

Methodology for improving technique in the first phase of the 100-m race

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Abstract: The objective is to design a methodology for the improvement of the technique in the first phase of the 100m flat race in juvenile sprinters; Materials and Methods; quantitative and qualitative approach, documentary analysis, non-participatory scientific observation, survey, interview, expert and user criteria, methodological triangulation as a procedure for the recruitment of information, from different methods, techniques for biomechanical analysis, statistical methods and/or mathematical processing, frequency, mean and variability coefficient, and non-parametric Wilcoxon test; Results: the design of a methodology was achieved which, with its implementation, allowed for the improvement of the first phase of the 100m flat race of the juvenile runners; Discussion, which allows for the existence of an improvement in the improvement of the technique of the first phase of the 100m flat race of the athletes studied; Conclusions, the implementation of the methodology allowed for the improvement of the technique of the first phase of the 100m flat race for juvenile sprinters, in accordance with the spatial kinematic characteristics that model it and the characteristics of the competitive activity of this test.

Keywords: characteristics of competitive activity, Flat speed, first running phase, kinematic characteristics, methodology.

I. INTRODUCTION

In Athletics, specifically in the 100-meter dash, the exit of the cleats is the first phase that takes place within a sprint race. Bezodis (2009) mentions that the exit of tacos, being part of the first phase of the race, is even more decisive despite the brevity of this since bad start conditions the resulting acceleration of the athlete and therefore the acquisition of the maximum speed later. Therefore, an efficient start is one of the most important factors to consider in the 100-meter dash.

Vittori ([1995]), states that in speed races and specifically in the 100-meter flat test, four phases are distinguished in which it can be divided: putting into action (known as the first phase), acceleration, maximum speed, and deceleration; of which the first is the part of the race in which the runner takes off from the starting cleats after the shot made by the judge of the test, trying to start the race more efficiently and with the highest speed that the runner can reach. This research assumes the classification, which is called putting into action.

All the above demands a look at Cuba's sports results in the 100-meter dash, because, in past decades, speed test specialists wrote glorious pages for Cuban sport. From the legs of those impressive runners emerged unforgettable feats that very few countries on the planet can match (Muñiz, 2018).

However, in the 1980s the quality decline of the 100-meter flat sector in the country began. To date, Cuban athletes have found it difficult to access an Olympic, World, and Pan American final, an aspect that urgently needs to be improved.

There are many causes, which justify the lack of elite sprinters at present but considering the importance given to the first phase of the 100-meter dash, is that among other aspects the present study is carried out; in addition, one of the

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problems of the bank of the National Athletics Commission and a response to one of the tasks of the project for the rescue of speed in Cuba.

The study of the Preparation of the Athlete of speed and in particular the contents, methodological guidelines for flat speed; as well as the adaptations to the Integral Program of Preparation of the Athlete (PIPD) 2017-2020, reveals that there is no methodological tool for the improvement of the technique of the first phase of career for athletes of the youth category, which is decisive in sports results.

In the analysis of the works of literature found on methodology and improvement of the technique of the 100-meter dash, it is found that there are several authors who have addressed the subject, such as (Ae, et al., 1994; Romero and Scrubb, 2003; Rius, 2005; Barrera, 2013; Krzysztof, & Mero, 2013; Morin, et al., 2015; 2019; Lopez and Bilirs, 2015; Schmidt, et al., 2016; Rios, 2016; Palacios & Villalobos, 2017; Winkelmann, et al., 2017; Yagi, et al., 2018; Haugen, et al., 2019; Huanaco, 2019; Morales, et al., 2021; Purwanto, et al., 2021; Wild, et al., 2021).

From the previous studies, it is revealed that there are shortcomings of several didactic components of the teaching-learning process since most of them show only the content or exercises for teaching, of structured methods, means, organizational procedures, and methodological observations; In addition, there have been no studies that refer in a particular way to the improvement of the technique of the first phase of this career.

In the works of literature consulted, no systematization has been found on the technical requirements imposed by the characteristics of competitive activity on athletes, especially in the 100 meters flat, aspects that must be addressed in a particular way, because there are differences in the demands of competitive activity between the 100 meters and the races of 200 and 400 meters flat.

Similarly, the spatial kinematic characteristics that model the first phase of this test in juvenile sprinters have not been found, aspects that in addition to describing the technique, guide an optimal improvement of this.

The above, allows us to propose that there is a lack of theoretical-methodological ways to perfect the technique of the first phase of the 100-meter race in juvenile sprinters.

