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Biomechanical variables and their relationship to the time taken and the achievement of a 400-meter sprint

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Abstract--The research objectives were: Exceptional endurance and its relationship to the level of achievement of 400m. The time is taken between the race segments and the completion level of 400m. The most critical assumptions were: There is a correlation between exceptional endurance and enemy level 400m. There is a correlation between the time taken and the parts of the race and the achievement level of the 400m sprint. As for the research sample, it was represented by the hostility of the Iraqi clubs in the 400 m enemy for the applicants. As for the approach used in the research, which is the survey approach for its suitability to the research method, then the researcher discussed the analysis and discussion of the results using sober scientific methods, through which the researcher reached the most important conclusions, which were as follows: The random rate of speed among the members of the research sample in the first and third parts of the race. The average speed has decreased in the last 100m compared to the global method. The lack of rhythm, feeling and controlling the speed used, especially in the first half.

Keyword--Biomechanical variables, time taken, 400-meter sprint

Introduction

The continuous competition to break records and achieve the highest levels of achievement in athletics events in particular, and the effectiveness of the 400-meter sprint in particular, is one of the topics that occupy the minds of many interested in achieving the digital development of this event due to the length of the race and the time it was cut, as this event depends on its performance. The movement along the step and its frequency to achieve the highest levels of physical and physiological characteristics and the degree of integration between them, in particular, the length and frequency of the step, and because these two compound characteristics have a great relationship with the factor of resistance to fatigue, as well as the accumulation of the concentration of lactic acid in the

blood, so this relationship comes from Through the efficiency of the nervous-muscular system to generate the necessary force during the stages of the race, especially when implementing both the length and frequency of the step, and since the effectiveness of the sprint (400) meters is one of the most challenging sprints, as it requires the elements of fitness that control the digital level, especially the elements of anaerobic and aerobic endurance and speed As well as from the technical point of view, which is characterized by this race of codifying the steps between the parts of the race (the first half of the 200m and the second half of the race), as the process of sprinting requires In those parts, it was shown to maintain the rhythm used in the sprint, because the change of rhythm, such as the length and frequency of the step, occurs as a result of the lack of physical fitness of the runners, which shows fatigue as a result of the accumulation of lactic acid in the muscle, which leads to the inability to continue performing with the exact specifications. Through this, the importance of the research has emerged in identifying the effectiveness of the training programs prepared by the trainers to know the sports format for each player, whether in the preparation stage or the stage of competitions.

Research problem

Through the researcher's experience in training athletics activities and his knowledge of the sources, he sees that level assessment tests are among the indicators that reflect the level the player reaches during the competition period, whether these tests are physical, physiological or psychological, and sometimes tests focus on running distances from each other. It is less than the distance of the specialist race, some exceed it, and some use the distance of the specialist race. This is to predict the player's performance level and to determine his training status and thus his participation in the competition.

From this point of view, the research problem focused on evaluating the training programs for runners coaches (400) meters in the clubs of the Iraqi country in terms of physical and parts of the race and achievement, due to the stagnation of the Iraqi number for more than (30) years, amounting to (46.00) seconds compared to the international level, which reached He got the world record with a time of (43.18) seconds, in addition to that, as a runner's performance of (400) meters hurdles became equivalent to the performance of our runners in the sprint of (400) meters freestyle.

Research aims:

1. Recognize the relationship between the step length and frequency and the enemy's speed (400) m
2. Recognize the relationship between the time between the race segments and the achievement of a sprint (400 m)

Practical part

The researcher used the descriptive analytical method and studied the correlational relationships for their relevance and the nature of the research problem, as it explains "the reality of accidents and the report of their present facts by biomechanical analysis and evaluation in order to derive important

conclusions from correcting this reality, update it or create new knowledge about it."

Research sample and community:

The research sample was tested randomly from (400) young runners, which numbered (5) players out of (7) players, and (2) of them were excluded because they did not participate in this tournament within the competitions held by the Iraqi Central Athletics Federation within its annual curriculum. Thus The sample constituted (70%) of the original population after the homogeneity of the sample was conducted in the variables - height - weight - training age.

Equipment and tools used:

- * Arab and foreign sources and references
- * Japanese-made SHARP electronic calculator
- (7) Manual stopwatches.
- * Registration forms.

The exams:

"Tests are one of the important means of evaluating the level reached by the athlete (mathematical formatting) as it shows the validity of the training program" (). Accordingly, the researcher decided to evaluate the performance level of the research sample through the tests conducted on the step length and frequency; then, the tests were compared to find out The differences between them and which one has the most influence on those variables on achievement.

