

PODIUM

Journal of Science and Technology in Physical Culture

Volume 19
Issue 1

2024

University of Pinar del Río "Hermanos Saíz Montes de Oca"



Translated from the original in spanish

Original article

Special rapid strength preparation in shot put athletes with physical-motor disabilities due to amputation

La preparación especial de fuerza rápida en balistas con discapacidad físico-motriz por amputación

Treinamento especial de força rápida em jogadores de futebol com deficiências físico-motoras devido à amputação

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Received: 04/10/2023.

Approved: 12/14/2023.

ABSTRACT

In the National Para-Athletics Championship in Cuba, the competitive results of shot-put athletes with physical-motor disabilities due to amputation show a decrease in several categories. Deficiencies were detected in the dosage of loads, in the use of methods, means and procedures; in addition to inadequate methodological guidance. The objective was to



design a methodology for planning rapid strength capacity in the special preparation stage of shot-put athletes with physical - motor disabilities due to amputation. A descriptive and quantitative research was carried out in the period between 2019-2022, the study focused on the planning and training process of rapid strength in the special preparation stage analyzed and described, through empirical methods such as the review of documents, survey, interview and methodological triangulation made it possible to evaluate its current state. Athletes, coaches and managers from provincial and national levels collaborated as a sample. The proposed methodology is viable and feasible, with expected effectiveness for the current sporting context and with possibilities of generalization in other throwing events. The designed proposal enriches the theory of sports training in athletes with disabilities.

Keywords: amputees, shot put athletes, disability, strength, methodology, planning.

RESUMEN

En el Campeonato Nacional de Paratletismo, en Cuba, los resultados competitivos de las balistas con discapacidad físico-motriz por amputación muestran un decrecimiento, en varias categorías. Se detectaron insuficiencias en la dosificación de las cargas, en la utilización de métodos, medios y procedimientos; además de una inadecuada orientación metodológica. Se trazó como objetivo diseñar una metodología para la planificación de la capacidad fuerza rápida en la etapa de preparación especial de balistas con discapacidad físico-motriz por amputación. Se realizó una investigación de tipo descriptiva y cuantitativa en el periodo comprendido entre el 2019-2022, el estudio se centró en el proceso de planificación y entrenamiento de la fuerza rápida en la etapa de preparación especial analizado y descrito, a través de métodos empíricos como la revisión de documentos, encuesta, entrevista y la triangulación metodológica, ello permitió evaluar su estado actual. Colaboraron como muestra atletas, entrenadores y directivos de nivel provincial y nacional. La metodología propuesta es viable y factible, con una efectividad esperada para el contexto deportivo actual y con posibilidades de generalización en otros eventos de lanzamiento. La



propuesta diseñada enriquece la teoría del entrenamiento deportivo en atletas con discapacidad.

Palabras clave: amputados, balistas, discapacidad, fuerza, metodología, planificación.

RESUMO

Nos Campeonatos Nacionais de Paratletismo em Cuba, os resultados competitivos dos balistas com deficiências físico-motoras por amputação mostram uma diminuição em várias categorias. Foram detectadas insuficiências na dosagem de cargas, no uso de métodos, meios e procedimentos, bem como uma orientação metodológica inadequada. O objetivo foi elaborar uma metodologia para o planejamento da capacidade de força rápida na fase de preparação especial de balistas com deficiência físico-motora decorrente de amputação. Foi realizada uma pesquisa descritiva e quantitativa no período entre 2019-2022, o estudo focou no processo de planejamento e treinamento da força rápida na fase de preparação especial analisada e descrita, por meio de métodos empíricos como revisão de documentos, pesquisa, entrevista e triangulação metodológica, o que permitiu avaliar seu estado atual. Atletas, técnicos e gerentes em nível provincial e nacional colaboraram como amostra. A metodologia proposta é viável e factível, com uma eficácia esperada para o contexto esportivo atual e com possibilidades de generalização em outros eventos de arremesso. A proposta elaborada enriquece a teoria do treinamento esportivo em atletas com deficiências.

Palavras-chave: amputados, balistas, deficiência, força, metodologia, planejamento.

INTRODUCTION

In Cuba, the practice of sports for people with physical-motor disabilities due to amputation is designed for its development, through sports complexes and special sports schools, some directly linked to the teaching-learning process of sports and others to participatory sports; In the latter, emphasis is placed on specialized preparations.



