

Characteristics of the competitive activity of the 100 hundred meters flat run

Abstract

The characteristics of the competitive activity of the 100-meter sprint has multiple demands in the physiological, morphological, psychological and functional order, which are usually found in most of the literature consulted for the 100, 200 and 400 m sprint races. in general, despite the differences between them. In addition, these demands are not found in a single literary body, which makes it difficult to understand them as they are not seen as a whole, for this reason this research aims to systematize the study on the characteristics of the competitive activity of the 100-meter race plans specifically and collect these in a single document. For this, methods of the empirical level and theoretical level are used, such as: the analytical-synthetic, the inductive-deductive, the systemic approach, the interview, the survey and open and participatory techniques, as well as user criteria. As a result of the assumed theoretical conception, it is possible to determine the demands imposed on the athlete by the competition in this test, all of which is valued as necessary and pertinent by the users of this specialty.

Keywords: *speed, indicators, competitive activity*

Introduction

The development of Athletics as the king sport of all the physical capacities of the human being, requires the correct application of all the scientific methods already established so that a positive influence is achieved in the sports performance of the athletes of 100 meters dash run (López and Granado, 2018).

In correspondence with the above, this study responds to a demand from Athletics coaches related to obtaining information on the characteristics of the competitive activity of the 100-m flat race, since their determination allows detecting the indicators performance, guide the athlete preparation process towards present and future achievements, as well as its control.

Matveev (2001), expresses that the competitive activity of the athlete is the set of actions that the athlete performs or executes in the competition process, united by the competitive end and the objective logic consequence of the regulations of its performance.

Authors, such as González (2016), Espinosa (2019) and Fundora (2019), have determined the characteristics of the competitive activity of their respective sports and have made clear the importance that these have when developing the preparation and

achievement of sports results, with which they have contributed to the theory of their sports disciplines.

Several authors have investigated on the subject, unleashing among these, Guerra et al. (2018) who allude to the differences of five variables in female 100-meter athletes in two levels of sports performance, Guillamon and Saorín (2014) refer to the physiological parameters of the 100-meter sprint test for Athletics and Salas (2009), who alludes to the physiological characteristics of sprint runners (100-meter flat), among others.

However, the lack of a systematization in relation to the study of the characteristics of competitive activity and particularly in the 100-m flat race, allows us to state that the bibliography on this activity is scarce and that which has been found, in its Most generalize these characteristics for the tests of 100, 200 and 400 flat meters, despite their particularities from the morphological, functional, physiological and psychological point of view.

For this reason, this research aims to systematize the study on the characteristics of the competitive activity of the 100-meter race specifically and to compile these in a single document.

Methodology

The research is carried out in the context of the Schools for Sports Initiation School (SIS) of Villa Clara and Sancti Spíritus, due to the fact that both provinces have been systematizing the database for this result in projects preceding this research.

We work with a first population made up of eight speed coaches, six from the Villa Clara SIS and two from Sancti Spíritus and a second population made up of the six members of the technical commissions of the Villa Clara and Sancti Spíritus provinces (3 and 3).

Among the applied methods are: the analytical-synthetic, the inductive-deductive, the systemic approach, the interview, the survey and open and participatory techniques; criteria of users.

The interview: to the members of the technical commissions in order to know the information they have on the characteristics of the competitive activity of the 100-m flat runners.

Survey: to coaches with the purpose of verifying the knowledge they have about the characteristics of the competitive activity of the 100-m flat runner and its importance.

To obtain information on user satisfaction regarding the characteristics of the competitive activity of the 100-m flat race, the IADOV technique was used for the evaluation of determined planes, as well as their need, utility and relevance, taking into account the Theoretical postulates of Campistrous and Rizo (2006) cited in Fernández and López (2014).

This technique allowed obtaining the group satisfaction index (GSI), for which we work with the different levels of satisfaction that are expressed on the numerical scale that oscillates between +1 and -1 as follows:

Scale	Result
+ 1	Maximum satisfaction
0.5	More satisfied than dissatisfied
0	Undefined and contradictory
- 0.5	satisfied
-1	Maximum dissatisfaction

Group satisfaction is calculated by the following formula:

$$GSI = \frac{A (+1) + B (+0.5) + C (0) + D (-0.5) + E (-1)}{N}$$

In this formula A, B, C, D, E represent the number of subjects with individual index and where N represents the total number of subjects in the group.

