

The Effect of Circuit Training According To the Variation of Speed and Time in Improving the Speed Strength, Specific Endurance and Achievement of 400 M Freestyle Runners Under 20 Years

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Abstract:

This study included an introduction to sports training and its effective importance in the development that occurs at the level of sports achievement, and it means developing physical, skill and psychological efficiency. The plan for runners to be able to meet the requirements of the race and achievement. In addition to the importance of using modern and advanced training methods, especially the various circuit trainings and the extent to which these trainings are linked to precise and important characteristics of the race such as speed and time due to their effective and great importance in improving the requirements of the race such as rapid strength and special endurance and the real and ideal knowledge of the impact of these trainings in improving the achievement of 400m freestyle runners under 20 years old. and The research problem was summarized by the researchers following the training of the runners of this race and conducting exploratory experiments for a number of runners. It became clear to them that there is a clear weakness in completing the 400m freestyle, as a result of the weakness of the physical abilities specific to the stages and completion of this race, including rapid strength and special endurance. Accordingly, the researchers prepared various circuit training and regulated the intensity and loads of its exercises

during the training units according to speed and time. To develop the variables under study that contribute to improving the achievement of that race. The study aimed to prepare various circuit training according to the variation of speed and time, and to identify their effect on rapid strength, special endurance, and achievement of the 400m freestyle under 20 years. And to identify the superiority of the effect of the training of the control and experimental groups in improving the research variables under study. The researchers assume that there is a positive effect of the various circuit training according to the variation of speed and time in improving rapid strength, special endurance, and achievement of the 400m freestyle under 20 years, and that there is an advantage for the training of the experimental group over the control group in all the variables studied. The researchers used the experimental method in the style of two equivalent groups with pre- and post-tests. The researchers identified their research community as runners of the Karbala Governorate clubs in athletics, numbering (10 runners), and they were all chosen using the comprehensive enumeration method to represent the research sample at a rate of (100%).

The researchers concluded that circuit training, which varies in speed and time, has a positive and significant effect on improving speed strength, specific endurance, and the 400m freestyle under 20 years of age. They recommend that this training method should be used with different races and in developing different age groups.

1- Definition of the research

1.1 Introduction to the research and its importance

Sports training is the basis for success and progress in the sports field, especially through achieving accomplishments in various races and sports, including track and field races. It is concerned with developing the player's physical, skill, psychological and tactical efficiency to enable him to meet the requirements of completing the race. The goal of the coach and the training process is to reach the best level and how to maintain and develop it continuously. Progress is based on the correct, modern and appropriate training foundations and principles for the type of game or race, and the careful selection of these diverse trainings specific to the 400m freestyle race. Among these trainings is the diverse circuit training, which is one of the ideal methods for developing runners' levels by relying on speed and time . In this type of races, where programming training based on speed and time and in a way that serves the race gives a high return for the development of runners, and this is what It contributes to achieving a better accomplishment, which is what we always strive for in the training process, and to achieve the requirements and specificities of the race.

The 400m freestyle race is one of the track races in athletics, which is characterised by excitement, suspense and great competition between the competitors. This race depends in its performance on maximum and submaximal physical abilities, including (fast power and special endurance) and on energy production by the lactic system, which places a great burden on the working muscles, which affects the coordination between the nervous and muscular systems due to lactic acid accumulations according to the distance and time of the race.

Developing the speed strength and special endurance of 400m freestyle runners are essential requirements for a successful training program for runners in this race, and they are the main key to it. Therefore, when preparing these trainings for runners, you must aim to develop these elements and take into account the gradual use of training loads and recovery processes according to the speed and time of the race. In this way, the training process will be effective and influential and achieve the goal for which it was built, which is to improve achievement.

Hence, the importance of the research came through preparing various circuit training exercises according to the variation in speed and time in improving the fast strength and special endurance

and the real and ideal knowledge of the effect of these exercises in improving the achievement of 400m freestyle runners under 20 years old.

1.2 Research problem

Considering the physically complex requirements of the 400m race, and through the researchers' follow-up of the runners' training in this race, their consultation with a number of specialists and their modest experience, and their conducting exploratory experiments for a number of runners, the researchers found that there is a clear weakness in the achievement of the 400m freestyle under 20 years, as a result of the weakness of the physical capabilities specific to the stages and achievement of this race, including rapid strength and special endurance. As well as the lack of interest of coaches and specialists in this field in using various circuit training during the training curriculum and training units according to speed and time.

Therefore, the research problem crystallized from preparing various circuit training exercises and standardizing the intensity and loads of its exercises according to the speed and time of the race, which reflects its effect on improving the fast strength and special endurance, and thus improving these abilities casts a light on developing the achievement of the 400m freestyle under 20 years. And studying this problem to provide field and scientific information and presenting this study as a service to coaches and athletes to increase their knowledge and to achieve better achievement for the athlete.