There are many efforts made by the country, the National Institute of Sports, Physical Education and Recreation (INDER) and the Cuban Association of Physically Limited Motors (ACLIFIM), in order to facilitate the inclusion of disabled people in society and in practice of physical and sporting activities, but once inserted, what role do professionals responsible for the training planning process for athletes with disabilities have to play?

Before referring to preparation planning, it is necessary to address what is defined as planning in its general conception, and in the preparation of the athlete. Westreicher (2020) suggests that planning is the structuring of a series of actions that are carried out to meet certain objectives, so planning sports training does not differ from the general concept that planning pursues. Delis (2021) defines it as a process through which the coach searches and determines alternatives and paths of action that are most likely to lead to success.

In non-formal interviews carried out with the coaches in charge of directing this process, it was evident that the planning of rapid strength capacity is decisive for the event and presents little scientific and methodological guidance, in correspondence with the competitive demands and characteristics of these athletes, fundamentally, in the special preparation stage where the maximum work levels are expressed; since they are based on their experiences as athletes, years of practice as coaches and on the transposition of training plans of conventional athletes, factors that influence competitive results.

In the National Paraathletics Championship held in the province of Villa Clara in 2019, the competitive results of the shot-put athletes with physical-motor disabilities due to amputation showed a decrease in the 17 athletes participating in the shot put, in several of the categories of classification compared to previous years, where only seven of them managed to improve their marks.

In the national context, the methodologies applied for the planning of rapid strength related to the throwing area of sports for the disabled, is a topic insufficiently addressed in scientific research; therefore, the study references focus on methodologies that have been validated for sports practice in conventional athletes.



When consulting how to apply methods and procedures for the efficient achievement of objectives in sports training (training methodology), there are several researchers who deal with methodological guidance in planning rapid strength in sports. At the national level, Román (2014) stands out, who deals with controversial aspects about the distribution of loads to work on the types of strength used in weight lifting as an auxiliary sport. This author explains how auxiliary exercises can develop the basic motor qualities that are decisive for achieving good results, especially maximum strength, rapid strength and endurance to strength.

Román himself (2005), some years earlier, described the preparation of strength with weights for disabled people with auxiliary and specific exercises, their variants, means and description of their execution, based on the individual characteristics of these athletes, with a simple execution with variants of grips and positions.

Navarro (2007) emphasizes the Cuban training model for elite shot-put athletes and describes, in depth, the determining elements of their sporting results, from strength and speed training, technical control and systematic control. On the other hand, González and Brito (2019) present a proposal for a graphic training plan, in correspondence with the physiological characteristics and classification of Cuban parataekwondistas.

The review carried out corroborates that there are insufficient studies, articles and publications as a source of rigor, with relevant information and methodological contributions that guide planning in athletes with physical-motor disability due to amputation.

In the throwing discipline, the objective is to propel the implement as far as possible; to do this, external endurance must be overcome and rapid strength is decisive. According to the comprehensive athlete preparation program (PIPD) for throwers of the 2016-2020 Olympic cycle of conventional athletes, work with this direction must be characterized by:

- To develop it with weights, it should be worked with 60-79% of the maximum strength that is had in a given exercise.



- it can be also worked with weights, between 30-59% of the maximum strength of a given exercise, but they must be performed with maximum execution speed.
- It is a direction of the anaerobic alactacid system, so its duration should not exceed more than ten seconds of work.
- Its physiological objective is the multiplication of muscle myofibrils.
- Recovery time between repetitions should be between 1-3 minutes.
- Recovery time between sets should be between 3-6 minutes.
- Adenosine triphosphate (ATP) and Creatine phosphate are used as the predominant energy substrate.
- No lactate concentrations are produced.

There are many criteria for how to use the different methods, means and implements for the development of rapid strength. Before making a decision, the coach of athletes with disabilities must know a series of important aspects to take into account when planning with them and assume a commitment that involves knowing and applying the theory and methodology of sports training, the elements related to the specific sport and fundamentally, the particularities of each person's disability.

Aguilar (2019), a coach of athletes with disabilities, suggests that programs and work methods in conventional sports must be adapted to the potential that athletes with disabilities may have in order for them to work. Therefore, this research focuses its objective on designing a methodology that guides methodologically rapid strength capacity planning in the special preparation stage of shot-put athletes with physical-motor disabilities due to amputation.