The group index shows values between + 1 and - 1. Values between - 1 and - 0.5 indicate dissatisfaction; those between - 0.49 and + 0.49 show a contradiction and those that are between 0.5 and 1 indicate that there is satisfaction.

Results and Discussion

Interview results

100% of the interviewees do not have a document that specifies the characteristics of the competitive activity of the 100-m flat runner, since in the existing ones characterizes the competitive activity of speed races in general, in the same way they refer that it is necessary to know them to perfect the phases of the race in this test, as it constitutes a guide for the selection of the determining factors in the preparation of these athletes.

Results of the survey: 100% refer to the same problem raised by the interviewed methodologists and add that they would like to have a didactic material whose content is related to the characteristics of the competitive activity of the 100-m flat runner.

One of the most followed criteria to analyze what should be considered by conception, is the one that considers it as a system of ideas, concepts and representations about one aspect of reality or all of it, ranging from general philosophical to natural scientific (Valle, 2007). Taking into account the objectives of this work, the model of this author was assumed for the elaboration of a conception that consists of the following steps:

- Elaboration of the theoretical foundations of the conception that should support the new point of view that is assumed.
- Fundamentation and definition of the new categories that should support the conception.
- Characterization of the points that within the theory must be changed.

These steps led to the selection of the following contents that group the demands of this activity:

- Physiological characteristics of the competitive activity of sprinting.
- Metabolic systems for obtaining energy.
- Anthropometric characteristics demanded by the competitive activity of the sprinter.
- Psychological characterization of competitive activity.
- Determining physical abilities in the technical gesture of the race.

Results of the elaboration of the characteristics of the competitive activity in the 100-meter flat test.

Metabolic systems for obtaining energy.

The 100 flat meters of Athletics is a speed race test in which various physiological parameters participate, mainly anaerobic, and which will be analyzed below (Guillamón and Saorín, 2014).

To perform any mechanical work, the muscle needs the presence of adenosine triphosphate (ATP) for muscle contraction. The replacement of ATP for muscular work is carried out by a macro-energy compound stored in the muscle, called creatine phosphate (PC), which is in equilibrium with ATP in concentrations 5-6 times greater than this. The enzymatic activity will be transcendental in the competition of the 100 flat meters, where ATP and PC can be considered non-aerobic sources, since they do not need oxygen for their use.

In situations of maximum and short-term exercise, such as the 100-flat meter competition in Athletics, it is impossible for the use of oxidative pathways to occur, as mentioned above, a circumstance that requires the use of high energy compounds

In speed tests, specifically in the 100 flat meter sprint, it has been described that the exhaustion of the anaerobic alactacid pathway can occur in a margin of approximately 7-10 seconds, which is almost the same time of duration of the race depending on the athletes' level in the 100 meters flat run. (Badtcke, 1987, cited by Mc Ardle, Match and Katch, 2004).

Physiological characteristics in the 100 meter flat test

The cardiac output (Q) during the test will require a considerable energy demand that will set in motion a series of mechanisms to adjust the cardiac output to the new situation. At the start of the test, systolic volume records of around 210-215 ml per beat are produced, which can yield heart rate (HR) values of 195-200 beats / minute. These data assume cardiac output values of around 20-22 liters of blood per minute.

The respiratory response is also very important in the 100-meter test, since it involves a mainly anaerobic effort, as described above, and although the involvement of oxygen in this activity is not so important during the race, it is necessary do not underestimate the implication of respiratory responses before and after the test itself.

In short, the improvement of aerobic parameters is of interest in working with sprinters to be able to face loads in competition or training of high anaerobic demand. This improvement will only occur through proper individualization of training.

Anthropometric characteristics demanded by the competitive activity of the 100-meters flat test.

There is no height limitation in a sprinter, although statistics have shown that the great specialists in track speed measure between 1.65 and 1.90 meters. The technicians agree that excess height is more of an impediment than lack of physical size when it comes to forming a great sprinter.

However, if the speed depends on the length and frequency of the steps and the first in turn on the length of the limbs among other factors, the success of a sprinter in a competition will also be conditioned by an adequate height.

The sprinter must also be a harmonious athlete who has to be at his right weight. It must be taken into account that sprinters eliminate fats very badly and therefore they must take extreme precautions when it comes to finding a healthy and balanced diet. The

specialists in 100 flat meters are those with the lowest percentage of fat in their body, which is favorable for success in competitions (Salas, 2009).