Therefore, it is proposed as an objective, to propose a methodology for the improvement of the technique in the first phase of the 100-meter flat race in juvenile sprinters, based on the spatial kinematic characteristics that model this phase and the characteristics of the competitive activity of this test.

II. METHODS

The quantitative-qualitative approach is assumed, according to the dynamics and characteristics of the object, the subject, and the process; as well as the subjective and the objective, because being a pedagogical phenomenon of sports training, studies are also influenced by other theories, such as sociological, psychological, educational, and special didactics, which makes the process of adopting a certain position more complex, which coherently relates each of them.

From the empirical level, the following were used: documentary analysis, non-participatory scientific observation, the survey, the interview, the criteria of experts and users, methodological triangulation as a procedure to verify the information, from different methods, techniques for biomechanical analysis such as filming, editing, and processing of videos, the use of software and group techniques (e.g., the workshop).

2.1 The statistical methods and/or mathematical processing used are the empirical frequency distribution, the mean and coefficient of variability, and the non-parametric Wilcoxon test.

2.1.1 Documentary review was applied to assess the current state of the way to improve the technique of the first phase of the 100-meter dash.

2.1.2 Observation (observational methodology), In the last decade there has been a significant increase in interest in the use of the observational methodology in the field of the sport since in many sports modalities (football, basketball, handball, tennis, swimming, athletics, judo, polo, among others.), studies have been carried out with the use of this

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methodology. On the other hand, the methodological interest was directed to other methodological options, such as quasi-experimental or selective, and, to a lesser extent, to case studies, or life studies; however, it offers procedural resources to researchers and professionals in the world of sport and physical activity (Anguera and Hernández, 2013).

2.1.3 The survey, was applied to Athletics coaches working in the School of School Sports Initiation (EIDE) of Villa Clara and Sancti Spiritus, respectively.

2.1.4 A questionnaire, applied in the diagnostic stage of the project "Integral development of the athlete" was used, to explore the knowledge of the teachers on the improvement of the technique of the first phase of the 100-meter race in the youth category. This was composed of a series of items, as a basic unit of information of a questionnaire, which consisted of questions that promote closed and/or open answers.

2.1.5. The interview was applied to directors of Villa Clara (Head of the Provincial Technical Commission of Athletics, Head of Chair of EIDE) and directors of Sancti Spiritus (Methodologist of Athletics, Technical Head and Commissioner) this was applied to obtain information on the conceptions, experiences, needs, as well as the points of view related to the improvement of the technique of the first phase of the 100 meters flat race in the category juvenile.

2.1.6 Triangulation, offered us the opportunity to compare the information of the results found, derived from multiple scientific methods in a valid and coherent interpretation (Ruiz, 2005).

2.1.7 Open and participatory techniques, the workshop was applied to prepare observers as well as coaches to apply the influence system.

2.1.8 Biomechanical analysis, allowed to confirm the biomechanical characteristics (spatial kinematics) of the first phase of the race of 100 meters flat of the juvenile category. A Panasonic digital camera was used for the recording of the images and the Kinovea biomechanical software. Four steps were selected from the start, and the indicators: ready position, thrust at the exit of the block, angles of the step in the variables, subsequent takeoff, previous step and inclination of the trunk, low start, and steps.

2.1.9 Criterion of experts allowed the assessment through questionnaires of the theoretical endorsement and their experience.

2.1.10 Statistical-mathematical, given the impossibility of applying inferential statistics given the size of the sample, descriptive statistics were used, which allowed the processing of the information obtained, as this mathematical technique made it possible to obtain, organize, present, and describe a set of data with the support of tables, numerical or graphic measurements.

2.1.11 The statistical program SPSS Statistics Wilcoxon test for signed-ranks (2 samples) was used.

2.2 Population and sample

The research is carried out in the context of the EIDE of Villa Clara and Sancti Spíritus. Among the subjects of the research are all the athletes that make up the population of sprinters of flat races that belong to the juvenile category. A simple random sample of probabilistic character was taken from eight athletes, where all the subjects of the population had the possibility of being chosen at random. This was five athletes, representing 62.5%, which is above the 30% considered as a representative population in social science research (Busot, 1991; Sierra, 2004).

Of these, three are members of the national youth pre-selection team who were training in Villa Clara, and two are female, all have sporting experience, and are medalists in the youth games. A second population made up of eight-speed coaches, six from the EIDE of Villa Clara and two from Sancti Spíritus, a third population integrated by the members of the technical commissions of these provinces (three and three), which make a total of six, and the two members of the Biomechanics group of the Faculty of Physical Culture of Villa Clara; as well as two specialists of Athletics of this center who participated in the filming and observation of the results of the information of the data provided by the biomechanical software. Also, 15 professionals were selected for the selection of the experts, discarding five who did not meet all the requirements, so the competence coefficient was determined only to 10 of them.