1-3 -:Research objectives

- 1- Preparing various circuit training exercises according to the variation in speed and time for 400m freestyle runners under 20 years old.
- 2- To identify the effect of various circuit training according to the variation of speed and time on fast power, specific endurance and achievement of the 400m freestyle under 20 years.
- 3- To identify the superior effect of training in the control and experimental groups in improving rapid strength, specific endurance, and achievement of the 400m freestyle under 20 years.

1-4 :Suppose the search is

Researchers assume:

- 1- There is a positive effect of circuit training with varying speed and time variations on improving speed strength, specific endurance and 400m freestyle performance in under-20s.
- 2- The experimental group had an advantage over the control group in improving speed strength, special endurance and completing the 400m freestyle under 20 years.

1-5 -:Research areas

1- Human field: 400m freestyle runners under 20 years of age for clubs in Karbala 1-5 Governorate

Time frame: from 1/5/2024 Until 9/5/2024 **2-5-1**

1-5-3 Spatial area: The secondary stadium in the sports city in Karbala Governorate, Al-Shabab Club stadium in Karbala Governorate.

2- Research methodology and field procedures

2.1 Research Methodology

The research methodology is important in scientific research because the value of the research and its results are closely related to the methodology followed by the researcher. Thus, "the experimental method is one of the most accurate types of methods and its results can be adopted, generalized and applied. It is not satisfied with existing phenomena and events, but rather studies

the causes and factors behind their occurrence and tries to explain and analyze them , and predict what phenomena will happen in the future" (). Therefore , the researchers used the experimental method in the style of two equivalent groups (control and experimental) with pre- and post-tests, as it is more appropriate for the objectives of the research and the achievement of its hypotheses. Table (1) below shows the experimental design of the research.

Table (1) The experimental design adopted in the research shows

Post-tests	Experimental handling	Pre-tests	The group
Rapid strength and endurance test and 400m freestyle	Circuit training that varies in speed and .time	Rapid strength and endurance test and 400m freestyle	empiricism
	Coach training only		The officer

2.2 Research community and sample

The researchers defined their research community as 400m freestyle runners (under 20 years of age from the clubs of Karbala Governorate, numbering (6 clubs who officially participated in the championships held by the Iraqi Central Athletics Federation, numbering 10 runners All of them were chosen to represent the research sample using the comprehensive enumeration method, and thus the sample represented 100%. They were divided into two groups, a control and an experimental group, using a simple random method through a draw, and each group had (5 runners).

2-3 The means, devices and tools used by researchers in the research

The researchers used the following methods, devices and tools:

- ✓ Note
- ✓ The interview
- ✓ Questionnaire
- ✓ Testing and measurement
- ✓ Weight measuring device, number (1), Korean made
- ✓ Length measuring tape (1)
- ✓ Acer laptop, number (1), made in Korea
- ✓ (3) manual stopwatches, type (Kilos 610), made in China.
- ✓ Cat is heavy
- ✓ rubber ropes
- ✓ duct tape
- ✓ Whistle number (2)
- ✓ red and white flags
- ✓ Starter support number)8(
- ✓ Registration forms

2-4 Field research procedures:-

2-4-1 Determining the physical tests for the research variables:-

In order to take into account the accuracy and objectivity of the test results that help researchers solve their research problem and obtain accurate numerical data, it was necessary to select the tests that measure those variables that the test was designed to measure, by the researchers preparing a

questionnaire form that was presented to some experts and specialists in sports training and track and field games to determine which of the tests is more valid than not , and after collecting the questionnaires, the researchers analyzed the experts' answers by using the statistical law (Chi 2) for approval or disapproval . The tests whose calculated value for (Chi 2) was greater than the tabular value were selected .

They are as follows: -

First: The three consecutive jumps test for both legs to measure the rapid strength of the leg muscles.

Second: Running test (300m) to measure speed endurance.

Third: Running test by jumping for a distance of (200 m) from a high start (with your weight).

2-4-2 Description of physical tests for the research variables under study:-

(1) :First: Test (three consecutive forward jumps for both legs)

- **Purpose of the test: To measure the rapid strength of the leg muscles.**
- **Test requirements:** flat ground at least 10 meters away, measuring tape, adhesive tape.
- **Test Description:** The test subject starts the test from the starting line and jumps forward for three consecutive jumps with both feet. He is given two attempts and the best attempt is counted.
- **Recording:** The distance covered by the tester during his three consecutive jumps is recorded from the closest trace left by the tester's feet towards the starting line and is measured in metres and parts thereof.