MATERIALS AND METHODS

The research was carried out within the framework of a doctoral study between 2019 and 2022, it is descriptive and according to the nature of the quantitative data, members of the provincial and national team collaborated and 17 athletes, as well as 17 coaches, were selected as sample and the selection criteria were:

- Being an athlete with a physical motor disability due to amputation.
- Having participated in the shot-put event of the 2019 national championship.
- Being a coach for athletes with physical-motor disabilities due to amputation at the provincial and national level, linked to the practice of bullet propulsion.

Other participants were the six directors of the national department of sports care for people with disabilities.

The methods were selected, based on the operationalization of the variable to be investigated, which, is carried out after the theoretical and practical analysis, in order to establish how it will be measured, and to know what instruments or tools. They should be used to obtain clear and true results.

Of the empirical methods, the review of documents, the survey and the interview were used to obtain information about the background, the current state of the problem and the empirical data and to diagnose the rapid strength capacity planning in the special preparation stage in shot put athletes with physical-motor disabilities due to amputation, in three fundamental dimensions, with their corresponding indicators (Table 1).



Table 1. - Dimensions and evaluation indicators of the planning variable

Dimensions	Indicators
Cognitive Coach knowledge for planning rapid strength capacity training in the special preparation stage of shot-put athletes with physical-motor disabilities due to amputation	Mastery of the classification of athletes with physical-motor disabilities, according to the level of amputation and for competition in field events (throwing) in athletics. Definition of the objectives for the development of rapid strength capacity in the special preparation stage in athletes with physical-motor disabilities due to amputation in the shot put Mastery of content for planning the training process (work frequency, methods, means, volume, intensity, density)
Practice Expression in training planning of the trainer 's knowledge in the process of the charge for development of rapid strength capacity in the special preparation stage of shot-put athlete with physical-motor disabilities due to amputation.	Work frequency. Use of combined exercises with and without weights. implementation of the principle of individualization of sports training. Number of series and repetitions either time of duration of each exercise. Intensity of the exercises. Time of recovery between series and repetitions.
Methodological The methodological treatment of the rapid strength capacity to achieve the objectives.	. Determination of rapid strength capacity as a condition or determinant. . Determination of the appropriate preparation stage for the development of rapid strength. . Methods of job for the development of rapid strength.

The revision of the documents was made in reference to the regulations that specify the methodological work for the development of the training process in shot put athletes with physical - motor disabilities due to amputation, of the provincial and national teams, among them:

- Comprehensive athlete preparation program (PIPD) 2016-2020.
- Sports training plan (PED) 2019 and 2020.
- Class brochure to determine eligible athletes 2019.

The survey was applied to the 17 coaches in the sample, in conditions of total privacy and respect for the principles of professional ethics, with nine items that, through open questions, collect the criteria on the variable, in the dimensions and indicators presented. .



The interview was considered relevant to know the criteria on the subject, it was applied to the five methodologists and the director of the national department of care for athletes with disabilities.

Methodological triangulation allowed differentiate or distinguish causality from evidence, to synthesize the results derived from different sources and, through a inferential process inductive, give objectivity to the information collected from the comparison and cross of the data obtained from several sources.

RESULTS AND DISCUSSION

In reviewing the documents planning, it was found that coaches do not have a PIPD for disabled athletes; PIPD training contents are extrapolated from conventional athletes to disabled athletes; not all have the class booklet to determine eligible athletes and their classification; the application of the principle of individualization in the conception of training plans is limited and this is planned in a traditional and non-multivariate way and the use of special throws, plyometrics and exercises with bands is scarce.

The analysis of the surveys applied to coaches showed that 100% used the PIPD of conventional athletes, which violates the principle of individualization that expresses the need to know each individual as a unique being, an essential aspect in working with these athletes; only 10 coaches made reference to the class brochure to determine eligible athletes, as a planning support document.

65 % defined rapid strength as a direction that determines performance and 35% as a direction that determines performance.

In the utilization of different methods in training of the rapid strength in the special preparation stage, six of the coaches, 35 % added, in addition to the use of the repetition method, plyometric methods and conjugate influence, 65 % only referred to the repetition method; this result revealed a limited use of methods as the combination of the job with



dumbbells, plyometry, exercises with bands elastic endurance and conjugate influence, characteristic of the special preparation stage in throwers.

About the means or exercises that should be used, 100% of coaches mentioned weights and throws, only three, 18% included general jumping. Regarding the exercises they were deficient in variety and amount; they predominated in exercises with weights, mainly the classic ones (start and hanging clean, half squat and clean and jerk) to a lesser extent (inclined strength, sliding and final effort with the lever on the shoulders).