The maximum force a muscle can generate is proportional to its cross-sectional area - the larger the area the greater the maximum force it can produce, not surprisingly sprinters are very muscular. However, improper use of weight and strength training can cause a loss of fluidity of movement and elasticity, which is unproductive in a speed competition (intermuscular coordination).

Psychological characteristics required by competitive activity in the 100-meter flat

The 100 flat meters start requires the athlete to be dynamic, active both in training and in competitions; the start requires agility and strong movements of the legs and arms, as well as reaction speed (Beltrán and Milan 2020).

Lability has a special importance in this ability, since this property is manifested when the subject knows in advance the stimulus to which he must react.

Also in this activity it is required that the sprinter be agile motor, due to the characteristics of this modality where motor skills predominate, fast force, explosive force, among others, they must apply these capacities at the time of starting (Beltrán and Milan 2020).

In a 100 flat meters sprint race, the athlete is the classic athlete who makes the coach nervous; he is outgoing, unstable in his mood, does not accept frustrations easily and is impulsive, especially in competitions.

In a 100 flat meters competition, psychological barriers may arise as a consequence of traumatic situations, frustrations or failures, which inhibit the athlete's efforts to achieve their goals and deserve specific treatment for their eradication.

In this career, part of these internal difficulties is the negative psychological state, fear of competition, feelings of physical insufficiency, poor technical level, poor tactical knowledge.

An important role in a 100 flat-meters race is played by the athlete's own type of temperament, which to some extent conditions the characteristics of their activities in training and competitions, such as psychomotor performance, work rate, quality, resistance to fatigue, among others (Beltrán and Milan, 2020).

When evaluating the psychological component of the preparation of sprinters, it should be noted that a wide group of contents from the psychic sphere are committed to performance during training and competition, which responds to the physical, technical, tactical and psychological demands. This constitutes the sustenance of the formation of

an optimal state of psychological disposition for the successful confrontation with the challenges presented in the form of obstacles and difficulties (Rios and Tejeda, 2016).

The set of muscle-motor sensations when executing the technical phases in a 100-m flat race, play their role in the development of the general ability to direct the body when fulfilling the most varied motor tasks and constitute the basis of the correct coordination of movements, observance of the correspondence between the initial position, the activity of the neuromuscular apparatus, the degree of resistance of the environment and the character of the movements and actions.

The visual perceptions of the successive substitution of the surrounding images and objects also help to determine the speed of movement and the correct execution of the movement in space. The dynamics and sudden changes of positions require the improvement of the sensations of balance, which allow the athletes to adapt and temper themselves to these demands (Ríos and Tejeda, 2016).

An important aspect in the 100 flat meters sprint race is volitional development. The fight to achieve victory requires the sprinter to overcome his weaknesses, hesitations, lack of courage and audacity, but this requires a high development of decision, courage, initiative, independence, perseverance, self-control and other qualities. that determine the successful development in sports preparation.

Physical condition that competitive activity demands in the 100-meter flat event.

The effectiveness of sprinter training depends, to a large extent, on the appropriate use of loads related to physical capacity endurance and their derived capacities, namely resistance to force, special resistance and resistance to speed. It can be considered that in sprinting races, despite presenting a minimal energy consumption achieved by aerobic route, the result depends fundamentally on the correct development of resistance since this serves as a basis for higher intensity workouts, allowing greater and faster recovery of the muscle groups involved in the activity (Ramos, 2011).

Maximum power work is the most characteristic for short sprints (up to 20 seconds). To overcome this distance with a speed limit, the energy possibilities must be exploited in those seconds. As a result, a large oxygen debt is created, the products of exchange accumulate rapidly in the muscles and an intense progression of fatigue of the muscles is observed, resulting in a decrease in speed.

Consequently, endurance in short sprinting is ensured primarily by the lactic anaerobic capabilities of the athlete's body. Endurance in short sprinting depends on the improvement of the corresponding cortical processes and the activity of the

neuromuscular apparatus, by increasing the effectiveness of biochemical processes in the muscles and a better use of reserve oxygen.