(2) :Second: 300m running test from a high start

- **Purpose of the test:** To measure speed tolerance.
- **Test Requirements:** Legal track, stopwatches, registration form, starter, timer, whistle.
- **Test Description:** The tester stands in the designated area, behind the starting line and at a distance of (300 m) from the finish line of the race, i.e. the end of the first curve of the track. The test begins from the high start position. Upon hearing the launch signal (whistle by the absolute referee), the tester sets off to cover the test distance at the highest possible speed. Upon reaching the finish line, the timing is stopped by the timer for the purpose of recording what the runner has achieved in the test.
- **Recording:** The time for each laboratory is recorded to the nearest (0.01) second.

Second: Running test by jumping for a distance of (200) from a high start (with your weight)⁽³⁾ :(

Purpose of the test: To measure strength endurance.

Test Requirements: Legal track, stopwatch, starter, timer, whistle, registration form.

(¹) Komi Pv Strength and power in sport. The Olympic book of sport medicine , Blak Werll scientific publication, Germany. 2007

Muhammad Subhi Hassanein: Measurement and Evaluation in Physical Education and Sports, Cairo, Dar Al Fikr Al (²) .Arabi, 2001, p. 254

Muhammad Abbad Abdul: The effect of developing special endurance in controlling running steps and completing (³) the 400m hurdles, Master's thesis, College of Physical Education, University of Babylon, 2003, p. 29

Test Description: The tester stands behind the 200m running starting line, then the tester takes the high start position, and upon hearing the whistle, the tester runs by jumping to the end of the specified distance, which is 200m.

.Recording: The time recorded by each laboratory is recorded to the nearest (0.01) second

(4) Third: 400m freestyle achievement test for under 20 years old

- **Purpose of the test:** (Measuring the achievement of the 400m freestyle race under 20 years old
- **Test Requirements:** Athletics track, manual stopwatch, registration form, timer, whistle, white .and red flags
- **Test Description:** The test begins after the tester stands directly behind the starting line. When the “Take your place” signal is heard, the tester takes his place and the starting position is sitting, then the “Come” signal is heard. When the start signal is heard (the whistle is blown), the runner runs in the designated area for a distance of 400 m. When the tester reaches the finish .line, the timing is stopped
- **.Recording:** The time of each lab is recorded on the registration form and is closest to 0.01 sec

:Exploratory experiment 2-4-2

In confirmation of the steps of scientific research and for the purpose of determining the accuracy and validity of the research work , the researcher conducted a survey experiment on (6) runners (6) corresponding to (Saturday , Monday /400m freestyle) from the research sample, on (15-17-19 :and Wednesday), and its purpose was

- 1- .Identify the difficulties and obstacles that will arise during the implementation of the tests
- 2- . Knowing when to take the tests and how long they take
- 3- .Identifying the sample members’ ability to perform the tests and their suitability for them
- 4- .Identify the necessary equipment and tools, provide them and test their suitability
- 5- .Training of support staff
- 6- .Extracting the scientific basis for tests

- :Scientific foundations of tests 1-2 -4-2

Tests and measures in physical education are an important tool for evaluation, and thus they are the tool used to collect data for the purpose of evaluation. These tests or tools also have good qualities, including the availability of scientific specifications, the conditions of which are (validity, reliability .(and objectivity

-:Validity of tests 1-1-2-4-2

Test validity means that the test “measures the ability or phenomenon accurately for which it was The researcher used content validity to determine its validity by . (5) ”designed to measure Its validity has been . sports training experts and track and field players presenting it to a group of . proven after experts agreed that it achieves the purpose for which it was created

Sareeh Abdul Karim Al-Fadhli: International Athletics Law (translation) , Baghdad, Dar Al-Diaa Printing House, (4) .p. 274 ,2014

Muhammad Sami Malham: Measurement and Evaluation in Education and Psychology , 1st ed., Amman, Al- (1) .Maysar Publishing House, 2000, p. 272

- :Test reliability 2-1-2-4-2

the extent of the test’s accuracy in measurement and the consistency of its “ Test reliability means The researcher used the (test and .(6) ” results when applied multiple times to the same individuals retest) method to find the test reliability coefficient , as the researchers repeated the tests on the same individuals of the exploratory experiment on days. (Sunday, Tuesday and Thursday) .corresponding to (23-25-27/6) with a time interval of (5 days) between the first and second tests

The researcher extracted the stability coefficient through the correlation coefficient (Pearson) between the results of the first and second tests. The values of the calculated stability coefficient for all physical tests were greater than the tabular values of the correlation coefficient (Pearson) at a significance level of (0.05) and with a degree of freedom of (4), amounting to (0.811), which .indicates that all tests enjoy a high degree of stability as shown in Table) 2 (

:Objectivity of tests 3-1-2-4-2

The objectivity of the test is defined as “the agreement of opinions of more than one judge when as the objective test is one in which there is no significant variation , (7) ”they evaluate the test between the judges ’ opinions. To find the objectivity of the test, the researcher used the correlation coefficient (Pearson) between the scores of two judges*All the calculated . when retesting objectivity coefficient values for all physical tests were greater than the tabular (critical) values of the Pearson correlation coefficient at a significance level of (0.05) and with a degree of freedom of (amounting to (0.811), which indicates that all tests enjoy a high degree of objectivity, as ,(4 .shown in Table) 2 (

Table (2) Shows the reliability and objectivity coefficient of the tests.