In relation to exercises without weights, 100 % reflected the use of light and heavy technical throws, to a lesser extent the normal ones. There was very little use of special throws (plyometric throws) and general throws that, although they belong to the means of general preparation, prepare to face the large number of technical and special throws that are performed, only two coaches included exercises with band of elastic endurance and plyometric jumps, and the latter only seven coaches, 41 % use it.

As a result of the work frequency and dosage of the means and exercises, it was shown that in the weekly work frequency 100 % coincided in both the exercises with weights and without weights and they worked two to three frequencies in the week.

Regarding the volumes of work in exercises with weights, six of coaches 35 % framed he job between the Per cent 85 %-90 %, five 30 % in range between 70 %-85 % and six 35 % in the range between 60 %-85 %.

Regarding the number of repetitions, the number of exercises and series, the criteria were the most diverse, very little coincidence was noted in the quantities, only seven, 41% coincided in some of the established parameters. The rest raised amounts, either below or above.

In relation to the work intensities in exercises with weights, 100 % agreed that it should be high, but only 11 expressed the % with ranges between 80 % and 95 %.



Regarding recovery times, 100 % agreed that it should be three to six minutes between sets; none made reference to the rest time between exercises and only six proposed taking into account the individual characteristics of each athlete for recovery.

In the exercises without weights, the work volumes coincided with the same amounts of repetitions, series and exercises exposed with weights and it was not clear if these volumes are dependent on the use of the different means and exercises. On the other hand, the work intensities in the case of the exercises without weights, in the results shown, they agreed that they work at high intensity, but they did not express the % and with respect to the recovery time they coincided with the responses issued for exercises with weights.

The criteria expressed by the coaches denoted insufficiencies in the methodological treatment of planning and were appreciated limited knowledge in the use of methods, dosage, use of means and procedures, to the detriment of the development of rapid strength in the special preparation stage in ballistas with physical-motor disabilities due to amputation; this meets the need of having a methodological resource that serve of referent to this purpose.

The results of the interview to the directors showed as main factors that affect training:

- The non-existence of a PIPD for athletes with disabilities.
- The non-existence of methodological indications for sport.
- The poor conditioning of the facilities.
- The little or almost no insertion, in the undergraduate and postgraduate courses of Physical Culture graduates, of topics related to the planning of the training of athletes with disabilities.

Regarding the importance and contribution of the research that was carried out, those interviewed claimed that it is of utmost importance, since it contributes to the orientation and control of work with athletes with disabilities. These could be the first steps for the design of a PIPD for athletes with disabilities or include the results in the throwing PIPD of



conventional athletes, since the coaches, in many provinces, are the same for both types of athletes (conventional and with disabilities).

When crossing the results of the different methods applied, it was evident the insufficient preparation on theoretical and methodological preparation, the poor theoretical mastery of the contents for planning the training process; little link between theory and practice; inconsistencies in work volumes, as well as in the number of repetitions, series, intensities and recovery times; limited amount and variability of means and exercises; the training was planned traditional and not multivariate and inadequate individualization of the content, form and exercises for each athlete that takes into account their classification and disability; this justified the need to have methodological resources that serve de referent to the trainer to face the planning of rapid strength capacity in the special preparation stage in shot put athlete with physical- motor disability due to amputation.

Consequently, the structural elements that support the methodological actions based, in the field of theory and methodology, by researchers of sports training of conventional athletes and those disabled by amputation, in shot put, are taken into account and grouped aspects of the content adjusted to the treatment of rapid strength for planning, development, increase, maintenance and evaluation.

Based on the need of the correct methodological orientation of the coaches, it is proposed the methodology as a resource appropriate to the current conditions and individual characteristics of these athletes, governed by the theoretical foundations that guide the planning of training of athletes with disabilities to date.

Methodology

The objective of this proposal is to methodologically guide the planning of the rapid strength capacity in the special preparation stage in shot put athletes with physical-motor disabilities due to amputation, in correspondence with the individual characteristics of their classification.



Strength plays an essential role in the thrower's results due to the great influence he has on speed. The relationship between the two (rapid strength) determines the power level of the launcher (explosive strength) and its possible performance.