Survey experience:

The exploratory experiment was conducted on 27/2/2020 at Al-Shaab International Stadium on three runners at ten in the morning. The purpose of the exploratory experiment was:

- 1- Knowing the period required to perform the tests.
- 2 - Ensure the validity of the tools and devices used.
- 3- Ensuring that the work team and the medical staff know their duties and their correct sequence.
- 4- Identify errors that may occur to address them.

In light of this work, the main experiences were identified.

Specifications of the tests and measurements used:

The test ran 300 meters from the high start.

The stride length of a runner who ran 400 metres was measured for the test.

Necessary tools: Athletics track and the start of a distance of (300) meters are determined so that the end of this test is at the same end as the 400-meter distance.

- Stopwatches - Absolute - Temporary.
- Description of the test: The tester stands behind the starting line from a standing position, takes the preparation position, and when the signal is heard, he runs as fast as possible to cover the distance and reach the finish line.

Recording: The time taken to travel the distance to the nearest 1/100 second is recorded using three timers, and the number of steps and time is calculated through the imaging equipment prepared for this.

A test run by jumping 150 meters from the high start.

Test purpose: To measure the step frequency of 400m runners.

Equipment needed: - Athletics track

Stopwatches - absolute - temporary.

Description of the test: The tester stands behind the starting line with the feet slightly apart and parallels so that the instep of the feet touches the starting line from the outside, then the tester takes a position (bending the knees slightly and leaning the trunk forward with the arms swinging back, and when hearing the signal, the arms swing forward with the knees extended Forcefully along the torso to push the ground with the feet, forcefully to bounce forward on one foot, alternating thrust with the other foot, and so on until the end of the distance.

Recording: The number of steps and the time taken to cover the distance is recorded twice to the nearest 1/100th of a second.

The main experience:

After conducting the exploratory experiment and ensuring the correctness of the procedures followed, the field experiment was conducted on the members of the research sample and from the period 1/3/2020 and it was as follows:

*Step frequency test run by jumping 150 meters 0

*Step length test ran 300m0

1. The timing of the time elapsed between the parts of the race and completion was conducted on 3/3/2020 in the Athletics Club Championship, which was held on the athletics track at Al-Shaab Stadium at 4:00 pm.

The test procedure was as follows:

- * The time elapsed between the first (100) starting line has been timed
- * The time elapsed between the start line (100) seconds has been timed
- * The time elapsed between the starting line (100) and the third is timed
- * The time elapsed between the starting line (100) and the fourth is timed
- * The deadline for the completion of the event is (400) meters

Statistical means:

SPSS statistical bag

Results

Presenting the results of the special endurance relationship and the percentage of lactic acid accumulation in the blood after effort and achievement in running (400).

Table (1)

Shows the correlation relationship between the study variables and the achievement of (400) meters running for the research sample members

Variable	step length	step frequency	percentage of lactic acid build-up in the blood after exertion
400 m	0.969	0.966	0.835

Table (1) shows the values of the correlation coefficient between the study variables and the achievement of the 400 m sprint, as there was a significant correlation between the step length test represented by running (300) meters and the achievement because its calculated value is greater than its tabular value, and a significant correlation appeared between the test The frequency of the step represented by running from jumping for a distance of (150) meters and achievement because its calculated value is more significant than its tabular value, at a degree of freedom (3) below the level of significance (0.01). While the correlation relationship was random between the percentage of lactic acid accumulation in the blood after effort and achievement, This is because its calculated value is less than its tabular value at a degree of freedom (3) below the significance level (0.01).

Note / lactic acid was measured in the laboratory using a blood sample by (kata) by specialists.

Presenting the results of the time relationship between the parts of the race and the achievement of a sprint (400) meters for the members of the research sample

Table (2)

It shows the results of the relationship of time taken between the parts of the race and the achievement of a sprint (400) meters for the members of the research sample

The player	time parts of the race				achievement
	first	second	third	fourth	
1	11.00	12.07	12.18	12.25	47.50
2	11.10	12.30	12.35	12.40	48.15
3	12.20	12.28	12.50	12.62	49.60
4	12.09	12.55	12.49	12.85	49.98
5	12.30	12.59	12.54	13.00	50.43

Table (2) shows the values of the correlation coefficient between the time taken between the parts of the race and the achievement in the effectiveness of a sprint (400) meters for the members of the research sample. As the correlation relationship (significant) appeared between the time taken for the first part (100) meters and the third part (100) meters and achievement, while the time taken in the second and fourth part and the level of achievement (random) because its calculated value is smaller than its tabular value at the degree of freedom (3) and below the level of significance (0.05) as shown in Table (3).