Correlation relationship	Factor Objectivity	Correlation relationship	stability coefficient	Test Name
Strong	0.897	Strong	0.847	Three consecutive forward jumps with both legs
Strong	0.924	Strong	0.882	300m high start run
Strong	0.905	Strong	0.876	200m jump run

- :Pre-tests 3-4-2

The researcher conducted pre- tests for the variables (speed power, speed endurance, power endurance, and 400-meter freestyle race completion). Over the course of three days, the speed endurance test (300m run) was conducted on the first day, Saturday (29/6/2024) , and the two rapid) and the strength endurance test (three consecutive forward jumps with both legs) strength tests on the second day, Monday (1/7/2024), while on the third day, Wednesday (200m jump run the achievement test (400m run) was conducted, in order to stabilize the runners’ level, ,(2024/7/3) .and to work in light of these levels when preparing the training

-:Homogeneity and equivalence procedures 4-4-2

- :Homogenization procedures 1-4-4-2

After conducting the pre-tests The researchers conducted the homogeneity process for the extraneous variables (height, body mass, training age, and chronological age), as they have an effect on the research variables, by using the statistical law (Levine's homogeneity coefficient). The results .proved that the individuals of the two research samples were homogeneous in these variables

Muhammad Jassim Al-Yasiri, Marwan Abdul Majeed: Measurement and Evaluation in Physical Education and (6) .Sports , 1st ed., Amman, Al-Warraq Foundation for Publishing and Distribution, 2003, p. 78
 Marwan Abdul Majeed: Scientific foundations and statistical methods for tests and measurement in physical (7) .education , 1st ed., Amman, Dar Al Fikr Al Arabi, 1999, p. 155

:Equivalence procedures 2-4-4-2

After the researchers found that the individuals of the experimental and control groups were homogeneous, the researchers conducted the equivalence process between the control and) experimental groups for the research variables (under study) by using the statistical lawT for .independent samples) as in Table (4(

Table (4) It shows the equivalence of the control and experimental groups in terms of the .measurements and research variables under study

Type of indication	Morale level	T value Calculated	A	S	The group	Variables
Non-moral	0.836	0.116	1.69	7.82	The officer	Fast Force
			1.20	7.94	empiricism	
Non-moral	0.924	0.062	2.38	39.87	The officer	Speed tolerance
			2.16	39.97	empiricism	
Non-moral	0.521	0.429	3.58	47.36	The officer	bear strength
			4.18	48.54	empiricism	
Non-moral	0.745	0.253	2.48	55.76	The officer	Achievement
			2.87	56.24	empiricism	

It is clear from Table (4) that all) The significance levels of theT- test for independent samples) greater than the (0.05) level, which indicates that there are no significant differences between were the control and experimental groups in the measurements and variables (under study), which .indicates their equivalence

- :The main experiment 5-4-2

The researcher prepared and conducted various circuit exercises according to the variation in speed Within the training curriculum to develop the research variables under study :and time and included for the experimental group, relying on the analysis and review of a large number of specialized scientific sources and references , the researchers took into account the training level, age group, and physical ability of the research sample. They also took into account training the sample members for the rest of the days of the week so that the training goal is the same for all members of the research sample through coordination with the trainers and in order to control the experimental -:variable . The training was characterized by It comes

.The training was carried out in the special preparation stage -1

. 2024 , 6 on Saturday, July The training began -2

.continued for a period of (8 weeks) included in the training program

The number of training units during one week was (3 training units), and thus -4 .the total number of training units was (24 training units)

.The training unit days were: Saturday, Monday, Wednesday -5

The time for performing the exercises in the main section of the training units differed according -6 . to the objectives and requirements of each one

7- The intensity used in performing the exercises ranged from between (80% - 90 %) of the .maximum hostility threshold, in light of the pre-tests applied to the research sample

8- .The researcher used the method of high -intensity and repetitive interval training

9- The implementation of the exercises prepared in the training program ended on Wednesday, . August 21 , 2024

- :Dimensional tests and measurements 6-4-2

After completing the implementation of the trainings prepared by the researcher and included in the training program , the researcher worked on re-applying the tests that were conducted in the pre-test and in the same place and steps for the pre-tests for the research variable as much as possible, on (.Saturday, Monday and Wednesday) corresponding to (24-26-28 / 8 / 2024 (