The fundamental methods for its development are: conjugate influence (technical throws with the competition implement, develop rapid strength and perfect technique); plyometric (special throws with increased weight of the implement using impulses and throws without pause) and repetitions. It is included in this way the standard (volume and constant intensity), undulatory (it progressively alternates loads and the varied (diversity in the degree of the loads stimulation)

The fundamental means are general jumps, exercises with weights, exercises with elastic endurance bands, technical throws from the position of strength and with incomplete momentum, complete technical throws, special throws and general throws.

Methodological guidelines for planning. General releases

For classes F42, F43, F44, F46, F56, F57, F61, F62 and F63. These sessions are made up of exercises that prepare to face the large number of technical and special throws, they are performed with an increase in volume (repetitions) and intensity of execution and also increases the variability of the weight. The implements to use can be medicine balls, dumbbells, shot put implement, stones, with weights of up to four and six kilograms (kg), from different starting positions.

The work is carried out twice a week with three or four series, six to eight repetitions, with a minimum and maximum volume of 100 to 150 repetitions per training session, eight to 10 of the main exercises are used in the week, with a recovery time between sets of one to three minutes, depending on the athlete's recovery level.

The exercises are outlined with a tendency towards the special, they must have a competitive throwing component, since it is simply about making the general throws more special; for this, the use of the following groups of exercises is indicated:

- Throw in front of the area, towards the front, over the head.



- Throw from the front of the area, towards the front, from the chest.
- Final effort facing the area, with both hands (except F46).
- Final effort from the side to the area, with the throwing hand (except F56 and 57).
- Final side-back effort to the area (except F56 and 57).

General jumps

For class F44, F46 and F63.

- These constitute an effective means, above all, for the development of the reactive character of the muscles. Due to the characteristics of the stage, plyometric jumps are used to develop reactive strength, controlled by the execution time of each combination of this type of exercise.
- Drop heights of 20 centimeters (cm) up to 50 cm are used.
- They are worked twice a week with three or five series, of 10 to 20 repetitions, with a minimum and maximum volume of 60 to 100 repetitions per training session.
- Three to five combinations of this type of exercise are used, with a recovery time between sets of one to three minutes, depending on the athlete's recovery level.
- Classes F44 and F63 are worked with two or three series and a maximum height of up to 40 cm, as long as the unaffected leg coincides with the throwing arm.

Exercise with weights

For classes F42, F43, F44, F46, F56, F57, F61, F62 and F63. Exercises with weights aimed at the development of special rapid strength are those that are executed very similar to a part of the throwing act, it is special because it transfers in the same direction, amplitude, speed and acceleration in which the complete movement or part of it occurs. he.



They work three times a week with three or four series per exercise and four to six exercises per workout, they are performed with a high intensity, the speed of execution is controlled with the stopwatch, so that each repetition is performed to the maximum of speed.

Between one series and another, there is a recovery time of three to six minutes, depending on the athlete's recovery level; if it is observed that after a series, the movements become slow, the recovery pause is increased. The following groups of exercises should be used:

- Incline sitting strength.
- Inclined strength.
- Series of slides or turns with the lever or bar on the shoulders. (only classes F46 and F61 to F63 where the prostheses allow it).
- Imitation of the final effort with a dumbbell.
- Series of slides or twists with a barbell or dumbbell (only classes F46 and F61 to F63 where the prostheses allow it).

Exercises with endurance elastic bands

For classes F42, F43, F44, F46, F56, F57, F61, F62 and F63. Elastic endurance exercises are those that are performed with tensioners (springs), rubber bands or pure latex, they stand out for their great elasticity, very practical for athletes with disabilities, since they allow a greater range of joint mobility during performance. Due to the result of the reactive action and the level of endurance, rapid strength is developed and technique is perfected.

They work is carried out two to three times a week with three or four series per exercise, three to five exercises per workout and six to 10 repetitions without pause of each exercise, each series is performed at maximum speed. Between one series and another, there is a recovery time of one to three minutes, depending on the athlete's recovery level. The following groups of exercises should be used:

- Imitation of the final effort facing the area.



- Imitation of the final effort from the side to the area.
- Imitation of the final side-back effort to the area.
- Imitation of sliding (only classes F46 and F61 to F63 where the prostheses allow it).
- Imitation of sliding with final effort (only classes F46 and F61 to F63 where the prostheses allow it).