Table (3)

It shows the correlation between the time taken between the parts of the race and the achievement in the event of a sprint (400) meters

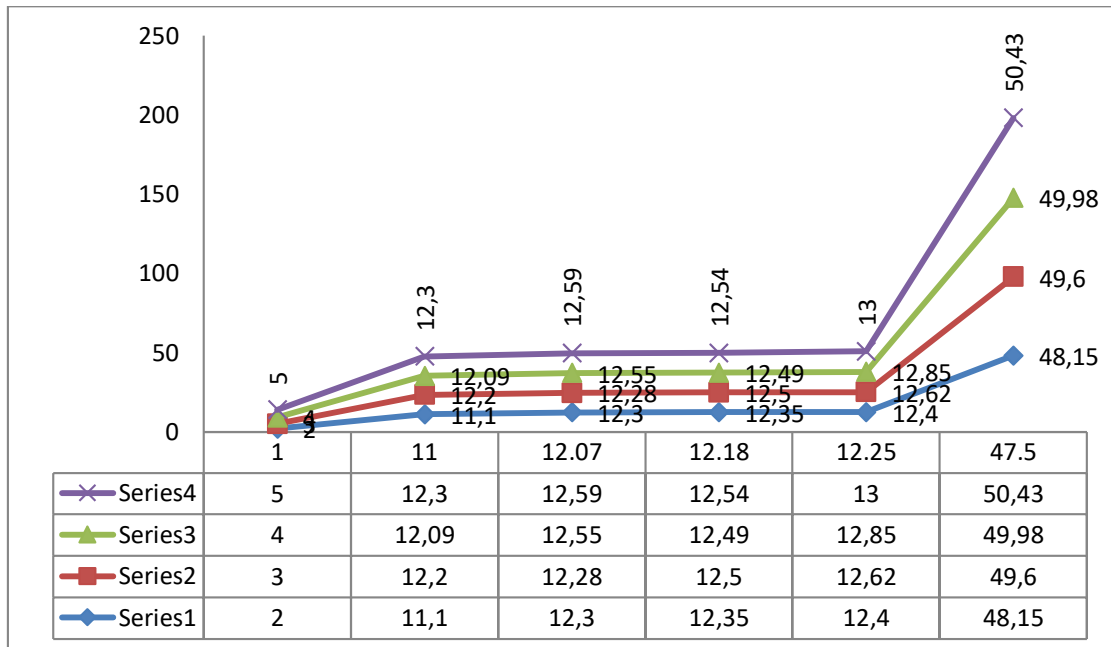
The time is taken between parts of the race	complete a sprint (400) meters
100 meters first	0.987
100 meters per second	0.943 *
100 meters third	0.998 *
100 meters fourth	0.945

We discussed the results of the time taken between the parts of the race and the completion of a sprint (400) meters for the members of the research sample.

Through the results that appeared in Table (2), it is clear that the relationship between the speed used (time taken) for the first and third part of the race and the level of achievement was significant, that is, the intensity exerted by the competitors was high (high speed) not commensurate with their physical capabilities, which This led to a rapid decrease in the speed used (the time taken) in the last part of the race, while the results appeared random in the time taken for the fourth part and the achievement, i.e. the instability in the rate of speed, and the reason for this was the emergence of a state of early fatigue as a result of an increase in the high percentage of lactic acid accumulation And the depletion of glycogen stores, which led to a decrease in the speed of the runners. The researcher attributes this to the fact that there is no correct use of the step length and its frequency in the forces used (effort) at the race distance for the sample members. Maintaining the rhythm used at the race distance so as not to make any error that could negatively affect the performance time and the change that appeared in the rate of speed (the rhythm between the parts of the race) among the sample members is due to a lack of In the level of step length and frequency, which affected the performance speed used as shown in Figure (1) and this can be compared with the global model as in Figure (2).

"So, to get good numbers in a 400-meter sprint, it is necessary to divide their effort into the race distance by developing the length and frequency of the step, as the process of choosing the appropriate speed at the beginning of the race and up to the first (200) meters is one of the critical factors in determining the digital level At the end of the race, if the time of the first 200 meters is compared to the second 200 meters in this event, the second 200 meters should not be slower than the first except within 2-3 seconds only.

(1) Harra D principle of Sports Training Berlin Sport Velave p58 1990



shape (1)

It shows the parts of a 400-meter sprint for each runner for the sample according to the achievement

Conclusions

From the results, the researcher concluded the following:

1. The random rate of speed of the sample members increased in the first and third parts of the race in a way that was not commensurate with their physical abilities and capabilities, which negatively affected their speed in the rest of the race distance.
2. The average speed decreased significantly in the last 100 meters of the race compared to the world-level style.
3. The absence of rhythm or sense and control of the length of the step and its frequency used, especially between the first half (200) meters and the second half of the racing distance, affected the achievement.
4. 04 Maintain the length and frequency of the step along the 0. clocking distance.

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