- :Statistical methods 5-2

The researcher resorted to choosing the statistical methods related to comparing the results of the pre- and post -tests . He used theSPSS :statistical package system , as follows

- Arithmetic mean , standard deviation , Levene's test of homogeneity, chi-square (Chi2) , , Pearson 's simple correlation coefficientt- , test for matched samplst- test for independent . samples

Chapter Three

:-Presentation, analysis and discussion of the results -3

Presentation and analysis of the results of the pre- and post-tests of the research variables 1-3 .under study for the control and experimental groups and their discussion

Presentation, analysis and discussion of the results of the pre- and post-tests of the 1-1-3 .research variables under study for the control group

Table (5) Shows the values of the arithmetic mean, standard deviation, mean of the differences, standard deviation of the differences, the calculated t- test and their statistical significance. For pre- and post-tests of the physical research variables for the control group

Type of indication	Significance level	Calculated t value	A F	- F	Post-test		Pre-test		Unit of measure	Search variables	
					A	- Q	A	- Q		Special tolerance	
moral	0.008	3.11	0.18	0.25	0.54	8.07	1.69	7.82	M		Fast leg power
moral	0.004	3.76	0.71	1.19	0.35	38.68	2.38	39.87	Tha	Speed tolerance	Special tolerance
moral	0.000	4.75	1.03	2.19	0.99	45.17	3.58	47.36	Tha	bear strength	
moral	0.001	3.94	0.63	1.11	0.52	54.65	2.48	55.76	Tha	400m completion	

.With a sample size of (5) and a significance level of)0.05(shows the statistical indicators of the results of the pre- and post-tests that the members of the (5 .control group underwent

The results showed that the arithmetic mean values of the variable (the fast power of the legs) were greater in the post-test than in the pre-test, and there was a significant difference between the two tests in favor of the post-test . The results showed that the arithmetic mean values of the variables (speed endurance, strength endurance, and achievement) were better in the post-test than in the pre-test, and there was a significant change between the two tests in favor of the post-test, since these variables have inverse values . Because it deals with the time factor by measurement , i.e. the lower the arithmetic mean, the better the level. This is what the significance levels indicated by using the statistical lawt for symmetrical samples, as all variables were less than a significance level of which indicates the presence of significant differences between the two tests in favor of the ,(0.05) .post-test. This indicates the development of the individuals of the control group sample

- :Discussion -

Through the above presentation and analysis of the results obtained by the researcher and shown in Table (5), it is clear that the individuals in the control group achieved significant development in . all the variables studied

The daily training of the individuals in this group was aimed at developing the physical and motor abilities specific to the stages of the 400m race under 20 years old , as these trainings focused on improving the high reflexes of the runners of that race to obtain the greatest power that the runner can produce and as quickly as possible to exit the starting blocks and obtain the best speed from the first step of the race, and the ability to perform repeated movements with high strength and speed (fast power) , and the ability to endure this performance until the end of the race (special endurance .to cover the race distance in the shortest possible time (

(Adel Turki, 2009) confirms that “the group of exercises or physical efforts used in training units leads to adaptation or functional change in the body’s internal systems and organs to achieve a high This confirms the development of the individuals in the control .⁽⁸⁾” level of athletic achievement group in the variables (fast power, speed endurance, strength endurance, and achievement of the 400m hurdles under 20 years old), as these trainings followed by the individuals in this group have affected the development of these abilities, which are among the basic abilities that 400m freestyle . runners need to perform their motor duties with high and ideal technique

Presentation and analysis of the results of the pre- and post-tests of the research 2-1-3 .variables under study for the experimental group and their discussion

Table (6) Shows the values of the arithmetic mean, standard deviation, mean of the differences, standard deviation of the differences, the calculated t- test and their statistical significance. For pre- and post-tests of the research variables for the experimental group

Type of indication	Significance level	Calculated t value	A F	F	Post-test		Pre-test		Unit of measure	Search variables
					A	Q	A	Q		
moral	0.000	5.66	2.53	1.14	0.42	9.08	1.20	7.94	M	Fast leg power
moral	0.001	4.97	2.22	2.18	0.30	37.79	2.16	39.97	Tha	Speed tolerance
moral	0.000	6.62	2.96	5.45	0.86	43.09	4.18	48.54	Tha	bear strength
moral	0.000	7.27	3.25	2.73	0.48	53.51	2.87	56.24	Tha	400m completion

.With a sample size of (5) and a significance level of)0.05(

Table (6) shows the statistical indicators of the results of the pre- and post-tests that the members of .the experimental group underwent