III. RESULTS

Diagnosis of the current state of the analysis of the sprinting technique carried out in the EIDE of Villa Clara.

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As a result of the triangulation, the following generalities are derived:

- The study of the speed PIPD does not offer any methodological procedure for the improvement of the technique of the first phase of the race in juvenile sprinters.
- The written training plans of the speed coaches of the EIDE of Villa Clara and Sancti Spíritus, as well as the content of the planned training sessions, reflect tasks for the teaching of the technique of the first phase of the 100 meters flat race in juvenile sprinters, but in very few occasions for its improvement.
- The athletics managers recognize that there are insufficiencies in the methodological order for the improvement of the technique of the first phase of the 100 meters flat race in juvenile sprinters and they would like the speed coaches to have the steps for this in this phase.
- The coaches surveyed do not have total clarity on how far they are talking about teaching and how far they are talking about improvement.
- There is a need for the preparation of the teacher to carry out methodological exercises, as well as a methodological procedure for the improvement of the first phase of the race in juvenile sprinters.

3.1 Procedures leading to the design of the methodology and its system of influence for the improvement of the technique of the first phase of the 100 meters flat race in juvenile sprinters.

For the design of this methodology, it was necessary to determine the characteristics of the competitive activity of the runners of this test, because in this improvement it is necessary to consider a group of indicators in the metabolic, physiological, psychological, technical, and physical order that influences it. It was also determined the spatial kinematic characteristics that model the first phase of the 100 meters flat race of juvenile sprinters, which form the guide for the elaboration of the observations that should be considered in the methodological steps for the improvement of the technique.

In addition to these steps, the criteria, and norms for the evaluation of the results of their implementation were determined, which are other novel elements of the methodology. Finally, experts and users were selected, as well as the scientific methodological procedure of the observational methodology to evaluate the results of the implementation of the steps.

3.2 Presentation, application, and evaluation of the methodology for the improvement of the technique of the first race phase of the 100 meters flat race in juvenile sprinters.

3.2.1 Presentation of the methodology

The concept of De Armas (2003), on methodology, is assumed in its more specific meaning, which points out that it is "a set of methods, procedures, techniques that regulated by certain requirements, allow to better order the thinking and way of acting, to obtain, discover, new knowledge in the diagnosis of the theory or the solution of problems of the practice" (p.14), as well as the structuring of the proposal given by this author and the Center of Studies in Pedagogical Sciences (CECIP) of the Higher Pedagogical Institute "Félix Varela" of Villa Clara. See Fig.1

- General objective.
- The theoretical foundation of the methodology.
- Conceptual apparatus that sustains the methodology.
- Stages that compose the methodology as a process.
- Procedures that correspond to each stage.
- Graphic representation of the methodology.
- Evaluation to verify the achievement of the proposed objectives.
- Recommendations for its implementation.