In such conditions, training should be performed to improve and refine all components of endurance. For this reason, the movements with maximum speeds or close to them constitute the base of the education of the special resistance in the races of short speed. To educate speed resistance with an intensity close to the limit, it is very important that the improvement of the anaerobic possibilities of the organism is carried out in a similar way to the competition with 100 or 95% intensity.

In the endurance education process, the dynamics of speed changes in relation to increasing fatigue must be taken into account. It is that the anaerobic productivity of the organism unfolds following a certain sequence. Investigations carried out show that in the first 3 · 8 seconds of maximum intensity work, the creatine phosphate mechanism (alactacid resistance) acts and, later, that of glycolysis (alactacid resistance).

The speed of translation (running) takes into account the amplitude of the stride, the frequency with which the impulse is made, and the resistance to speed or the ability to maintain maximum speed for as long as possible.

Reaction speed is determined by the shortest time that elapses between the application of a stimulus to obtaining a motor response. Taking into account these factors, it is necessary to define the requirements that speed as a sporting modality demands of an athlete, in order to compare the correspondence of individual characteristics with these requirements.

Therefore, a large part of sports performance can be achieved today with greater rapidity of movements, meaning that this is becoming increasingly important in today's contemporary sport, so it is considered necessary to address the different conceptions and positions of authors on fast and speed.

Fast and speed are different characteristics of the motor functions of man. The individual characteristics of rapidity in all its forms of manifestation are conditioned by genetic factors and, therefore, the possibility of developing them is limited.

The speed of movements or displacements in space is a function of fast, strength and endurance, but also of the athlete's ability to rationally coordinate their movements according to the external conditions in which the motor tasks are carried.

Unlike speed, the possibilities for improving movement speed are limitless.

Speed is not a pure physical capacity but a mixed one, between psychic, cognitive, coordinative and conditional since it largely contains psychic and neural aspects, in addition to energetic ones, which justifies its denomination as conditional.

Taking into account the aforementioned, it is agreed that the qualities of speed are characterized by the ability of man to perform motor actions in the shortest possible time under given conditions, without denying the influence of the environment for their development, as a determining element.

Phases of the sprint race

These phases are not always uniform and vary depending on internal factors such as motivation, technique or physical condition, and external factors such as wind, temperature and type of track. Therefore, the duration of each of these phases varies between and within the subject.

Stride phases

The stride is the default motor action in sprinting and it is important to understand what parts it is composed of (Bergamini, 2011). The stride is the action between the supports of both legs and is composed of two phases: support and suspension.

The support phase can in turn be divided into three sub-phases, depending on the position of the center of gravity (point where the forces applied by gravity on its parts produce a zero moment)

- Cushioning: in this phase the center of gravity is located behind the support to mitigate the impact. It is considered that there is a moment of braking, but some athletes are able to transform it into positive energy thanks to a good technique.
- Support: the center of gravity is vertical to the support, it is a very short and transitional phase in which the main work goes from the flexor muscles to the extensors.
- Drive: starts when the center of gravity exceeds the support. This phase is very important because it is the forward and upward push by action of the leg extensor muscles.

Acceleration: within this phase there are two sections:

First, an initial acceleration phase during the first 20 m. In it there is a large increase in speed as a result of the high increase in amplitude and frequency. During the other 10 meters, there are increases of speed of up to 70% (3.88 m / s), of frequency of 20% (4.40 Hz) and of amplitude of 43% (192 cm). From 20 to 40 m there is an extended acceleration phase, where the speed increases by 49% (~ 7.56 m / s), and the amplitude reaches 2.49 m. In this phase, the high speed is produced by the large increase in the

stride width experienced by the athlete, which makes it possible to lengthen the flight phase, which is where the movement occurs faster.

Criterion of the users

When evaluating the group satisfaction of the users on the characteristics of the competitive activity in the 100-m flat race, the satisfaction that they experience with the proposal was verified, due to the fact that an index of 0.95 close to 1 is achieved, which indicates that there is a great satisfaction and they also express that there is a need, utility and relevance of this characterization of the competitive activity of the 100-m flat race for the work of the coaches.

Conclusions

As a result of the assumed theoretical conception, it was possible to determine the characteristics of the competitive activity of the 100 m flat test, all of which was valued as necessary and pertinent by the users of this specialty, who also express high satisfaction.

Users express high satisfaction with the proposed characteristics of the competitive activity of the 100m sprint race, as it responds to a need for coaches to guide the preparation of sprinters in the improvement of racing technique.

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