AUCTORES
Globalize your Research

Journal of Clinical Research and Reports

Ibrahim O. Mustafa *

Open Access

Review Article

Special Strength Exercises to Prevent Tendinitis in Vocational Technical Education

Edilberto Serrano Sánchez. P. H [1]*, Rubén Alexis Martínez Puig [2], Alfredo Vásquez Reyes [3]

[1] Full Professor. Center for studies of physical activity and sport. Faculty of Physical Culture. University of Camagüey and Head Coach of Baseball players, Cuba.

[2] Full Professor Center for studies of physical activity and sport. Faculty of Physical Culture. University of Camagüey, Cuba.

[3] Assistant professor Guáimaro Municipal University Center. University of Camagüey.

***Corresponding Author:** Edilberto Serrano Sánchez. P. H, Full Professor. Center for studies of physical activity and sport. Faculty of Physical Culture. University of Camagüey and Head Coach of Baseball players, Cuba.

Received date: April 04, 2023; **Accepted date:** June 05, 2023; **Published date:** June 16, 2023

Citation: Ibrahim O. Mustafa, Yusuf Tanko, Rasheed Yusuf, Sunday A. Musa, (2023), Special Strength Exercises to Prevent Tendinitis in Vocational Technical Education, *J Clinical Research and Reports*, 13(5); **DOI:10.31579/2690-1919/321**

Abstract

The innumerable benefits of physical exercises for the improvement of the quality of life of the human being are unquestionable, so the scientific community is constantly committed to the search for the best alternatives so that the well-being and health of humanity are effectively enhanced.

Keywords: world health organization;

Introduction

The innumerable benefits of physical exercises for the improvement of the quality of life of the human being are unquestionable, so the scientific community is constantly committed to the search for the best alternatives so that the well-being and health of humanity are effectively enhanced.

In this regard, the World Health Organization **(WHO)** defines **exercise** as the variety of physical activity planned, structured, repetitive and performed with an objective related to the improvement or maintenance of one or more components of physical fitness.

In line with these ideas, vocational technical education introduces students to work practice and, among the objectives of physical education and sport indicates, *to create adaptive physical conditions that favor the execution of the actions* and physical *operations involved in all the productive processes of the trades and professions*. Ministry of Education (2015).

Both in the adaptation and in the preparation to execute the actions and productive physical operations, discomfort associated with muscle contractures, pain, inflammations, tissue ruptures appear, causing limitations. functional of the organism in some cases (Martin, 2015), especially when students do not have an optimal level of previous physical preparation that allows them to be executed properly.

From this perspective of analysis, the criteria of Ozolin (1988) are valued; Matveev (1983) on aspects that distinguish special strength preparation; Roman (2011); Forteza, and Ranzola, (1988) regarding the specificity of the content of special exercises.

Kuznetsov (1981) related to the pathways to develop muscle strength, Romero, and Becali (2014) the aspects that produce variation of muscle strength and the percentage of muscles that contract in trained subjects. Meanwhile, the opinion of Román (2011) is valued; Ruvalcaba, and Loaiza (2001); Zatsiorki (1989); Kuznetsov (1981) on the behavior of the synchronization of nerve impulses in trained and untrained subjects, intramuscular coordination as an element on which strength resistance depends.

From the work of González, and Zambrano (2018) referring to the benefits and fields of application of strength training, as well as what was addressed by Horsford, and Sentmanat (2011) regarding the effect of physical exercises on organs and tissues, the physiological mechanisms of regulation of their functions in humans. All of which allows us to understand the preventive, prophylactic and therapeutic action that physical exercises fulfill, basedon the basic mechanisms of toning, trophic action,formation of compensations and normalization of functions.

When inquiring about the process of physical adaptation in students of the professional technical education of Guáimaro to face the actions and operations of the productive processes, the following characteristics were

contacted.

- Insufficient use of strengthening physical exercises aimed at physical conditioning of muscles, ligaments and tendons.
- inflammations in the body segments with participation in the specific activities of trades and professions.
- Discomfort associated with muscle tractures.
- Insufficient theoretical and methodological knowledge of teachers regarding the development of strength capacity and its manifestations.
- Low rate of application of means aimed at stimulating different types of contractions for muscle strengthening.
- Optimal availability of time for the strengthening process through physical education classes.
- Few habits in terms of systematic physical exercise.

Although action is being taken in schools to increase the quality levels of physical education classes, it is clear that there is insufficient use of the methodological potential available, which undermines the achievement of the objectives set for vocational technical education.

In this regard, the insufficiencies found from the theoretical assessment and interpretation from practice in relation to the prevention of tendinitis in the arms of students of vocational technical education, were considered negative external manifestations that limit the execution of the actions and physical operations involved in the productive processes that are developed as part of job training.

Consequently, from the above described emerges the **problematic situation** that reflects the contradiction between the insufficient methodological treatment offered to muscle strengthening, applied with a general character and the need for special physical exercises of strength for the prevention of tendinitis in the context of the physical actions and operations of the productive processes.

From the problemsituation revealed emerges the following ***scientific problem***

How to contribute to the prevention of tendinitis in the arms of students of vocationaltechnical education? Therefore, the **object of study** defined for the research is located in the process of special preparation through special physical exercises of strength in the physical education classes of the professional technical education.

To mitigate the effect of the problem situation and solve the problem raised, it is proposed to meet the following ***objective:*** *design a program* of special physical strength exercises to prevent tendinitis in the arms of technical education students professional.

The field of action is framed in: *the prevention of tendinitis* in the arms of students of *proffesional* technical education through *special* physical exercises *of strength in physical education classes*.

The research defends the following ***scientific idea****:* the *application* of *special physical strength exercises for the prevention of tendinitis in the arms of students of vocational technical education, which takes into account* the actions and Productive physical operations of trades and professions, itatively favors the *adaptive* conditions and physical preparation of the labor training process.

The solution to the problem addressed, from the fulfillment of the proposed research objective required the following **Scientific Tasks**

1. Epistemological analysis of the fundamentals related to the process of special preparation through special physical exercises of strength, as well as the prevention of tendinitis in the arms of students of vocational technical education.
2. Study of the current guidelines on the treatment of physical strength exercises, particularly those of special types for the arms of students of technical-vocational education.
3. Diagnosis of the current state around the relationship with special physical strength exercises and the preventive process of tendinitis in the arms of students of professional technical education.
4. Determination of the components and characteristics of special physical strength exercises for the prevention of tendinitis in the arms of students of vocational technical education
5. Assessment of the effect and relevance of special physical strength exercises to prevent tendinitis in the arms of students of vocational technical education.

The research methods and techniques were used from the central objective of the research and were used to characterize the problem raised, among these are the bibliographic review, document analysis, standard and individual and semi-structured interview, the individual survey, the observation and the measurement, all of them are described in detail in the headings where they are used.

A pedagogical pre-experiment was also designed and applied, consisting of a longitudinal descriptive study of the before-after type (pretest-postest), for the same group with quantitative analysis of variables, based on observations and pedagogical tests of active participation, with the use of intentional sampling. All this in order to collect information and make comparisons related to the effectiveness of special physical strength exercises applied for the prevention of tendinitisin the arms of students of vocational technical education.

From the descriptive statistics, we worked with the arithmetic mean and the median, the proportion expressed in percent, for the analysis of the data collected, through the methodsand techniques of empirical character; of the inferential statistics the non-parametric Shapiro-Wilk docim is used to test the normality in the distribution of the data, with a significance level of (0.1).

From the results obtained, theDocim t of Student and Wilcoxon was applied for dependent samples, in order to compare and determine the existence of differences before and after the response was applied. For this, the levels of 0.10 were used; 0.05 and 0.01 indicating the degrees of significance not significant , significant and very significant; in the statistical processing the statistical package SPSS version 21.0 was used.

Chapter 1.Theoretical and methodological foundations that support the special preparation through special physical exercises of strength and the prevention of tendinitis in the arms.

1.1. Special preparation through special physical strength exercises. General considerations for your study

The term special exercises come from sports periodization, particularly they are characteristic of the special preparation stage, they are aimed at developing specific skills that provide the basis of sports performance.

However, in assessing thecomponents that characterize them, it is worth noting that they include elements of competitive actions and their variants, as well as actions substantially similar in the form and character of the attitudes that are revealed in the specific activity.

In this sense,approximation exercises can be distinguished, aimed

mainly at assimilating the forms of movements and those of development, which aim to develop physical qualities (aptitudes), towards the latter The objectives of this research are directed, since the students of the Professional Technical Education carry out operations and productive actions that require adaptations and physical developments.

From this point of view, it is possible to create and select special physical exercises in any activity, trying to ensure the most selective and most considerable influence by certain parameters of the overload in comparison with the integral exercise of the specific activity, since special physical exercises are not totally identical to the one chosen for specialization. The specificity of the content of the special physical exercises is determined by the motor structure that implies the activity, the work regime and by the supply energy that the body would use to guarantee the specific activity. Forteza, and Ranzola (1988), these arguments satisfy the intention of extrapolating to the field of physical education what refersto special strength exercises from the logic of the objectives of vocational technical education.

However, the special preparation of strength is distinguished by the high capacity to deploy the forces of the muscles in regimes and levels applicable to the specialty practiced Ozolin (1988); it leads to the development of strength skills by the path of specialization, plays an important role in the formation of the structure of strength skills according to the particularities of the Matveev modality (1983).