The results showed that the arithmetic mean values of the variable (rapid power of leg muscles) were greater in the post-test than in the pre-test, and there was a significant change between the two tests in favor of the post-test. The results also showed that the arithmetic mean values of the variables (speed endurance, strength endurance, and 400m freestyle achievement under 20 years) were better in the post-test than in the pre-test, and there was a significant change between the two tests in favor of the post-test, as they deal with time units in their measurement, and this is what the significance levels indicated by using the statistical lawt for symmetrical samples, as all variables were less than the significance level (0.05), which indicates the existence of significant differences .between the two tests in favor of the post-test

Adel Turki Hassan Al-Dalawi: Principles of Sports Training , Najaf , Dar Al-Diaa for Printing and Design , 2009 , (1) .p. 2

- :Discussion -

-:The quick power of the legs -

Through the presentation and analysis of the results of the tests of the experimental group members, which the researchers obtained for the variable of rapid strength of the legs, it showed that there are significant differences between the pre- and post-tests in favor of the post-test. The researchers attribute the advantage in the results of the post-tests to the various circuit trainings that they prepared and included within the experimental curriculum for the members of the sample of this group, which included exercises according to the variation of speed and time, which enabled the competitors to create functional adaptations, especially in the various systems and functions of the body, especially in the working muscles and those opposing them. This was confirmed by the results of the comparisons between the pre- and post-tests in Table (6), and that this improvement enabled the competitors to perform the race distance in less time by improving strength and speed, and in turn, improving the rapid strength of the muscles of the legs and trunk. (Mufti Ibrahim Hammad, 1998) confirms that such diverse exercises that combine very high motor speed and high production of muscle strength for the muscles of the legs, trunk and abdomen impose great demands on the targeted muscle groups, as there is a reciprocal relationship between Speed movements and force production lead to maximum tension in the muscles used to engage and excite the largest number of motor units and the high interconnection between the nervous and muscular systems and this is ,⁽⁹⁾ "increases the productive muscle capacity and the rate of contraction speed is faster what a 400m runner needs . Researchers have focused on the various circuit training to be with high reactions while ensuring that the exercises are performed with strength and as quickly as possible , with an intensity ranging from (85-95%) and using the high-intensity interval training method and the repetitive training method. This enabled runners to give great positive returns to achieve the best level in the rapid strength of the muscles of the legs and trunk by mobilizing the largest number of motor units participating in the required muscle performance. This is confirmed by both (Mohammed Hassan Alawi, Ahmed Nasr El-Din) "that the most important thing that distinguishes superior runners is that they possess a great deal of strength and speed and have the ability to link them together in an integrated manner to create strong, rapid movements in order to achieve optimal The development of the fast power of the legs ,⁽¹⁰⁾ "performance and reach a better achievement contributed significantly to improving the performance of the technical stages of the 400m freestyle race under 20 years old, and thus improving the achievement of the performance of the members of .this group, which confirms their development

➤ -:Discussion of special endurance (speed endurance, strength endurance)

The researchers attribute the development of speed endurance and strength endurance to the various circuit training exercises according to the variation of speed and time, which they prepared and included in the training curriculum for the members of this experimental group, which was applied over two consecutive months, in which they took into account the gradualness of the training loads in terms of intensity and repetitions and ensuring rest periods between repetitions and sets to restore energy. These exercises represented speed and strength endurance exercises at a high level during specific time periods and distances, in a way that is consistent with and serves the race distance, to strengthen the muscles of the legs and trunk, and also serves the special endurance. Researchers believe that using longer work periods to perform exercises gives runners greater distances to endure strength and speed (specific endurance) and adapt to the most important distances (150m, 300m, 600m) while ensuring positive rest periods between repetitions and sets. In addition, runners can emphasize speed, specific endurance and relaxation in these distances by determining the

Mufti Ibrahim Hammad: Modern Sports Training (Planning - Application - Leadership) , 1st ed., Cairo, Dar Al Fikr (⁹)
Al Arabi, 1998, p. 138

Muhammad Hassan Alawi, Ahmad Nasr al-Din Radwan: Motor Performance Tests , 3rd ed., Cairo, Dar al-Fikr al- (¹⁰)
.Arabi, 1994

intensity of the exercises for each runner as well as the method and style in which the training was performed for the runners of this group . This is consistent with what was stated by (Mohammed Reda, 2008) “Special endurance (speed endurance and strength endurance) can be improved by repeating the exercises at an intensity less than maximum or near maximum and equivalent to (80-90% of the runner’s maximum capacity. It is preferable to use the high-intensity interval training (%90 method, and it is emphasized that when training for special endurance, the intensity less than maximum or near strength should be used and the performance period used in the speed specific to and as a result of using the various circuit training ,⁽¹¹⁾ ”.the race should be gradually increased according to distance and time by the members of this group, the level of physical qualities and abilities for the 400m race was raised, and then the optimal performance in endurance of speed and endurance of strength, and because of their effective role in the various directions of this race, and this is consistent with what (Faiza Abdul Jabbar) reached in her study, “that endurance of speed and endurance of strength training focuses on developing the components of the special load, which leads to the development of muscle fibers in the muscles of the body and its parts when subjected to the effects of resistance, and this response makes the muscle more effective and sufficient for Accordingly, the researchers believe that the reason for the improvement and .⁽¹²⁾ ”performance development that occurred for the members of the experimental group is the organized use of the various circuit training according to the variation of speed and time, which greatly helped in .developing the special endurance of the members of this group

