (full and partial body) are used to develop this capacity. For the authors Kieser, 1982; Spitz and Schnell, 1983; Letzelter, 1990 among others, cited by Martin D. and Cols (2004), strength exercises are classified as:

- Strength exercises for each muscle group and its forms of contraction.
- Programs for “pectorals-shoulders”, “back-abdomen-waist”, “legs-hips” among others.
- Strength exercises in relation to the execution of cyclic and acyclic movements such as jumping, throwing, pushing and pulling strength exercises, among others.
- Strength exercises for different strength capacities such as maximum strength capacity, rapid strength, reactive strength and strength endurance.
- Strength exercises in relation to strength training devices, such as medicine gym ball, climbing bar, fixed bar, box, hand weight, dumbbells, etc.
- Exercises with kinematic proximity to sports techniques (specific strength training).

For Cortegaza et al. The means of strength preparation are made up of: exercises that allow you to overcome the body weight with dynamic actions, exercises that allow you to overcome your own body weight and then fix it with isometric efforts contrasting the force of gravity, exercises to overcome the forces of an opponent, exercises to lift the weight of another partner, exercises that allow body mass to be accelerated using muscle reactivity, exercises that allow elastic objectives to be overcome, weight throwing exercises, exercises that allow overcoming the opposing force exerted by water, air, starting and stopping exercises, volitional exercises, exercises with rigorously dosed loads (weights) and static isometric exercises.

Among the first actions to be carried out by the trainer is the identification of the main muscle groups involved in the movements of:

- Of the head and neck: sternocleidomastoid, splenius capitis, complexus minor, semispinus capitis, longus capitis, longus colli, levator scapulae, omohyoid, dorsal scalenus, middle scalenus, ventral scalenus, superior oblique head, lateral rectus capitis, inferior oblique capitis.
- Of the upper extremities: deltoid, trapezius, infraspinatus, teres minor, teres major, subscapularis, biceps brachii, coracobrachialis, brachialis anterior, triceps brachii, long head of the triceps, anconeus, pronator teres, palmaris major, ulnaris anterior, superficial common flexor of the fingers, flexor pollicis longus, pronator quadratus, supinator longus, first external radial, second external radial, posterior ulnaris, supinator brevis, extensor pollicis longus, extensor pollicis proprius, extensor pollicis proprius.
- From the trunk: trapezius, latissimus dorsi, rhomboid major, rhomboid minor, angular scapula, rectus abdominis, external oblique abdominis, internal oblique abdominis, pectoralis major, pectoralis minor, subclavius, serratus major.
- Of the lower extremities: iliopsoas, gluteus maximus, gluteus medius, gluteus minimus, quadriceps femoris, piriformis, obturator internus, sartorius, rectus femoris, pectineus, adductor minor, adductor magnus, biceps femoris, semitendinosus, semimembranosus, tibialis anterior, extensor digitorum longus, extensor digitorum longus, peroneus longus, peroneus brevis, gastrocnemius lateralis, gastrocnemius, medial, popliteus, tibialis posterior, flexor digitorum longus, flexor hallucis longus, pedis (extensor brevis of fingers).

Despite the different author criteria on the means for developing strength, there is agreement in considering that the fundamental means is the lifting of different weights, as it allows the lifting loads to be planned, dosed and controlled more easily and accurately. training, guaranteeing the development of any type of muscle and the education of motor skills, based on prior knowledge of the athlete's real possibilities; based on greater functionality of the neuromuscular system, motor capacity and subsequent increase in sports performance.

The selection of strength exercises for the development of this capacity is an aspect of vital importance, especially if we take into account that it must be carried out based on the demands of the sporting discipline, the individual state of training and the objective of the training. of strength in each of the training periods.

It is known that during the preparation of strength with weights, athletes use a large number of exercises, therefore, to facilitate their selection and planning, these have been grouped into classic, special and auxiliary exercises. The classic exercises are the snatch and the clean and jerk); The specials are parts or phases of the classic exercises, or are similar to these with slight modifications, being subdivided into specials for the snatch, the clean and jerk and combined; while the auxiliary exercises, characterized by a relatively simple execution technique, are used for the development of different types of strength in the muscular planes, subdivided into auxiliary ones for the arms, legs, trunk and combined two or three subgroups previous.

During the development of strength with weights, according to Cuervo C. and Cols (1998), special attention must be paid to the use of certain exercises, for the development of various muscle groups, within these, those intended for the snatch, the clean and jerk, the legs, the arms and the trunk, taking into account that the snatch exercises and their special ones (hanging snatch, snatch from supports, hyper snatch, semi-slide snatch, non-slip snatch, snatch pull) are used mainly for improve quick strength and maximum strength, using weights that range between 40 and 100%, when it comes to classic exercise and other special ones, while for snatch pulls, weights that range between 70% must be used. and 120% of the maximum result of classic exercise.

This author states that the group of exercises for the clean and jerk, made up of the exercise itself and its special ones (hanging clin, clean and jerk from behind, clin from supports, clean and jerk push from behind, hyper clin, clean and jerk push from supports, clean and jerk from the chest, clin with semiglide, clin pull), are used for the same purpose as the snatch and special exercises (to improve quick strength and maximum strength), and must be worked with great care, due to their complexity and the Occasionally using small repetitions with medium and heavy weights can lead to fatigue. Hence the importance of executing the clin independently of the clean and jerk from the chest, in order to accumulate a greater volume of work and greater use of the technique, especially when working with beginner athletes.

This author adds that the group of exercises for the legs is made up of auxiliary exercises where these muscular planes fundamentally work (squats, squats in front, scissors behind, leg extensions, lateral scissors, leg flexions, half squats, jumps with weights, standing heel raises). It also highlights the great attention that must be paid to the work of these muscular planes, since in most sports, the competitive result depends precisely on the strength levels achieved in the lower extremities during preparation with weights.