In this context, special physical strength exercises allow strengthening through the active mobility arc and provide a greater degree of muscular resistance,with direct influence on all neuromuscular coordination, in the increase of muscle more, blood supply and, education of Ability to deploy muscle strength. In addition, they help protect the joint and the antagonistic muscles acting, increasing the speed of contractions and the functionality of the arms.

In line with what is expressed here, it is necessary to consider what was stated by Kuznetsov (1981) who refers that one of the ways for the development of muscle strength is the improvement of the internal coordination of the muscle, which is achieved with the increase of the capacity to synchronize the activity of the maximum amount of muscle fibers with the highest degree of tension of the same.

In this sense, Romero, and Becali (2014) affirm that the force varies depending on the number of rector muscle units requested and the synchronization and frequency of the impulses that Innervate the governing muscle units, in addition, conclude that resistance to force activates myofibrils and in conditions of resistance to rapid force are activated and multiply, which is assumed by the authors. However, Román (2011) indicates intramuscular coordination as an element from which resistance to force depends.

The treatment is based on the studies of Horsford, and Sentmanat (2011) to explain that, by sending impulses to the locomotor system, the motor area of the cerebral cortex excites parallel the centers of the vegetative nervous system, when applying the exercises systematically increase energy reserves and exerts a positive effect on the structures of organs and tissues (muscle hypertrophy) that favor muscle activity (trophic action).

It is also necessary to consider the criteria of Zatsiorki (1989), Kuznetsov (1981), Ruvalcaba, and Loaiza (2001) and Román (2011) which affirm that, in untrained men, no more than 20% of nerve impulses are synchronized in large muscles, and in small muscles, up to 50%. On the other hand, Romero and Becali (2014) report that, in trained subjects, they can contract up to 80% of the total governing muscle units.

What has been analyzed so far, allows us to infer that special physical strength exercises planned for the development of strength resistance for preventive purposes exert a positive influence on the thickening and multiplication of the number of miof ibrillas, with an impact on the increase of muscle mass, which has an impact on the favorably in increasing maximum strength.

This reflection is consistent with the opinion of Estrada, González, and Zambrano (2018) regarding the fact that strength is a conditional capacity that becomes an index of good health and a certain degree of global physical development; in this regard, Román (2011) stated that strength is a special physical capacity, basic for any profession, where their activities can be physically developed through weight training with greater success.

All this, because of the improvement of intramuscular coordination, achieved with the increase in frequency and ability to synchronize the nerve impulses that nerve the governing muscle units, in this case of the actions and productive physical operations of students of technical-vocational education. This reality finds support in the conclusive results of Quintana, and Michael (2007) to verify that strength training helps not only as a basis, but can be transferred to the work of other more special capacities, having in account of its manifestations.

The attributes outlined in this section are transferable to the context of physical education for technical-professional education, through special physical exercises of strength that meet the demands of the trades and professions, together with the impact of these in the education of physical and volitional qualities, for which they are assumed to fulfill the research objective.

1.1. Current guidelines for physical education classes in vocational technical education. Referring to physical abilities

The physical education of the technical-professional education indicates among the general objectives to successfully carry out the tasks that from the point of view of their physical preparation poses the school, the family and society and to identify and select the different types of exercises for the development of physical capacities conditional and coordinative as a means of self-exercise.

Specifically, in the context of basic gymnastics, it proposes to continue the work of developing the conditional and coordinative physical capacities inherent in sports that are the reason for classes and the actions and operations of the productive processes of the year. Ministry of Education (2015)

Among the conditional physical abilities to be treated appear as important two manifestations of strength, rapid strength and endurance of strength, these will be worked throughout the course in the way that the teacher deems appropriate, that is, combined in each class with the other abilities, basketball, volleyball and athletics, or in pure classes; in correspondence with the Objectives proposed for each class or class system and with the main sports skills of the sport under study.

However, in terms of methodological indications, it isclear that the order for teaching the subjects is established by the teacher in correspondence with his interests, always starting with the less complex activities. This indication shows a certain independence for the teacher, which opens the doors to the introduction of new ways of dealing with the contents taking into account the particularities of the students, revealed in the diagnosis.

In this sense, although it indicates the types of conditional and coordinative capacities to be treated, it leaves some freedom to the teacher with the contents, methods and exercises or means to be used in the treatment of these, This aspect is of transcendental importance in terms of the implementation of special physical exercises of strength inherent to the purposes of physical education, in particular to the actions and operations related to the productive processes of the academic year.

1.1. Tendons particularly in the arms. General considerations for its study and prevention

The organism is the set of organized parts or organs, which constitute the body of living beings, the human organism is composed of different particular structures gathered in a single whole, these are cells, tissues, organs and systems; As for tissues in the human body,four basic groups are recognized: epithelial, connective (connective), muscular and nervous.

In particular, connective tissue is assigned functions such as support, transport, reserves, protection and repair; the fibers that integrate it can be of three types collagenous, reticular and elastic; Collagen **fibers** represent the most abundant elements in connective tissue.

They are composed ofcollagen proteins, forming part of tendons, muscles, muscle sheaths, capsules, ligaments, fascia, fibrous sheaths, bones and have great resistance to longitudinal tensile modifications, as well as functional resistance capacity (rotatory) against torsional deformities.

Collagen is a glycoprotein that contains hexose residues linked with hydroxyl-lysine residues, formed by fibrillar proteins and, in its amino acid composition, glycine predominates in (33%), alanine in (11%) and hydroxylysine in (1%).

The fibrous tissue dense collagen, is closely related to the structure and the very resistant work of the tendons, organized in the form of bunches or sets, they are arranged mainly in the form of parallel bundles or bundles, to create a better resistance to the axial dimension changes ; For this reason the muscular belly has to be shortened when it is activated. However, these reasons cause the tendon to suffer very little elongation during muscular actions, its function is related to resisting longitudinal tensile deformations, which It causes intense caloric generation around it, the temperatures emerged under these circumstances are regulated by the lubrication produced by the bags or synovial sheaths that surround the critical areas of the tendons, in this way friction is avoided and the sliding of the tendons is favored , as well as the Muscle action.

The tendons, in some cases divide the fleshy part of the muscle into two or three bellies (muscle intersections), but are usually found at the ends of the muscles, as it is the fixed part or muscle insertion, at the proximal end (in relation to the median plane of the muscular belly) is called the head or insertion of origin, and the distal end is called the tail or terminal insertion annex 1; Thus the muscles are inserted to the different corresponding structures. Annex 2 and 3

The tendons are bright white, composed of bundles of fibers, fibrous tissue, with few vessels, which make them possessor of little vascularization, few intermediateconnective cells, poseedores of some sensory corpuscles and a thin nervous network similar to that of the articular ligaments, in Intimate relationship with the sense of postural activity, wide and thin tendons are called aponeurosis. Annexes 1,5,6, 7

As can be seen, it is evident that functionally the tendons are built to resist longitudinal deformities, for this, the fibers are arranged parallel to the greater length of the muscles, structurally they are constituted by fibrous connective tissues, this kind of tissue is distinguished by the intense development of intercellular substances, where Elastic fibers are observed.

However, despite everything addressed in favor of the functionality of the tendons, it is necessary to consider that, due to its deficient vascularization, it barely reacts to stimuli, instead it is its synovial sheath that presents great inflammatory reactivity, which is why it can be said that the tendons are subject to a constant risk of injury which implies a correct attention that allows mitigation of such risks.

1.1.1. Main inflammatory processes related to tendons particularly in the arms. Causes, signs and symptoms

The arm, is the region of the upper extremity, between the shoulder joint (humeral scapular) and the elbow (ulnar radial humerus), its skeleton is composed of the humerus , its upper end is covered by muscle groups that move the shoulder as the Elevators, anteversors, rearversors, rotators, approximators or adductors, separators or abductors annexed 7,8 all inserted by their tendons of origin and terminal.

In this region, the appearance of tendinitis is latent, defined as the inflammation of a tendon or anchor point of a muscle in the bone Alvares, Ceballos, and Murgades (1986); What this author has raised does not differ from what has been discussed above, since it refers to the fixed or muscle insertion part. Associated with the inflation that occurs there, there are five signs that basically characterize tendonitis such as pain, heat, tumor, flushing and loss of function or functional impotence.

However, it is valid to point out that in the shoulder the supraspinatus that makes up the rotator cuff, allows to lift the arm separating it from the body in cross (Jiménez, G.J. s / f), the tendon that inserts this muscle to the bone is within a narrow space. Annexes 2 and 4

Reason why, during the repeated execution of the actions and productive physical operations exercised by the students of the teaching addressed, they are prone to suffer impingement or friction and inflammation (tendinitis), even breaking down, this is the cause of 75% of painful shoulders.

In this case, tendonitis appears with pain before the movements of the shoulder articulations, mainly when lifting the arm out at an angle between 80º and 120º with respect to the body, when performing movements of arm up and out muscle weakness appears. Another symptom is pain when pressed directly on the antero-upper part of the shoulder.

However, the deficient vascularization and the high inflammatory reactivity of the synovial sheath that surrounds the tendons give rise to tenosynovitis, caused by the rubbing of the inner surface of the tendon sheaths, caused by

that the tendons are tightened and movement in the synovial sheath is difficult due to the appearance of punctate hemorrhage and then aseptic edema and inflammation; This involves excessive muscle work, use of defective means, poor conditioning, handling excessive weights.