Technical throws

For classes F42, F43, F44, F46, F56, F57, F61, F62 and F63. They are those that are executed with the competition implement and vary the weight by 30 %, are classified as light, normal and heavy, with a proportional distribution of two light, two normal and one heavy of the total that are performed, they are governed by the method of conjugate influence that, at the same time as developing rapid strength They perfect the technique. Their work is carried out two to three times a week, one or three series, three to five exercises, performed at maximum speed (the light and normal ones). The frequency is performed between one series and another, with a recovery time of three to five minutes, depending on the athlete's recovery level. For technical throws the following exercises should be used:

- From the final effort position facing the area.
- From the final effort position from side to area (except F56 and 57).
- From the final side-back effort position to the area (except F56 and 57).
- Slips or turns with incomplete momentum (only classes F46 and F61 to F63 where the prostheses allow it).
- Slides or turns with full momentum (only classes F46 and F61 to F63 where the prostheses allow it).

When planning technical throws, the coach must follow the following regulatory guidelines on the proportion between the types of technical throws and the variability of the weight of the official competition implement (PIPD, 2016 -2020).



1. Determine the volume of technical launches for the macrocycle, the volume that corresponds to the special preparation stage and then calculate the proportionality. Example, if the volume of technical launches for the special preparation stage is 1200 launches (K) and the proportionality is light (L); 2, normal (N); 2 and heavy (P): 1

$$\text{Then: } K=1200 / (L \ 2 + N \ 2 + P \ 1)$$

$$K=1200 / 5$$

$$K=240$$

$$\text{Light throws} = K \times L$$

$$= 240 \times 2$$

$$= 480 \text{ light throws.}$$

$$\text{Normal Throws} = K \times N$$

$$= 240 \times 2$$

$$= 480 \text{ normal throws.}$$

$$\text{Heavy Throws} = K \times P$$

$$= 240 \times 1$$

$$= 240 \text{ heavy throws.}$$

2. Regarding the variability with respect to the official competition weight, 30%. The procedure is as follows. For example, the official female shot put implement weighs 4 kg, 30% of 4 kg is 1.2 kg; this means then that the range of weight variability is between 2.8 kg and 5.2 kg, according to the common weights in Cuba, so the light one is 3 kg and the heavy one is 5 kg (PIPD, 2016 -2020).

The procedure indicates the influence it will exert on the athlete's inter- and intramuscular coordination. The light throw develops the speed component of rapid strength and intermuscular coordination, the heavy implement develops the strength component of



rapid strength and intramuscular coordination, while the normal implement works on both components.

For the interpretation of this content, it is presented the variability of the competition official implement weight in the athletes with physical motor disabilities due to amputation in shot put, the proportion between the types of technical throws and their dosage in series and repetitions. are presented (Table 2).

Table 2. - Dosage of technical throws for shot put athletes with physical or motor disabilities due to amputation

Class	sex	Official competition weight	Weight by type of technical throws with 30% variability		Proportion by type of technical launches of the total	Series	repetitions
F42	F	4kg	L	3kg	2	1 to 2	3 to 4
F43			N	4 kg	2		
F44			P	5 kg	1		
F46	M	6 Kg	L	4 kg	2	1 a 3	3 a 5
F61			N	6 kg	2		
F62			P	8 kg	1		
F63							
F56	F	4 Kg	L	3 kg	2	1 a 2	3 a 4
	M		N	4 kg	2		
			P	5 kg	1		
F57	F	4 Kg	L	3 kg	2	1 a 2	3 a 4
			N	4 kg	2		
			P	5 kg	1		
	M	5 Kg	L	3.5 kg	2		
			N	5 kg	2		
			P	6.5 kg	1		

Legend: F: female, M: male, L: light, N: normal, P: heavy, Kg: kilograms.

Special releases

For classes F42, F43, F44, F46, F56, F57, F61, F62 and F63. Special throws are aimed at developing explosive strength in the main muscles involved in the act of throwing, particularly during the execution of the final effort, the weight of the implement is increased and plyometric throws are used.



These throws constitute means that act analytically on the movement, developing the main components of strength and perfecting the technique. These include heavy technical throws and exercises with elastic endurance bands.

They are worked twice a week with three or four series, eight to ten repetitions, with a minimum and maximum volume of 100 to 150 repetitions per training session, eight to 10 of the main exercises are used in the week, the Executions are not performed at maximum speeds and the recovery time between sets is three to five minutes, depending on the athlete's recovery level. The exercises have a large component of competitive throwing and should be used:

- Medicine ball, stones, light dumbbell pushes from the final effort position facing the area.
- Pushes of the medicine ball, stones, light dumbbells from the final effort position on the side and side-back to the area (except F56 and 57).
- Plyometric throws use impulses and receptions of a dumbbell, medicine ball, hammer bullet or tire that hangs from a rope in the hands of the thrower and without pause.
- Imitations of the movement with tensioners (springs), rubber or latex bands.