➤ **-:Discussion of the 400m freestyle achievement**

Through the above presentation and analysis of the results obtained by the researchers for the 400m freestyle under 20 years old, shown in Table (6), it is clear that the members of the experimental .group achieved a significant development in this variable

Researchers attribute this improvement and development in achievement to the use of various circuit training according to the variation in speed and time, which includes strength and speed exercises for distances greater and less than the race distance, and in line with the race distance time and standardizing them with high repetitions and less than maximum intensity and ,)150m - 600m) rest periods between repetitions and sets, which contributed significantly to improving the special endurance capabilities, anaerobic capabilities, tolerance to lactic acid accumulation, and delaying the appearance of the fatigue index, which led to an improvement in the achievement variable .among the individuals of this group

The researchers confirm that the training applied by the members of this group included performing the exercises with great force and speed, with sufficient rest periods between repetitions and sets to suit the near-maximal intensity, in order to rest the work of the muscular system and to rest the working muscles to enable them to work with high efficiency and great harmony during the race that "developing the distance. Both (Mohamed Hassan and Mohamed Nasr El-Din, 2007) indicate working and opposing muscle groups leads to increasing the length and frequency of the step by reducing the time of contact of the foot with the ground, which means that the runner exerts great force in a short time, which made him improve the time of completing the 400m freestyle in the This confirms that the various circuit training according to the variation in speed and .⁽¹³⁾ "post-test time contribute greatly to improving the speed and frequency of steps, which improves the time of the race distance running steps, which plays a major role in improving the achievement, and this is

Redha Ibrahim: Field Application of Sports Training Theories and Methods , Baghdad, Al-Fadhli Muhammad ⁽¹¹⁾) .Office, 2008

Faiza Abdul Jar Ahmed: Using some special exercises according to the pulse rate to develop strength endurance, ⁽¹²⁾ anaerobic capacity and achievement in running 400 m and 800 m, PhD thesis , College of Physical Education for Girls, .University of Baghdad 2009, p. 84

Muhammad Hassan Alawi , Muhammad Nasr al-Din Radwan: Motor Performance Tests, Cairo and Dar al-Fikr al-⁽¹³⁾) .Arabi 2007, p. 231

what gave development to the members of the experimental group in achieving the best achievement in the 400m freestyle under 20 years

Presentation, analysis and discussion of the results of the post-tests of the physical research variables and achievement for the control and experimental groups 3-1-3

Table (7) It shows the values of the arithmetic mean, standard deviation, calculated t value and its statistical significance for the post-tests of the physical research variables for the control and experimental groups.

Type of statistical significance	Significance level	Calculated t value	Standard deviation	Arithmetic mean	The group	Unit of measure	Physical research variables and achievement	
moral	0.027	2.94	0.54	8.07	The officer empiricism	poison	Fast leg power	
			0.42	9.08				
moral	0.000	3.87	0.35	38.68	The officer empiricism	Tha	Speed tolerance	Special tolerance
			0.30	37.79				
moral	0.002	3.19	0.99	45.17	The officer empiricism	Tha	bear strength	
			0.86	43.09				
moral	0.001	3.24	0.52	54.65	The officer empiricism	Tha	400m freestyle achievement	
			0.48	53.51				

. With a sample size of (10) and a significance level of) 0.05 (

Table (7) shows the statistical indicators of the results of the post-tests for the variables of physical abilities and achievement for the control and experimental research groups, which represent the nature of the performance of the two groups after the completion of the implementation of the main experiment

showed that the arithmetic mean values of the variable of fast power of the legs for the post-test of the experimental group were better than the control group, and there was a significant change between the two groups in favor of the experimental group. As for the variables of speed endurance, strength endurance, and completion of the 400 m freestyle, the arithmetic mean values were better for the experimental group than the control group, and there was a significant change between the two groups in favor of the experimental group. This is what was indicated by the levels of significance through the use of the statistical law T for independent samples, as all variables were less than a significance level of (0.05), which indicates the presence of significant differences between the two groups

:Discussion-

Through the presentation and analysis of the results obtained by the researchers, it is clear that there are significant differences between the control and experimental research groups in the results of the post-tests in favor of the experimental group for the variables of rapid strength, special endurance, and the achievement of running 400 m under 20 years. The performance of which depends on the amount of mobilization stimulated by the muscular system of the motor units in the body's muscles that perform the required task. Accordingly, most of the work is based on the efficiency of the muscles, the degree of neuromuscular coordination, and the level of muscle strength to endure the race distance and the heavy burdens it bears as a result of exerting great effort and high intensity