Crepitating dry synovitis is also calledperitendinitis, it is an inflammatory process that settles strength of the synovial sheath and is almost always located at a point of the tendon sliding apparatus, where it is already devoid of synovial fluid.

By palpation in the part of the inflammation, theso-called "snow crunch" caused by the rubbing of the displaced or mobilized tendons on the outer tissues is noticed , in this case the tendons devoid of sheath are wrapped by connective tissue or its components Structural.

The pressure of the tendons, causes a considerable painful state, the pains appear specifically in a well-circumscribed area of the affected body segment and make movements impossible.

This condition is benign prognostic and cures in two or three weeks, treatment consists of rest,dry, moist and combined local heat, short wave , radiation therapy and local cortisone injection. On inspection a slight swelling with redness and local heat is sometimes observed.

Bicipital tendinitis is due to an inflammation of the sheath surrounding the tendon of the long portion of the biceps, which originates in the supra-glenoid tubercle and extends over the articular capsule of the shoulder following the bicipital groove of the humerus until inserting into the radius. Annex 5

It shows hypersensitivity in the proximal area on the bic ipital groove of the humerus or more distally by sliding of the bicipital tendon (under the thumb of the explorer), in addition to flexion and supination of the forearm Against resistance aggravate local pain. The most frequent symptom of bicipital tendinitis, is local pain at the site of insertion of the long portion of the biceps at the elbow, pain can be caused by asking the patient to flex the arm against resistance. This type of tendinitis appears after prolonged exertion (workknown as overuse injury).

For its part, biceps tendonitis, is nothing more than inflammation of the long tendon of the biceps (annex 6) and is one of the frequent causes of painful shoulders , it is caused by the abuse of the biceps (elbow flexor) whose tendon becomes inflamed and hypertrophy.

Feeling pain over the front of the shoulder when the arm is flexed, you may also feel the tendon crunch (crepitus) over the front of the shoulder during bending and extending elbow movements.

In general, the criterion of Franke, (1977) regarding that the lack of blood irrigation is one of the main causes of weakness and injuries in the tendons, in addition there are others, such as the execution of intense load of long duration, on use of the arms Guerrero, Ugarriza, and Ysidro (2017), poor physical conditioning, incorrect execution of technical actions, muscle weakness, insufficient preparation, use of very heavy implements or defective unfavorable weather causing local cooling.

From this perspective, the physiological mechanisms of regulation of the functions of the organism, allow us to understand the preventive, prophylactic and therapeutic action that cumplen physical exercises, based on the basic mechanisms of toning, trophic, compensation formation and normalization of functions action Horsford, and Sentmanat (2011).

1.1.2. Main mechanisms to consider for the prevention of tendinitis in the arms through physical exercises

From this perspective of analysis, the physiological mechanisms of regulation of the functions of the organism that guarantee the preventive, prophylactic and therapeutic functions that it fulfills in the physical exercises allude in the first place to the toning action that is materialized, when the impulses are sent to the locomotor system, the motor area of the cerebral cortex excites parallel the centers of the nervous system vegetative.

The intensity of the emission of impulses by proprioceptors and other receptors participating in the movements depends directly on the volume of muscle mass mobilized by exercise and the intensity of work. produced.

On the other hand, the trophic action takes place when physical exercises are applied systematically, these increase energy reserves and exert a positive effect on the structures of the organs and tissues involved (muscle hypertrophy), which create Better conditions for the development of muscle activity. Proprioceptor impulses stimulate the metabolism of the central nervous system and restructure the functional state of the vegetative centers that improve the trophism of the internal organs and the musculoskeletal system.

All this is immediately favored with the intensification of blood circulation produced as an effect resulting from the application of physical exercises under conditions that guarantee Sufficient intensity, in this aspect the special physical exercises of strength are weighted since they play a role of utmost importance in this regard.

It increases the influx of blood into the tissues, the delivery of plastic protein substances, and the better assimilation of these, as well as the formation of scar tissue and compensatory hypertrophy of the organs. damaged if so.

Among many, the mechanism of formation of compensations, is based on the biological law that explains that when alterations occur in the functions of organs and systems, it brings as a consequence, the variation of the regulation of these and the modification of the work of the injured organs and of the systems that compensate for the impaired function.

The mechanism of normalization of the functions, provides as support that, when the movements are altered as a result of parabiotic states in different sectors of the reflex motor arc, it is necessary to generate impulses that favor the excitation and improve the trophism of the different links of the system nervous. With this, it contributes to the liquidation of substrates or parabiotic phenomena, in this regard passive movements, ideomotor exercises, and active exercises are effective.

The improvement and recovery of motor regulation, vitally necessary, is impossible without the use of muscle work, therefore, this depends on the correct planning and dosage of the physical exercises that are intended to be used, in this case special strength exercises.

Therefore, the objective of this research is aimed at assessing the effect of a program of special physical exercises of strength to prevent tendinitis in the arms of students of vocational technical education in the context of physical education classes, in pursuit of to satisfy the physical demands of the actions and operations inherent in the production processes.

1.1.3. Basic principles for the effective treatment of musculoskeletal injuries

1- Inflammation control

The inflammatory process beginsat the time of injury, in the initial stage of the injury is important control and repair by the body itself, however, if not intervened, this process can be prolonged and hinder repair and rehabilitation. Therefore, the control of inflammation begins at the time of injury, with compression at the site of injury, and immediate application of ice during the first 48 to 72 hours.

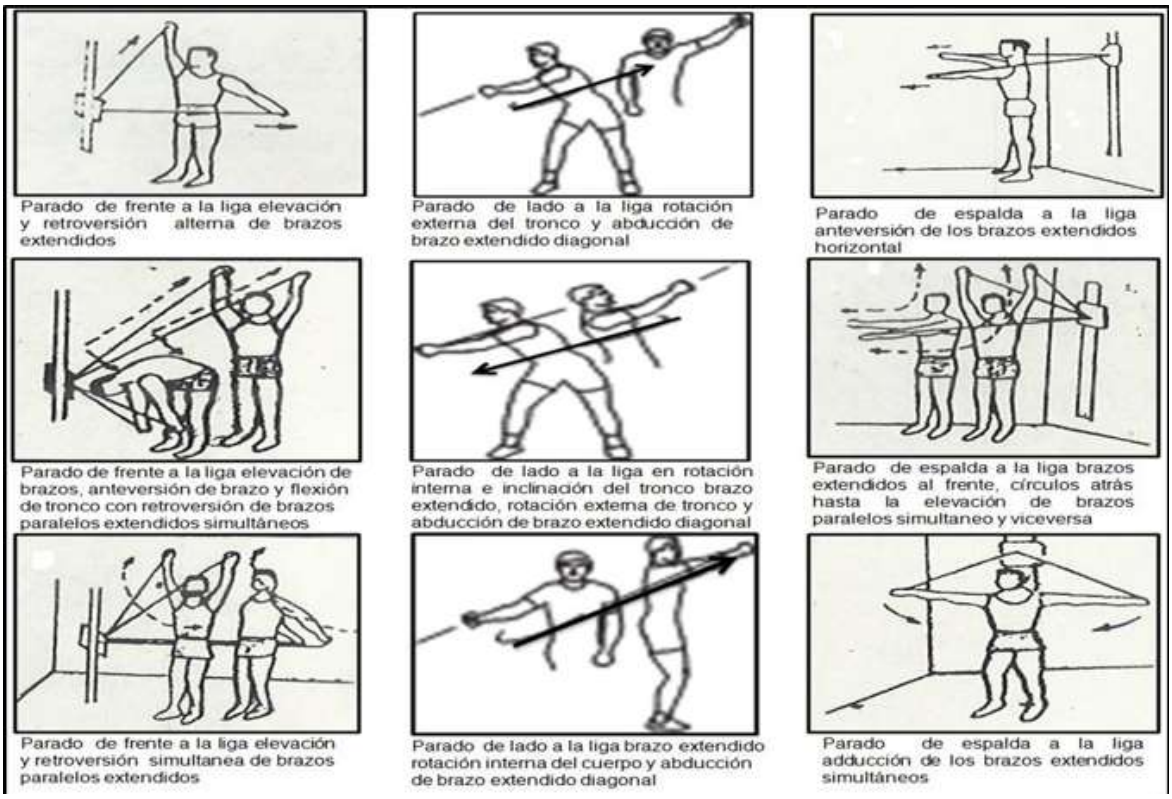
2- Pain control

The pain also beginswith the injury and evolution during the following 24 to 48 hours, it is during the beginning of the painful process when the intervention is essential, if the pain is not controlled, the limitations of movement can become prolonged.

The control of pain in musculoskeletal injuries can be achieved in several ways, limiting inflammation which reduces the distension of the tissues making the injured area less painful, compression and rest decrease inflammation and favorecen tissue healing injured.