Recommendations for the implementation of the methodology

- To individualize the planning of exercises to develop rapid strength, the following aspects are taken into consideration: main objective of the training session, age and class (classification) of the athlete, sports experience, level of development expressed in the initial test, aptitude and disposition to face the training.
- Systematically diversify training, alternating methods and means, varying the possible limits of the magnitude of the loads, the number of repetitions and series, the weight of the implements and the pace of execution of the exercises.



- Exercises with weights must be performed in the company of the coach or a support athlete who ensures compliance with safety measures during execution, the discs and the lever must not weigh more than 30% of the athlete's weight.
- Pay attention with twisting exercises in athletes with prostheses, to avoid detachment of the prosthesis and possible falls or injuries.
- Respect in planning the dosage of the technical throws that are proposed.
- The height of the adapted chairs used in training must coincide (including any accessories) with that of official competitions, which is 75 cm.
- Plyometric jumps are recommended to be performed on soft surfaces such as sand, as it favors the cushioning of the prostheses. Due to the variability of these athletes in terms of age, years of practice, type of disability and instability in training, the minimum and maximum volumes that are established are within the ranges to maintain the development of rapid strength capacity, it is the coach who determines it, based on the characteristics of each athlete, the dosage of the possible limits of the magnitude of the loads and the number of repetitions and series.

In sports for people with disabilities, the main difficulties that coaches face in their development are due to the lack of human resources, materials, scientific work and poor preparation to address the heterogeneity of athletes.

In the last decade, the number of research papers and publications related to Paralympic sport has increased. Pascual *et al.* (2019) designed a strategy to improve muscle strength in athletes with physical-motor disability due to lower limb amputation. Meanwhile, Martins *et al.* (2019) performed an ergonomic analysis of shot put in adapted sport, when performed on a chair or bench.

In the research of Melgarejo *et al.* (2020) assessed the influence of a six-week training program for the flat bench press modality (powerlifting) in athletes with physical disabilities; Ferrer and González (2022) propose general and special physical exercises for the muscular strengthening of disabled athletes in the F-56 category, in the discus throw as



a means of physical preparation, and the studies by Fonseca *et al.* (2023) propose exercises with bar short for improve the strength maximum in athletes of lifting of dumbbells for powerlifting, which adapt a conventional means for athletes with disabilities .

The research, which could be accessed as references related to the subject was limited, because it is a subject little addressed, although increasing and it was not found the existence of any methodological resource that makes direct reference to the planning of the rapid strength capacity in the stage of special preparation of players with physical-motor disability due to amputation; this reaffirms the practical usefulness and novelty of the proposed methodology, based on a coherent conception of the theoretical-methodological aspects, with recommendations for its instrumentation and the purpose of methodologically guiding the planning process, through the adaptation of multivariate training and the use of various methods such as the combination of work with weights, plyometrics, exercises with elastic endurance bands and conjugated influence.

Likewise, the adequacy and dosage of the components of the loads for the work of rapid strength, with the use of different means and exercises, in correspondence with the individual and competitive characteristics of each athlete and his classification, to enhance the increase of the results of this determinant direction of performance, which contributes to maintain and surpass the achievements reached by Cuban athletes with disabilities.

CONCLUSIONS

The study of the theoretical foundations showed the unavailability of a methodology to guide the planning of the rapid strength capacity, in the special preparation stage of shot-put athletes with physical-motor disability due to amputation.

The diagnosis of the planning of the rapid strength of the shot-put athletes with physical-motor disability due to amputation showed insufficiencies in the dosage of the loads, the use of methods, means and procedures and the lack of an adequate methodological orientation.



The methodology was characterized by the individualization, organization and dosage of the loads and methods, means and exercises were proposed, in correspondence with the individual and competitive characteristics of the athlete; which made possible the methodological orientation to the trainers for the planning of the rapid strength capacity, in the stage of special preparation of shot put athletes with physical-motor disability due to amputation, with possibilities of generalization to other throwing events.

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Conflict of interests:

The authors declare not to have any interest conflicts.

Authors' contribution:

The authors have participated in the writing of the work and analysis of the documents.



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