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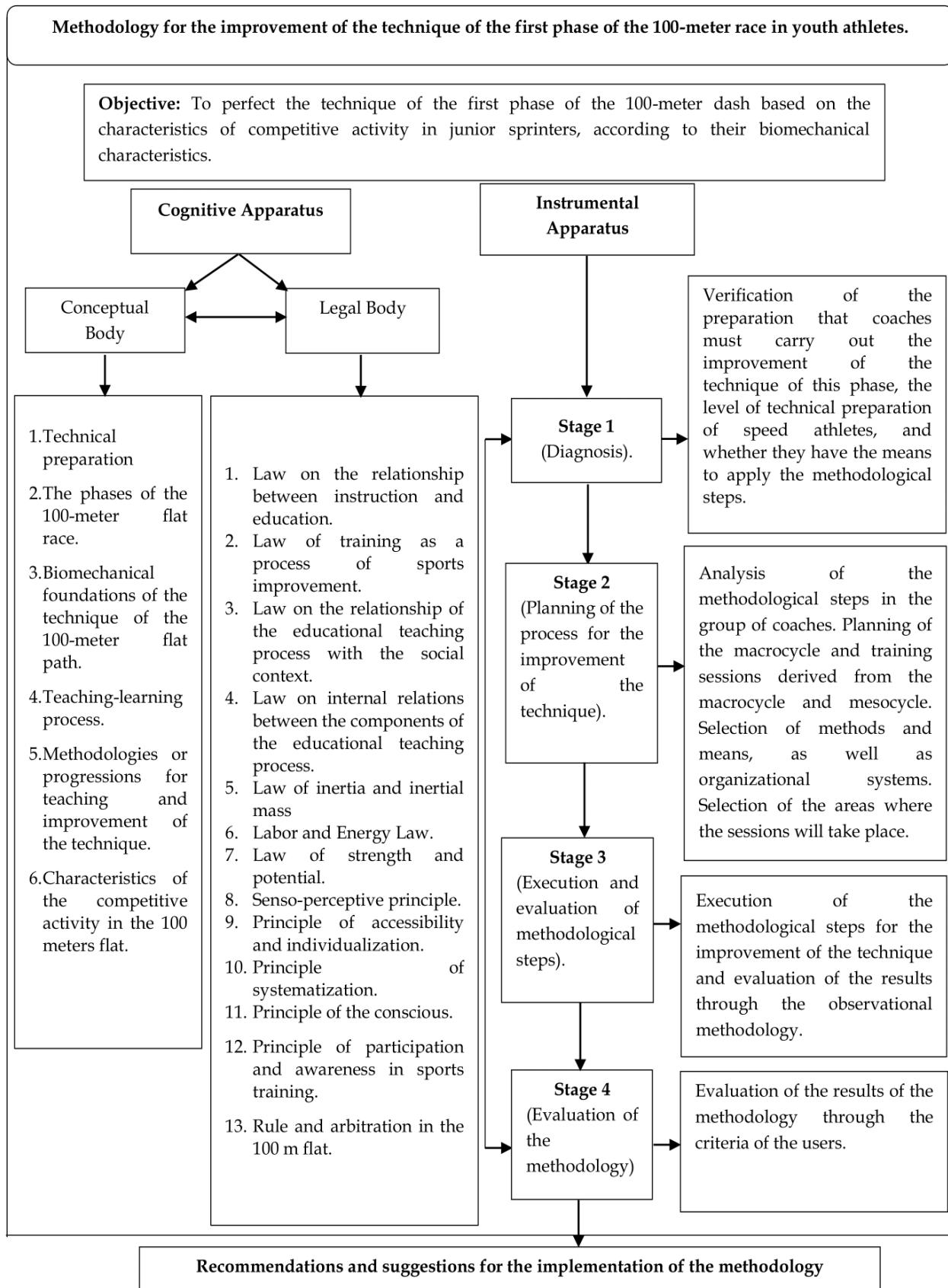


Figure 1 Graphical representation of the methodology

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4.1 Execution of the methodological steps

The execution of the methodological steps for the improvement of the first phase of the 100-meter flat race was carried out in the months of October-November 2020, corresponding to the second and third mesocycle of the general preparation. See Table 1.

Table 1 Graph of the macrocycle of training of sprint runners executed

SEP	OCT	NOV	DIC	JAN	FEB	MAR	APR	MAY		JUN	JUL	AUG
Preparatory Period I				(1) Cyclical model	Preparatory Period II			Competitive Period II			Regenerativetransitio n	
General Preparation		Special Period			General Preparation		Special Period		Pre- Competiti on			

Legend: Core Competency (C.C,1,2,3); Pre-performance Competence (C-F C. 2,3); Establishment of the form (Estab.form)

To carry out the implementation of the methodological steps proposed for the improvement of the 100-meter flat race, the observational methodology was used as a methodological option or alternative to experimental designs, to assess the influence of the proposed methodological steps. This methodology implied a sampling plan, which allowed planning one observation before and one after the application of the influence system, obtaining the corresponding records.

An observation record was made at the beginning and end of the period in which the methodological steps for the improvement of the technique of the first phase of the 100-meter flat race for juvenile sprinters were put into practice, corresponding to October-November 2020. (Anguera, 2003).

Two sessions per microcycle were used for general preparation, where tasks with overweight and tasks that were not in conditions like the competitive activity, that is, from the blocks or starting blocks, predominated.

The coaches were advised for the application of the methodology and the possession or not of the main means to put it into practice was verified.

For the evaluation of the results of the application of the influence system, one of the first elements to consider in the observational methodology was to keep in mind the stages: correct delimitation of the behavior(s) and observation situation (Anguera et al., 2000).

4.2 Data Analysis

First, another workshop was held, whose content was focused on the preparation of the two Biomechanics teachers and the two Athletics specialists, for the analysis of the data of each of the indicators and their respective variables. This had as content, the analysis of the filming in an indirect way and then the biomechanical software Kinovea was applied in one of the participating athletes, determining the values of the indicators studied so that the necessary skills were developed to determine the values of indicators and variables to the rest.