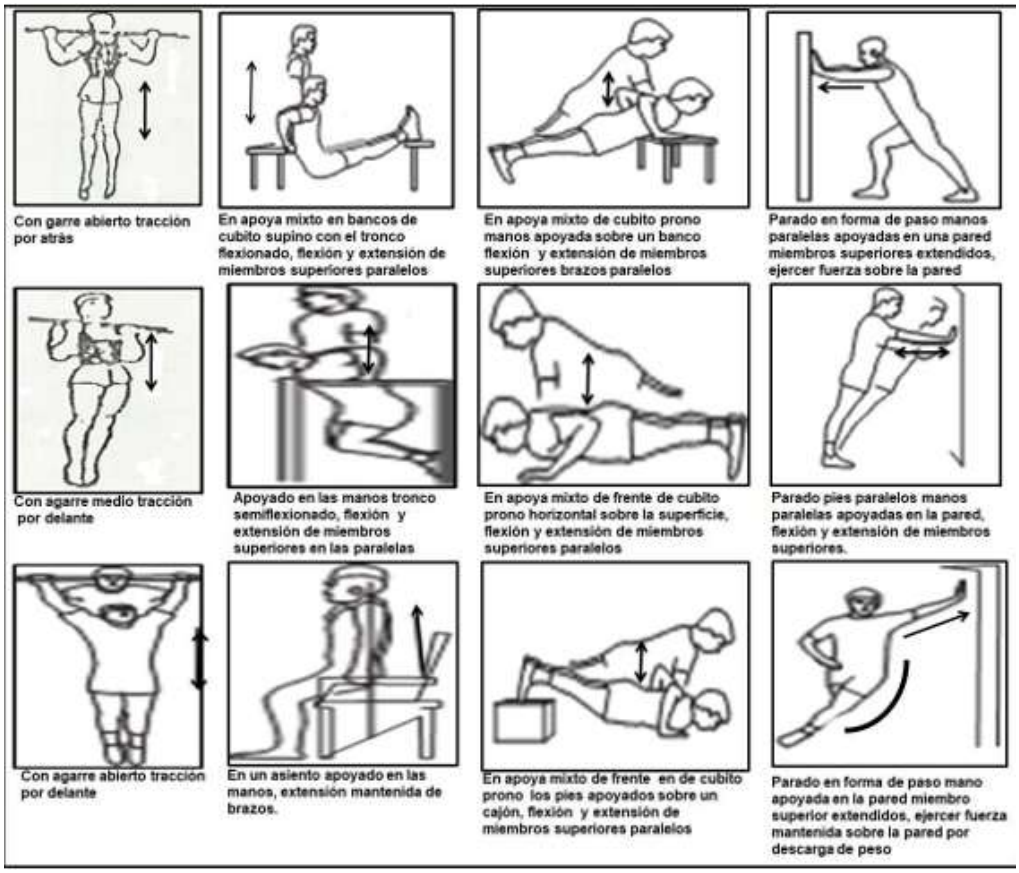
Ice application limits pain by reducing reactive muscle hypertonicity, providingsuperficial analgesia and vasoconstriction that reduces bleeding and also activity metabolic, thus decreasing inflammation and pain.

Exercises with trails or garters

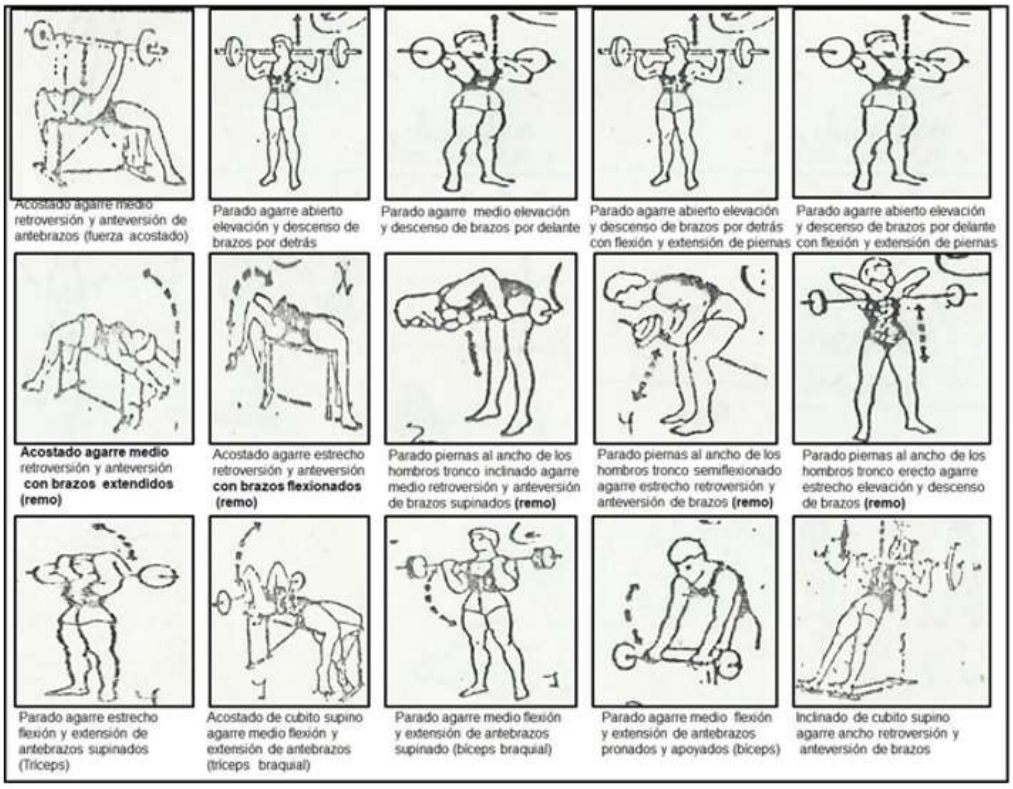


Exercises with dumbells

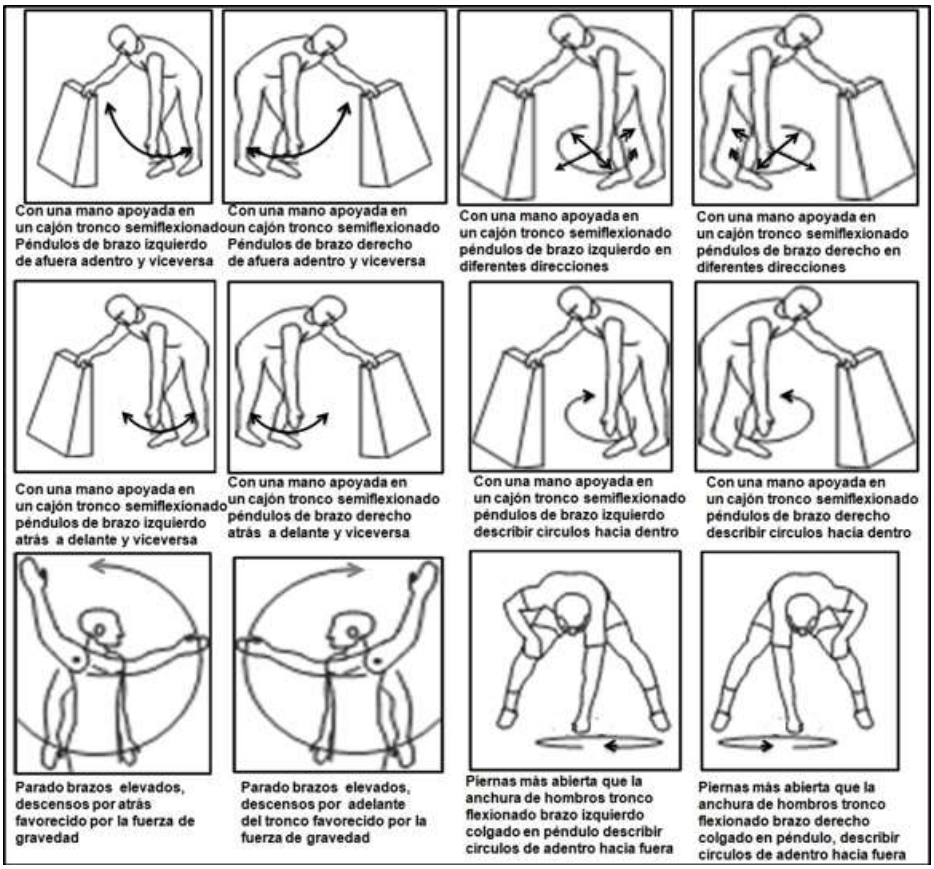
Exercises with body weight expiration



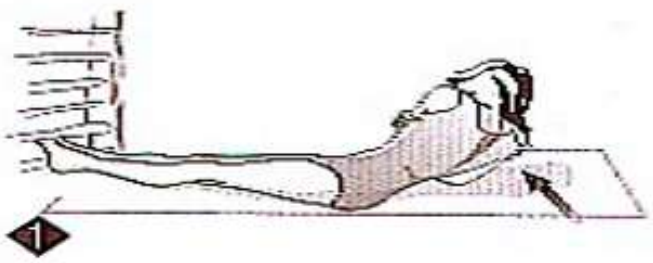
Exercises with average weights with respect to the maximum result



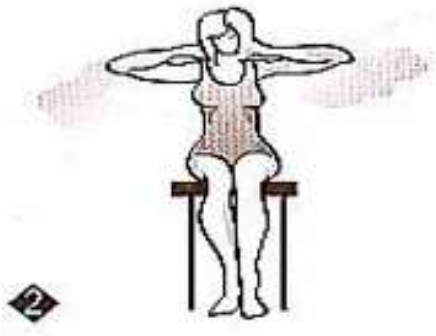
Degravitated exercises



Breathing exercises



Elevation of the trunk with rotations alternating to one side and another. Remember to maintain the rotation of hips, if it is not achieved it will be done with hips flexed 45º

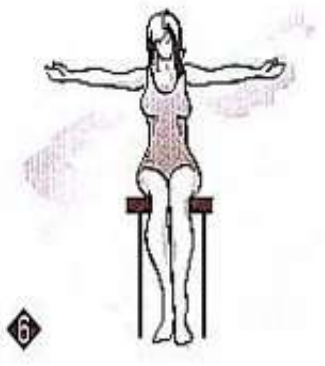


Sitting on a stool, with his knees together and his hands clasped behind the back of his neck. Inhale deeply through the nose, with the mouth closed, until the rib cage is filled to the maximum, directing the elbows backwards.