He also adds that the group of exercises for the arms is made up of auxiliary exercises where these muscular planes basically work (standing strength, standing biceps, sitting strength, standing brachialis, strength from behind, standing triceps, strength push, forearms), which has a large number of exercises that also influence the development of the shoulder girdle, where the proportion of these exercises, with respect to the total volume of the mesocycle and training, can be very diverse.

This author points out that the group of exercises for the trunk is made up of auxiliary exercises where the muscular planes of this area of the body are fundamentally worked (bowing with flexion, inclined rowing, bowing without flexion, lying rowing, take-off with flexion, pullover, take-off without flexion, lying strength, hyperextension of the trunk, leaning strength, twisting of the trunk, abdominals on the

board), which is composed of bows and hyperextensions to increase the strength of the back extensor muscles, other types of exercises for The abdomen; which, when performed, almost all the work influences the muscles of the torso, as well as other exercises such as the take-off, where muscular planes of the legs and arms also participate.

Another aspect to consider for strength work is the order of its contents, which responds to the objectives of strength training: guarantee the necessary functional and structural adaptations (muscle groups, ligaments, tendons) for the development of strength capacity. , improve inter and intramuscular coordination, develop muscular hypertrophy and maximum strength of the athlete, gradually convert maximum strength into power, muscular endurance, or both at the same time, in the chosen sport and specialty, maintain the strength levels achieved in previous phases of training and eliminate fatigue, rehabilitate and recover injured muscles, tendons, muscle joints and joints, etc.

There is a diversity of criteria on the subject in the specialized literature consulted. Bompa T. O. (s/a), considers that, when ordering exercises for the development of strength, work should be alternated between the muscle groups of the members in order to achieve better recovery. It suggests that, in the case of working with the whole body, the order of the exercises should begin with the legs, then the arms, then the abdomen, then the legs, then the arms and finally the back, keeping in mind the proportional use of work for each muscle group, according to the characteristics of the sport, as well as the variation between agonist and antagonist muscles. It is the criterion of placing the exercises from top to bottom, with the purpose of facilitating the recovery of the muscle groups involved, since, by using longer rest intervals between series, a better recovery is favored before the Perform another set for the same muscle groups. He classifies as irrelevant for the strength training of most sports the theory of working the large muscle groups first and then the small ones since he has a poor understanding of the needs and specificity of these, since it ignores that strength exercises are selected to imitate, as much as possible, the technical pattern of the sport, since its imitation allows the participation of the chain of muscles that intervene in competitive exercise.

On the other hand, when addressing the topic, Román I. (1996), expresses that the order in which weight exercises are placed for athletes depends on the muscular planes they work, while Cuervo C. (2005), refers that the order in which the exercises are placed within each workout depends, among other factors, on the technical complexity and the pace of their execution.

In this sense, both authors are of the opinion that generally, the most technically compiled exercises are placed at the beginning of training, so that the phases of the movement are assimilated more effectively and are not altered due to fatigue. Next, the less complicated exercises are performed, but they are

executed at a fast tempo or with an "explosive" character. As a rule, these precede those performed at a slow tempo. Next, the exercises are performed with a medium (moderate) or slow tempo in which maximum efforts are made and finally the exercises that develop strength resistance based on using many repetitions in each round or that have a local influence (in a certain muscle), which serves to exercise muscle planes separately.

Román I. (1996) states that an appropriate order to organize exercises with weights is one that first arranges for the exercises for the arms to be performed, then the exercises for the trunk and finally the exercises for the legs. The author points out that this variant is based on the fact that lower weights are used in arm exercises than in the other muscular planes, and therefore they serve as a basis for subsequent work with larger weights. He adds that for the exercises for the trunk, intermediate weights are used and they are located in the central part of the training where there is an anterior base and lastly, the exercises for the legs are located because they are the muscular planes where the greatest weight is used. He recommends for beginners in working with weights not to place two exercises in a row for the same muscle plane since it can be exhausted quickly, so he suggests alternating some exercises that work different muscle planes.

For his part, Cuervo C. (2005) suggests that, in class, the exercises that are performed in batches of few repetitions, aimed at developing rapid, explosive and maximum strength, are performed before the exercises with batches of many repetitions, aimed at developing strength and endurance.

The author states that, with some exceptions, multi-joint strength exercises (intermuscular coordination) precede mono-articular strength exercises (muscle isolation). He also points out that exercises performed in a dynamic motor regime (concentric-eccentric) precede those performed in dynamic resistant regimes (eccentric), isometric, and plyometric exercises.

## **CONCLUSIONS**

The appropriate use of the means in sports preparation, especially in strength training, increases the possibilities of assimilating the loads in the physical, technical-tactical and psychological order and thereby guarantees the possibility of achieving high sports results in the practiced sport.

In order to design a good strength program, it is necessary to carefully periodize its development, adequately determine the methods to be used and at the same time objectively select the means to be used.

The selection of the means must take into account the characteristics of the phases of the periodization of strength, the nature of the work to be performed (general, special), as well as the particularities of

the muscle groups to be developed (agonists, antagonists and cinergists) in dependence on the characteristics of the motor action and their participation in the execution of the competitive exercise. When selecting the means for the development of strength, the increase in intra- and intermuscular coordination, as well as muscle hypertrophy, must be guaranteed, for which, in order to improve their effectiveness, they must have a similar trajectory, amplitude and power. than competitive exercise. The demands of contemporary sport have resulted in the improvement of the means for developing strength and with it the creation of modern, highly precise electronic components that allow athletes to develop their muscular strength more effectively in a programmed and precise manner.

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