Once the analysis of the data contained in the data collection forms in both observations was carried out, the results were evaluated by indicators and variables. A table was prepared to allow a comparative analysis of the results on the values of the indicators and variables, as shown below. Table 2.

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Table 2 Analysis of the data of the two observations made

Parts of the first phase of the race	Indicators	Qualitative evaluation of the first observation (mean)		Qualitative evaluation of the second observation (average)		Differences between moments 1 and 2
Ready position	The angle between the leg and femoral quadriceps	A) Back stud 96°/5	B) Front stud 110°/5	A) Back stud 98°/5	B) Front stud 115°/5	0.100-0.180
	Arm extension	170°/4		175°/5		0.109
	The angle of the line from head to the hip and horizontal	25°/4		25°/4		1.000
Push and exit of blocks	Head position	Looking one meter forward		Looking one meter forward		0.42 - 0.100
	Leg angles at the exit	D. Post. 169°/4	Q. Previous 78th/3rd	D. Post. 175°/5	Q. Previous 80°/4	
		39°/2		44th / 5th		1.38
	Front and rear arm angles	Front 67°/5	Buttocks 154°/2	Front 75°/5	Buttocks 80°/5	0.157-0.180
Position of the trunk and head concerning the horizontal	Degrees of amplitude at subsequent take-off	161°/4		164th / 5		0.100
	Leg of anterior step concerning the horizontal	32/4		27/5 (5)		0.100
	Degrees of inclination of the trunk	34°/5		32°/4		1.00
Length of steps	Step 1	82 cm /5		114 cm /5		0.46
	Step 2	108 cm /5		116 cm /5		1.00
	Step 3	129 cm /5		144 cm /5		0.43
	Step 4	131 cm /5		147 cm /5		0.42

4.2.1 Interpretation of results

Data on indicators and variables were analyzed in both observations.

Example of one of the analyses carried out from the two moments of the observation.

When observing the results of the table, after applying the influence system, it is appreciated that in the ready position, the angle indicator between the leg and femoral quadriceps, the variable rear cleat; are evaluated of four points in the first measurement and five points in the second, with a difference of five degrees in favor of the second measurement, which allows raising the existence of an improvement in the improvement of the technique of the first phase of the race of 100 meters flat of the athletes studied.

The IADOV technique allowed us to obtain the group satisfaction index (ISG),

In general, users propose the following:

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They attach great importance to the proposal of methodological steps for the improvement of the technique of the first steps of the race of the 100 meters flat test with youth sprinters, with which the speed coaches do not count, be adjusted to the characteristics of the youth category and be easy to apply, although they recognize that the necessary means for its implementation can be a limitation.

When calculating the overall satisfaction index, a score of 0.94 was obtained, indicating great satisfaction.

Evaluation that allowed to verify the achievement of the proposed objective.

The objective of the methodology was aimed at perfecting the technique of the first phase of the 100-meter flat race for junior sprinters of the EIDE of Villa Clara, based on the characteristics of the competitive activity of this test and the spatial kinematic characteristics that model it.

Through the opinion of the users who endorse the viability and usefulness of the proposal; as well as the results of the application of the observational methodology, it was possible to verify the achievement of the proposed objectives.

The influence system was an essential component in the proposed methodology, as it was the transforming agent in the technique of the first phase of the 100-meter dash of the youth sprinters of the EIDE of Villa Clara, because of how the tasks were organized, the methods and methodological observations were selected and facilitated the technique of the speed athletes under study, from a state to a qualitatively superior one, which proves the achievement of the objective.

Recommendations for its implementation.

For the implementation of the influence system, the following steps must be assumed:

- Study of the specialized literature in this regard.
- Disclosure of steps in digital or printed form among speed coaches.
- Carry out, within the framework of the methodological preparations, seminars, and workshops where the application of the methodological steps for the improvement of the technique of the first phase of the 100-meter race of the youth sprinters of the EIDE is discussed.
- Select media and create rustic with recyclable materials to put into practice the methodological steps:
 - a. Car and motorcycle tires
 - b. Leagues
 - c. Sagas
 - d. Wooden blocks
 - e. Sleds of disposable iron or wood material
 - f. Other
 - g. Adapt the exercises to the individual characteristics of the athletes.

IV. CONCLUSION

The methodology proposed for the improvement of the technique of the first phase of the 100-meter flat race in juvenile sprinters, based on the spatial kinematic characteristics that model this phase and the characteristics of the competitive activity of this test, allowed an improvement in the technical performance of the youth athletes of the EIDE of Villa Clara in that phase.

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