Next, flex the body forward bringing the elbows closer to achieving contact with the knees, breathing deeply at the same time; in this exhalation exercise, the duration will be double the time spent during inspiration. This exercise will be repeated 10 to 12 times.

Place one hand behind the nape of the neck and the other on the waist. Inhale deeply.

Then make a movement of flexion and twisting of the body forward, until achieving contact with the elbow of the knee on the opposite side, exhaling at the same time. This exercise will be performed by exchanging the position of the hand on the back of the neck, and the other on the waist.



With arms outstretched in cross inhale deeply

Then bend the knee that is held with both hands; flexion of the trunk, until the knee contacts the forehead, at the same time that it exhales profundamente to return to the initial position.

Sitting on a stool: place one hand on the waist and the other elevated above the head. In this position inspire deeply.

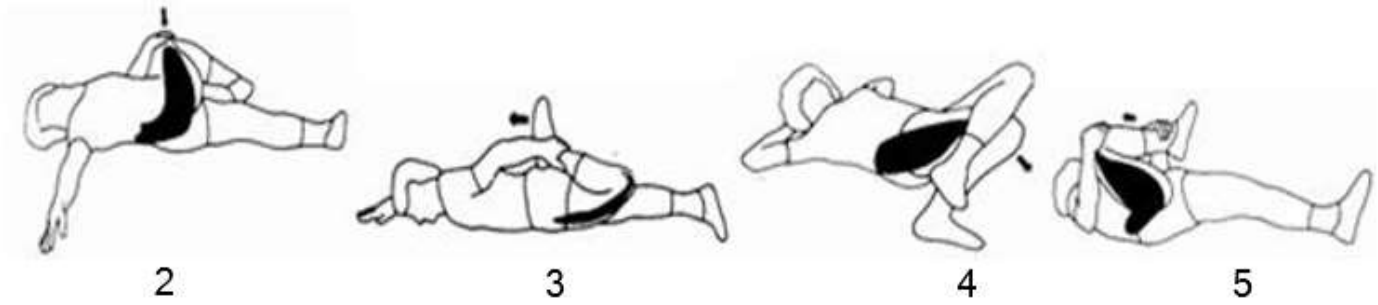
Then flex the body laterally until with the raised hand you can touch the ground, breathing out slowly and deeply. This exercise will be repeated by exchanging the position of the raised hand, above the head.

Stretching or muscle relaxation exercises

They are used in the final part of the class with the aim of achieving a total recovery of vital signs (blood pressure, heart rate and respiratory rate) and the muscles involved in the activity. They are combined with breathing exercises, from the supine ulna position or sitting.

1

1. Prone cube stretch your arms back and contract your whole body for 10" and then relax quickly.

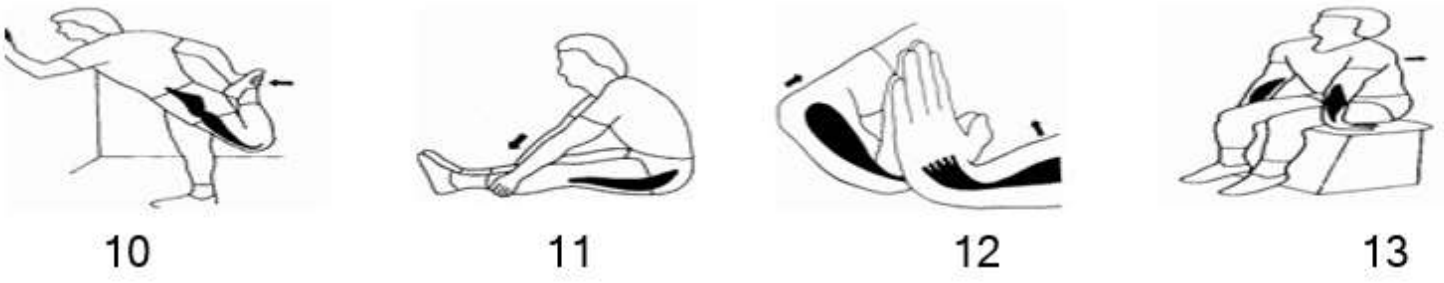


2 3 4 5

2. With your hand on the knee of the opposite leg, pull the leg over the other until you reach the ground. Stay in this position for 10 to 15 seconds. The shoulders should touch the ground; The free arm, relaxed, should be extended laterally, and the head directed towards the hand on that same side.
3. With the auxiliary hand pull the leg up, until the heel touches the buttocks. Feel the tension in the front of the thigh, and stay that way for 10 to 15 seconds
4. Lay your lower leg on the floor and let the weight of the upper leg press it against it. The tension should be felt on the outside of the hip. Stay like this for 10 to 15 seconds.
5. With both hands pull the leg as far as you can, so that it crosses the chest, and remains so from 10 to 15 seconds. The other leg is kept extended on the floor.

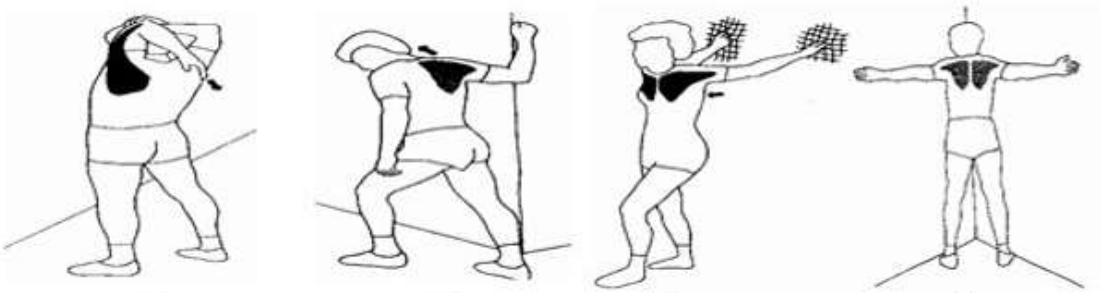
6 7 8 9

6. Pull your leg with both hands as far as you can toward your chest and stay that way for 10 to 15 seconds. Make sure your knee is not overloaded. The feeling of tension should be experienced in the back of the thigh.
7. Bring the heels up to the buttocks and with your hands pull the insteps back. Squeeze your knees down, as hard as you can, with your elbows. Slightly bend your back forward above your legs and stay for 10 to 15 seconds. This is felt along the inside of the thigh.
8. Flex that carefully to the side, exactly towards the raised leg, and stay like this 10 to 15 second.
9. Bend your hips forward, keeping your back straight. It is easier if you look directly forward with your hands behind your back. Stay in that position for 10 to 15 seconds.



10 11 12 13

10. Note: This technique can be very effective practicing it with the hand on the opposite side, which, passing behind the back, grabs the foot and lifts it until pressing on the buttocks. This technique will last from 10 to 15 seconds. If the hand opposite the leg being exercised is used, the knee flexes at a natural angle.
11. Sit with your legs extended forward and your knees bent slightly on the floor. Extend your arms forward and hold your legs as low as possible. Keep your back straight. Feel the tension in the back of your thigh and stay there for 10 to 15 seconds.
12. Squeeze your palms against each other and lift your elbow outward with your arms facing your chest. Feel it stretch on the inside of your forearm and stay that way for 10 to 15 seconds.
13. Hands against the seat. Slowly, recline the trunk back, with your arms stretched out, and feel the tension on the inside of your forearm. Stay in this position between 10 and 15 seconds.



14. Bend the arm back with the wall for about 15 seconds with the help of the arm.
15. Keep your forearm still, and sharpen your feet. Turn the trunk forward and outward, so that the chest part is advanced as possible. Feel the feeling of tension in your chest, above, in the front of your shoulders. Stay that way between 10 and 15 seconds.
16. Extend your arms up and back, if possible passively, and remain so for 10 to 15 seconds, holding on to a net. The extension can also be done with the help of a partner who holds you by the wrists.
17. Stand in a corner or corner, facing it. Lean each hand (or forearm) against a wall and drop your body forward. Press 10 to 15 seconds forward in such a way that you experience a feeling of tension in the upper part of the rib cage.

18. Keep your hands in the same position, but bend your knees and bend over as much as you can. Feel the tension in your shoulders, arms, and chest. Stay like this for 10 to 15 seconds.
19. Spread your legs as far apart as you can, slowly. Remain passive for 10 to 15 seconds, with your legs spread and your heels against the wall. The wall serves as a support and makes it possible to maintain between 10 and 15 seconds.
20. With your body upright and your leg thrown back, project your hips forward. Feel the tension in your hip, and stay there for 10 to 15 seconds.
21. Keep the same leg position, but project your hips as far forward as you can. Feel the tension in your groin and hip. Stay like this for 10 to 15 seconds.
22. Drop the trunk back and down, and stay in this position for 10 to 15 seconds. Sitting in the way that feels as comfortable as possible, the eyes Serrated (preferably), we place one hand on the chest to control the entry of air (if we feel that the air enters the chest part is that we are doing it incorrectly) and another in the diaphragm to feel the entry of air.

Once the inflammation and pain are controlled, the next phase of rehabilitation can begin, this forms the basis of the subsequent phases and initiates the repair of the affected tissue.

Restore joint range of mobility and soft tissue extensibility

Before starting strengthening or resistance exercises, it is necessary to restore the active range of mobility of the joints completely, without pain, as well as the extensibility of the soft tissues surrounding the joint. The impossibility of achieving a complete development of the active mobility range before strengthening can cause a new injury or a biomechanical error, so it is necessary to make sure that it has been achieved with this joint contractures are avoided and the resulting functional limitations.

Passive mobility arc techniques are used first, followed by active, assisted mobility arc exercises, and then active mobility arcs. The active mobility range does not require muscle activation and, therefore, can be used very early in the rehabilitation process.

In this way it can help reduce edema and promotes early recovery of joint function. The muscles and support structures are allowed to rest, so that pain and edema will be less.

3- Restoration of muscle strength

Once the full active range of motion is restored without pain, strengthening can begin. It begins with isometric exercises and goes through manual resistances, elastic bands, isotonic exercises, isokinetic exercises and finally a functional test.

Exercises that cause isometric contractions protect the injured joint and antagonist muscles, because they do not cause changes in the length of the muscles. They can be started before the restoration of the full active mobility arc because they do not cause movements when the contraction power of the agonist and antagonist muscles equalizes.

The use of exercises with elastic bands (garters), are an excellent way to introduce strengthening through the active mobility arc, because they cause a minimal, although constant, resistance. The elastic bands must have different degrees of resistance, differing by their widths.

The exercises that cause isotonic contractions can be used in two aspects for concentric contractions (towards the center), shortening by approximating their insertions, also for eccentric or plyometric contractions, resistant or Cession (away from the body) when a group of muscles causes continuous tension with elongation and separation of the insertion point.

For them it is essential, the use of devices or free weights that provide a greater degree of external resistance and also require a greater ability to integrate other parts of the body to a variable degree in a given exercise.

The strengthening that causes isocynic contractions allows to work at different speeds; Thus, in the arm you can get more functional exercises. In the functional test the real activity that is going to be developed is used,

it is therefore the greatest challenge for the recovery of the patient, in these exercises coordination is much more important.

4- Restoration of muscular endurance, including discharges This basic principle is achieved with the strengtheningecimiento, for this series with few weight loads and very repetitive are used developing muscle endurance, The use of aerobic apparatus of variable resistance is useful to develop resistance in the muscles and tendons of the extremities, to restore physical shape and cardiovascular.

Therapy with exercises in the water and swimming is very useful to maintain fitness and increase endurance, especially for injuries that need to limit weight loading, this type of treatment It is called discharge.

5- Biomechanical rehabilitation; involves the use of specific movement models

At this stage, the full range of joint mobility has been recovered and the functional strength in the area or limb, in this case in the arms, has also been recovered Muscular endurance and tissues respond to the demands of sustained activity.

The specific readaptation, for this we use exercises that demand actions related to the specific activity of the subjects, this allows to perform an adequate biomechanical function, which avoids appearing models of sustitutions leading to recurrence of lesions; At the end of the program, greater efficiency has been acquired in the activity, achieving a safer and more effective degree of activity

6- Maintenance of cardiovascular health status

To the extent that an injury is treated or avoided, the state of health is improved to the extent that the subject is able to tolerate the activity maintained. Maintain fitness.

7- Program development to maintain strength, flexibility, physical form and skills

These programs are integrated as soon as active training is completed in a given area or body segment, incorporating the usual exercise process, as this is a fundamental step in the recovery of a safe and independent function. Both flexibility, strength, and aerobic endurance must be present in the preparation plans, as well as joint mobility.

As can be seen, the principles discussed present a logical coherence that guarantees the attention to musculoskeletal injuries effectively, however, in the case at hand , although it is not a trauma with The same magnitudes as those caused by the particular sporting activity itself, deserve to be taken into account.

Since students of vocational technical education suffer to a lesser extent injuries related to the specific activities of their professions, that is why we assume them, in particular we weigh those referred to principles four (4) and eight (8), which is why a program of special physical exercises is proposed. of strength in tune with the particularities of the students of the referred education.

Chapter 2. Design of the program of special physical strength exercises to prevent tendinitis in the arms of students of vocational technical education

When structuring the program of special physical exercises of strength for its application, the results of the studies of Nieto and Gamardo (20 20) were taken into account, who affirm that three weekly sessions of physical education of Uninterrupted manner are appropriate to produce increases in the muscular strength of the upper body.

In this sense, exercises that produce isometric contractions are combined in order to protect the joints and antagonistic muscles; isotonic to increase muscle mass and endurance and subsequently those that produce isokinetic contractions to increase the speed of contractions, neuromuscular coordination and with She the functionality of the arms.

For these purposes, warm-up exercises (manual resistances) are applied with garters, dumbells, with body weight expiration, with average weights with respect to the maximum result, gravitated, all combined with breathing exercises and stretching or muscle relaxation.

Once the first step above mentioned has been made, we breathe in a deep and gentle way to a count between 5 to 8sec. and we also expire deeply and gently at a count between 5 to 8sec.

For the realization of the program, the criteria of Román (2011) referred to the fact that work with little weight and many repetitions in beginners favors the increase of muscle thickness and Romero were taken into account, and Becali (2014) in relation to the resistance to force activates myofibrils and in conditions of resistance to rapid force myofibrils are activated and multiplied; thus favors the Nutrition of muscles and tendons through the blood supply produced.

Methods of the program of special physical strength exercises for the prevention of tendinitis in the arms of students of vocational technical education

The methods for special strength preparation have as their main task the development of the necessary force in the muscles that support the main load, in close relation to the fundamental motor quality and under conditions Conservation of the specific motion structure Kuznetsov (1981).

That is why of the methods for the development of strength in beginners, are assumed in the case at hand, those proposed by Roman (2011) in the first place the method of low weight and few repetitions, with a weight that allows to perform sufficient re requests for batches with ease, about six (6), being the maximum of your possibilities ten (10) repetitions. This method allows that there is a muscular adaptation to the overload and that the muscular pains typical of this activity are assimilated, thus creating basic premises of adaptation.

It was also emphasized in the method of low weight and many repetitions, with a weight that allows to perform enough repetitions by batches between 8 and 12 per batch; this method allows the organism to adapt to the loads without causing injuries and leads to a considerable increase in muscle volume (hypertrophy) and with it of body weight.

Weight method and intermediate repetitions: with a weight that allows four (4) to six (6) repetitions per batch. This method guarantees a greater increase in strength in relation to the previous method, with a smaller increase in muscle volume and body weight.

Methodological treatment to the content of the program of special strength exercises to prevent tendinitis in the arms of students of vocational technical education

Being consistent with the theoretical and methodological conception assumed, the methodological treatment of the content of the program is based on the principles of restoration and maintenance of muscle strength, addressed above. Reason why, it starts with exercises of low weight and few repetitions (between 6-10) per batch, to achieve the necessary muscular adaptations and learning the execution of the exercises (two weeks).

Exercises are used with a predominance of isometric contractions, through elastic bands (garters), dumbells and objects that simulate work activity. Then exercises with little weight and many repetitions (more than 6 and up to 12) in batches, to pottenciar the resistance to the force and achieve the increase of the muscle thickening and the improvement of the technique of execution of the programmed exercises.

Exercises are predominantly used that cause isotonic contractions, with body weight expiration, objects that simulate work activity and exercises with elastic bands (garters) and dumbells are maintained under these conditions.

In the remaining four weeks, the previous form of exercises is combined

(little pes or and many repetitions) with those of medium weights and average repetitions (between 3 and 6) by batches, the latter with weights, with them the increase of the strength speed is propitiated and the muscle thickening is maintained.

To fulfill these purposes, exercises that cause isokinetic contractions are mainly used, through exercises with body weight expiration, exercises with weights, under these conditions the exercises are combined and alternated. previously treated

In the treatmentto the indicated content, the exercises degravitados of Cosman are inserted as a means of rehabilitation and prevention of bursitis and tendinitis, its use is justified by considering that the conditions of weightlessness (impesantez) cause elongations in the axial dimension of the structures, this elongation modifies the orientations of the collagen.

Thus,to the extent of the decrease in gravitational loads, laxity increases (increase in the composition of water and distension of the spaces of the aerolar system) in the connective components and within it the straightening of the aspetic collagen system.

Therefore, these degravitated exercises are performed with the lowest incidence of gravitation, hence their name, in this way they improve the amplitude of the articular arch, through the movements, it is gained in elongation of the ligaments and mobility of the joints in particular the humeral scapular (the shoulder).

To be more efficient in their conditioning, they are executedin the form of pendulums that are directed towards different directions, describing circles, "S"; after the exercises are mastered without external resistance by the students, and painful symptoms have disappeared if any, they can be applied with small external resistances, as well as used throughout the program.

Breathing exercises, on the other hand, have a double function as a means of recovery and as a means of nutrition, since diaphragmatic breathing is used with emphasis without and with means that allow the complete expulsion of the waste substances produced as a result of the special strength exercises treated, so as to facilitate a greater entry of oxygen to the lungs before, during and after the relevant repetitions have been applied in each case; They are used throughout the program.

Both the content, methods and means referred to are involved harmoniously and progressively under the requirements of the physical education program for professional technical education, however, it is of interest the approach of methodological indications appropriate to the particularities of the proposal raised.

Methodological indications to complete the program of special strength exercises

- Respect and therefore start from the initial diagnosis for the planning and treatment of the contents, objectives, methods and means to be used.
- Maintain at all times the facilitating role of the teacher in the conduct of the methodological treatment of the content, characterized by the constant teacher-student interaction and among the students themselves.
- The dosage of the classes will maintain the requirements established in the physical education program of the teaching and in thiscontexto, the special physical exercises of strength will be treated once the related contents have been concluded. with the corresponding sports skills.
- It is necessary to indicate independent activities in order to enhance the systematicity and systematization of contents in an environment that encourages the search for new exercises and activities by students, in line with the fulfillment of the objectives set in each session.
- Systematically analyze how students behave before the contents treated on special strength exercises for the arms.

Under these conditions, the objective of assessing the effect of special physical strength exercises to prevent tendinitis in the arms of students of professional technical education is met.

Chapter 3. Assessment of the effect and effectiveness ofspecial strength exercises to prevent tendinitis in the arms of students in vocational technical education.

Participants

The 10 second-year students of the Profesional Technical Education of the Guáimaro Municipality were intentionally selected, all of them male. As a selection and inclusion criterion, it was defined that they should be enrolled in the education and the referred study center, not have physical or cognitive limitations, as well as chronic or latent pain that prevent the practice of physical exercises in particular strength, the Students had to express their willingness to collaborate and participate systematically in the research voluntarily.

Se established as exclusion criteria, students with surgical history of cardiovascular type or acute myocardial infarction, with cognitive or mental alterations , with the presence of chronic or latent pain and those that will not remain systematically during the development of the research.

In the presence of the participants, a document was signed with the consent of parents and representatives, in addition to the school authorities authorizing the implementation of the program of special physical strength exercises, research methods and techniques , as well as for the handling and dissemination of information for academic purposes.

Prior to the study, all students were summoned to explain the objective and procedures for their development, they issued a document with the consent of their parents about being informed of the development of the pedagogical medical test that includes medical maneuvers, Interrogations (anamnesis) related to the signs and symptoms of tendinitis, physical strength exercises and dissemination of results for research purposes.

On the other hand, they were examined by the physician (doctor) through the application of the medical methods referred to at the end of the first year, for the sake of a clear diagnosis associated with tendinitis and to know the real possibilities of receiving physical exercises, in particular special force.

At the beginning of the new school year, participants filled out a questionnaire to identify socio-demographic, psychopedagogical and personal data; were examined again by the doctor (doctor) in order to corroborar the initial diagnosis, to these medical tests after two weeks of physical adaptation was added the maximum strength tests, in the same way it happened after applying The program of special physical strength exercises, all to determine the initial and final state of the students regarding tendinitis, maximum strength and functional adaptations.

To assess what is related to tendinitis, the criterion provided by Alvares (1990) is assumed to classify tendinitis, who refers that in Grade **I** there is pain after activity, Grade **II** pain during and after non-disabling activity, Grade **III** pain during and afterdisabling activity, **Grade IV** pain during daily activities.

In order to comprehensively address all possible evolutionary behaviors of students, it was necessary to incorporate **Grade 0** such as the absence of symptoms and pain in the arms.

To measure the maximum arm strength, the non-extreme weight test was

used to consider that the students do not systematically practice physical strength exercises, in this case the lying force was used as a base exercise, on a horizontal bench in a supine position, for this purpose used an Eleiko Olympic bar.

The test consists of selecting a weight to each student according to their physical characteristics and diagnostic results, the weight is placed in the barra and the repetitions are executed (more than 10) without reaching exhaustion or deforming the technique, the final result is added 3 Repetitions.

To determine the maximum force, the equation FM= (implement weight + repetitions) is used**.** 0.03 + weight of the implement, muscle weakness was considered cases of results less than 59 kg. Several heart rate shots are made, all by the radial artery, first at rest, at the end of the test and after three (3) minutes of recovery, Invicta Ultimate brand chronometer was used.

To carry out the maximum strength test, the morning schedule is used, the students upon arrival deliver to the data logger the result of the basal pulse takenor when waking up at home and, this ratifies to each student the weight to be used for the test, equivalent to the individual average value considering the maximum result of the strength of arms lying down, Endorsement three well-executed repetitions, obtained after the second week of adaptation.

Half an hour of rest is indicated, and then the resting heart rate 1 is taken, which is noted in the student's box, the individual conditioning is performed, at the end of this the average weight is placed in the box a Each student,starting with the one with the least weight and executing more than ten continuous repetitions of strength lying down without exhausting or deforming the correct execution of the technique, the result under these conditions, will be hisman three repetitions.

Immediately after the repetitions the heart rate is taken two and after three minutes the heart rate three, all in ten seconds, the result was multiplied by six to determine the physiological effect of the effort physical based on one minute and how the adaptation of students to the physical load behaves,based on the percentage of recovery past the load determined through the Karvonen formula.

Once the total result of the repetitions has been obtained and the weight of the implement used by each student is known, the result of their maximum strength is determined, the resulting value is considered as their maximum arm strength.

Statistical analysis to determine the effectiveness of special physical strength exercises in the prevention of tendinitis in the arms of students of vocational technical education.

The descriptive analysis of the results was established through the arithmetic mean, the median, the standard deviation and the percentage calculation, the correlation between the development of maximum strength and the prevention of tendinitis determined through Spearman's Rho test, by establishing a relationship between a quantitative variable and a qualitative variable.

The normality in the distribution of the data obtained before-after applying the exercise program was determined through the nonparametric docim (Shapiro, and Wilk, 1965) with 95% confidence equivalent to 0.05; in this regard, Student's t-test was used for the normal distribution data and Wilcoxon for those who did not They are distributed normally, in both cases to assess the level of significance of the differences for related dependent samples.

The following significance levels 0.10 (not very significant), 0.05 (significant) and 0.01 (very significant) were used to analyze the results obtained in the applied tests. Statistical analysis in general was possible through the application of the professional package SPSS version 21.0 for Windows and Microsoft Excel.

Results

The application of Spearman's nonparametric Rho correlation test revealed a - **0.572** correlation coefficient, which indicates the existence of a correlation between the results of the maximum force achieved and the Prevention of tendinitis in the arms of students.

This behaves in a moderate negative way, which is why the null hypothesis is rejected and the alternative hypothesis H1 is accepted, referring to the existence of a relationship between the two variables. The significance is 0.08, which places it between the levels of little significant and significant because it reaches 92% of bilateral significance.

Correlation			Strength	Tendinitis
Rho de Spearman	Maximum strength	Correlation coefficient	1,000	**-,572**
		Sig. (bilateral)	.	,084
		N	10	10
	Tendinitis	Correlation coefficient	**-,572**	1,000
		Sig. (bilateral)	,084	.
		N	10	10

Table 1: Correlation behavior

However, Table 2 shows the behavior of the distribution of the variables investigated, in them a normal distribution is seen when reaching $p > 0.05$ when comparing the initial and final results of the maximum force values reached, contrary to the behavior expressed Physical adaptations assessed through the behavior of the pulse, in particular that of the load and the recovery, as well as the prevention of tendinitis that are distributed in both cases in a non-normal way when reaching a $p < 0.05$ respectively.

Normality table

Indicators	**Test**	**Signification**		**Distribution**
		Initial	Final	
Maximum strength	Lying strength	0,274	0,717	Normal

Heart pulses	Heart pulse 1	0,359	0,008	No Normal
	Heart pulse 2	0,551	0,418	No Normal
	Heart pulse 3	0,130	0,015	No Normal
Tendinitis	Medical anamnesis-manoeuvres	0,045	0,000	No Normal

Table 2: Results of normality in the distribution of initial and final data (Shapiro-Wilk nonparametric docim)

For the research, 10 male students with an average age of 15.6 years were identified, all belonging to the second year of professional technical education, of whom 10% one (1) presented pain after the activity, equivalentlens to (tendinitis grade I).

20% two (2) non-disabling pain during and after activity (grade II tendinitis), 60% six (6) disabling pain during and after activity (grade III tendinitis) and 10% one (1) had pain during daily activities (grade IV tendinitis).

The 80% equivalent to (8) students presented muscle weakness, in generalsense it is initially revealed the involvement of the 10 students in painful symptoms a significant number with muscle weakness before actions and physicalproductive operations.

Once applied the program of special physical exercises of strength planned, the following results are achieved, 3 students 30% evolved from tendinitis of more complication grade IV one (1) and two (2) of grade III , the grade I presence of pain only after some physical activities productivas, the remaining 70% (7) managed to eliminate tendon pains and only four (4) representative of 40% maintained the condition of muscle weakness of a total of eight (8), even when the results of maximum strength were increased.

10 Students	**Variables to characterize the presence or absence of tendinitis (before)**										
	Painless	Pain after activity	Pain during and after the activity in the disabling	Pain during And after disabling activity	Pain during daily activities	Muscle weakness	**itis rating** scales				
							Grade 0 0	Grade I 2	Grade II 3	Grade III 4	Grade IV 5
Until	0	1	2	6*	1	8*	0	1	2	6*	1
%	0	10	20	60*	10	80*	0	10	20	60*	10
Pts	0	2	6	24*	15	-	0	2	6	24*	5
Variables to characterize the presence or absence of tendinitis (after)											
Until	7*	3	0	0	0	4*	7*	3	0	0	0
%	70 *	30	0	0	0	40*	70*	30	0	0	0
Pts	0*	6	0	0	0	-	0*	6	0	0	0

Legend: Pts. Points; Tot.Total;*. Results by variables that stand out

Table 3: Comparison of results with respect to tendinitis

Table 4 shows the descriptive measures, before the exercise pattern strength of lying down, where it was found at the beginning that the values of the maximum strength oscillated around 54.8 kg, compared to an average weight set for the exercise of 39.5 kg, before which 11.6 repetitions were executed as an average; which evidencesmuscle weaknesses, The standard deviation reached a value of 7.77 kg.

At the final moment, the values of maximum force before the standard exercise oscillate around 62.9 kg, compared to the weight initially set of 39.5 kg and the higher figure of 16.6 repetitions was favorably reached, which represents an increase of 5 average repetitions, without deforming the technique of execution of the exercise, with a standard deviation of 12.16 kg.

The adaptation, assessed through the heart rate as an effect of the load of 39.5 kg of weight set for the exercise pattern strength of arms lying down, oscillated around 222.6 p / m and at rest in 97.8 p / m respectively, which yielded a recovery percentage of 73.4 %, which reveals organic adaptation to the load, with a deviation of 8.79 all at the beginning.

On the other hand, in the end, the pulse under the effect of the load oscillated around 184.2 p / m and at rest in 52.2 p / m, the percentage of recovery in 97.9 % which means a high level of supercompensation before load similar to the initial and the deviation is 4.36 p / m.

Students 10	**Results of the maximum strength test by non-extreme weight (before)**								
	Basal pulse	Pulse 1	Pulse 2	Pulse 3	% Recup	Weight Kg	Repeat	Repeat +3	Maximum Force Kg
Fashion	36p/m	4,6p/	216p/m	114p/m	77,2	40	12	15	58
Media	41,4p/m	2,8p/	**222,6p/m**	**97,8p/m**	**73,4**	39,5	**11,6**	14,6	**54,8**

Median	41,5	54,00	222, 00 p/m	102,00p/m	76,5	40	12	15	58,00
S	55,9	6,60	**11,81 p/m**	**16,01 p/m**	**8,79**	6,43	**0,51**	0,51	**7,77**
Maximum strength test results for non-extreme weight (after)									
Fashion	36p/m	48p/m	180p/m	54p/m	98,9	40	18	21	73,35
Media	36p/m	4,4p/m	**184,2 p/m**	**52,2p/m***	**97,9***	39,5	**16,6**	19,6	**62,91***
Median	36	,00p/	180,00 p/m	54,0 p/m	99,8	40	17	20	63,40
S	4,00	19p/m	**10,60 p/m**	**4,04 p/m**	**4,36**	**6,43**	**1,64**	1,64	**12,16**

Legend. Recup: recovery. Repet: repetitions. + 3: the sum of 3repetitions to the final result.

S: standard deviation. p/m: beats per minute.

Table 4: Results achieved through maximum arm strength and hysical adaptation

What has been seen here, shows a high level of coherent and favorable adaptation to similar loads that reveal the effective assimilation of the program of special physical exercises of strength, if we take into account the results of the pulse before the fixed load and the evolution of the percentage of recovery that is manifested when assessing the results of this indicator.

Table 5 shows the means and the significance of the mean differences of the indicators maximal strength, tendinitis and heart rates, it shows that each variable analyzed both through the parametric test t of Student, as with the non-parametric Wilcoxon, reach in both cases values lower than or equal to the levels of significance previously set by the researcher (0.10 - 0.05- 0.01) to make the relevant analyses with them.

For this reason, the existence of very significant differences is revealed when comparing the data of the initial and final moments, which demonstrates the effectiveness of the program of special physical exercises of strength planned and applied to prevent tendinitis in the Arms of the students of second year of the Vocational Technical Education, under the conditions of the Physical Education of the ENSEñanza. The results also show that it is feasible to apply special physical strength exercises to prevent tendinitis in the arms of students investigated.

Table of means and significance of differences					
Indicators	Tests	Medium or Median		Signification	
		Initial	Final		
Maximum strength	Lying strength	54,8870	62,9100	0,019	Very significant
Heart pulses	Heart pulse 1	54,6	44,4	0,007	Very significant
	Heart pulse 2	222,6	184,2	0,005	Very significant
	Heart pulse 3	97,8	52,2	0,005	Very significant
Tendinitis	Anamnesis- medical maneuvers	3,70	0,60	0,000	Very significant

Table 5: Statistical values of the significance of the results of maximum strength, physical adaptation and tendonitis.

Conclusions

In the first instance, it is possible to determine the maximum arm strength of the second-year students of the professional technical education through the non-extreme weight test, the existence or not of muscle weakness in the arms of the students is identified and the percentage of recovery that allowed to evaluate the behavior of the physical adaptation to the loads.

The bibliographic systematization allowed to reveal the benefits of special strength exercises for the thickening and multiplication of myofibrils, thereby inferring that in the studies studied above there was an increase in muscle mass, intramuscular coordination and synchronization of impulses that innervate the governing muscle units before productive physical actions because of the increase significant of the maximum force.

The program of exercises to prevent tendinitis in the arms of the students of the professional technical education that was designed, oriented to satisfy a specific need of the process of physical education of this teaching, is based on the basic theoretical and methodological principles of the treatment of Musculoskeletal injuries and physical education and indicates how to proceed to develop the process from the didactic tendencies and specificities of contemporary physical education, which corroborates the idea to Defended.

The statistical analysis showed the existence of a correlation between the program of special physical exercises of strength and the prevention of tendinitis in the arms of the second-year students of the professional technical education of Guáimaro.

Recommendations

It is necessary to take into account in future research the evolutionary control of muscle mass, the type of muscle fiber predominant instudents and their behavior, the internal and external coordination of muscles under the influence of special strength exercises. to prevent tendonitis.

References

1. Alvares, R., Ceballo, A., Murgades, R. (1986). Ttratado of orthopedic surgery and traumatology volume II, orthopedics. Havana City: Editorial Pueblo y Educación.
2. Alvarez, R., (1990). Manual of diagnostic and treatment procedures in orthopedics and traumatology, t,i, Editorial Pueblo y Educación, Havana City.
3. Doxey, R., Thiese MS., Hegmann, KT. (2018). Reliability of Common Provocative Tests for Shoulder Tendinitis. J Occup Environ Med., 60(12), 1063- 1066.
4. Estrada, To., González, Y., Zambrano, To (2018). Weight-

bearing exercises in the rehabilitation of bronchial asthma. In
5. Franke, K. (1977). Traumatologíe des Sport. VEB Verlag Volk und Gesundheit. Berlin.
6. Guerrero,L.,Ugarriza, L.& Ysidro, A.(2017). Association between musculoskeletal disorders, De Quervain's tendinitis and the possession of the Smart phone in inhabitants of the Agua Viva Christian community of the district of Los Olivos. Catholic University Sedes Sapientiae.
7. Hernandez, R. (2011). Sports functional morphology. Havana City Publisher: Scientific-Technical.
8. Horsford, F., and Sentmanat, A. (2011)." Overview of Therapeutic Physical Culture and Rehabilitation. In Hernández, R, and Aguilar, E. (2011) Physical exercises and rehabilitation Volume I. (PP.11-27). Havana City. Publisher: Sports.
9. Jiménez, G.J. (S/F) Manual of Sports Injuries. Havana Cuba Kuznetsov, V.V. (1981). Strength Preparation in Athletes of the Higher categories. Editorial Orbe. L to Havana, Cuba.
10. Martin, J. (2015). Causes, symptoms and treatment of bicipital tendinitis.Recuperado
11. Ministry of Education (2015). Directorate of Technical and Vocational Education Physical Education Program. Level: Medium Technician. Lto Havana Cuba.
12. Nieto C.C., Gamardo, P.F. (2020). Evolution of Muscle Strength in Second Year High School Students. EmásF, Digital Journal of Physical Education. Year 12, Num. 68
13. World Health Organization. (2019). *Global Strategy on Diet, Physical Activity and Health*. Retrieved from
14. Patselas, T., & Spanos, S. (2020). Clinical reasoning in patients with lower limb tendinopathy a rehabilitation framework. Archives of Hellenic Medicine, 37(2), 162–168.
15. Quintana, A., Michael., R. (2007). The influence of special strength exercises on technique in the 400-meter dash runners of the EIEFD in the macrocycle 2005-2006. In
16. Roig, N. (2010). Medical Control. Editorial Deportes. Havana City. Cuba. Roman, I. (2011). Multiforce. Havana City. Cuba: Editorial Deportes Romero, R.J., Becali, A. (2014). Sports Training Methodology. The Cuban School. Editorial Deportes. Havana. Cuba
17. Ruvalcaba, L., Loaiza, W. (2001). Methodology &Sport. Basic considerations. San Juan de los Morros. Venezuela. ISBN 980-6426-57-66
18. Shapiro, S. S., Wilk, M. B. (1965). An analysis of variance test for normality. Biometrics, 52:3.
19. Zatsiorski, V. M. (1989). Sports Metrology. Havana: People and Education.

DOI:10.31579/2690-1919/321