The researchers attribute the superiority of the experimental group over the control group to the use of diverse circuit training, which was prepared in a scientifically standardized manner in terms of the components of the training load and implemented in a diverse circuit training style, which had a great and effective impact on the development of the research variables and the adaptation of the working and opposing muscles to them and their ability to bear the burdens of high effort during the race distance

This development led to the recruitment of a greater number of motor units participating in the motor work, and thus increased the ability of the muscles to produce the highest force at high speed (highest fast force) and with high compatibility between the work of the nervous and muscular systems. (Sareeh Abdul Karim Al-Fadhli, 2003) confirms that "muscle fibers have the ability to produce high force by changing or diversifying the type of resistance or exercise, and thus the number of working motor units will increase according to their ability to produce energy and the which means that performing different and varied ,⁽¹⁴⁾ ".ability to bear lactic acid accumulations types of exercises for a few days, accompanied by a change in the number of repetitions, intensity, and rest, contributes greatly to creating adaptations. This is what the researchers took into account when implementing the exercises prepared within the various circuit training exercises that were .included in the training curriculum for runners

As for the variable of rapid strength, researchers believe that the various circuit exercises worked to mobilize more fast-twitch muscle fibers, in addition to improving the slow muscle fibers, and thus improving the rebound movements by improving the amount of strength and speed in the power equation, and the result is improving the rapid strength of the legs, which was confirmed by (Jamal Sabry Farag, 2012) "Varied training and resistance force the athlete to mobilize and release the fast-twitch muscle fibers, and this is of great importance because these fibers are responsible for the largest amount of growth in rapid muscle strength. This training requires the muscles to adapt to contract at the highest speed and strength and to have high compatibility. In addition, these exercises involve both the fast-twitch and slow-twitch muscle fibers in contracting, launching and) and this agrees with what was stated by ,⁽¹⁵⁾ "running faster and more powerfullyWilliam J. Kraemer, 2006 that the great speed in producing force during performance is the result of the " (rapid recruitment of fast-twitch muscle fibers, in addition to the rapid coordination between The which was not achieved in the control group, ,⁽¹⁶⁾ main working muscles and the opposing muscles .which gave an advantage to the experimental group

As for the variable of special endurance (strength endurance and speed endurance), the researchers attribute the superiority of the experimental group over the control group to the various circuit trainings that the researchers prepared according to the variation of speed and time, which were standardized with intensities ranging between (80-90%) and repetitions and rests between repetitions, which were applied using the method of high-intensity and repetitive interval training and according to distances greater and equal and less than the race distance. This is consistent with what was stated by (Alaa Fleih, 2008) in his study, "which included special endurance training in which specific distances were used for this ability, which are less than the race distance and others "greater and with different intensities ranging between (80-95%) of the runner's maximum capacity These trainings greatly helped to improve the special endurance of the experimental research .⁽¹⁷⁾ sample members, by increasing the effectiveness of transmitting the nerve signal to the working muscles by improving the runner's ability to perform at a high and fast rate despite the accumulation of lactic acid and at maximum and less than maximum intensities, and this was also confirmed by (Abu Al-Ala Ahmed, 2000). Endurance training is performed at an intensity close to the maximum and less than it, as it works to improve the ability of the nervous system to send nerve impulses to the muscles with great effectiveness, and in turn alerts the muscles to contract despite

Sareeh Abdul Karim Al-Fadhli: The effect of variable resistance training in improving the shape and capacity of leg ⁽¹⁴⁾ .muscles, a study published in the Journal of Physical Education, Baghdad, Volume (12), Issue (1), 2003, p. 175

p. 493 .Jamal Sabry Faraj: Strength, Ability and Modern Sports Training , Amman, Dar Dijlah, 2012 (1)

(2) William J. Kraemer & Keijo Hakkinen , Hakkinen , Handbook of Sports Medicine and Science Strength Training for Sport , 2ed, Blackwell Scslnce , 2006, p83.

Alaa Fahih Jawad: The effect of a training method using pulse and time indicators to develop maximum speed , ⁽¹⁷⁾ special endurance and achievement for young 400m runners, Master's thesis, College of Physical Education and Sports .Sciences, Al-Qadisiyah University, 2008, p. 49

The researchers confirm .⁽¹⁸⁾ the appearance of lactic acid accumulations in the muscles and blood that the various circuit training aimed to increase the runner's ability to bear the burdens of performance by running different distances (150 m, 300 m, 600 m) and during standardized times aimed at improving the special endurance during the race distance, especially in terms of the lack of oxygen supplied to the muscles and blood and its insufficiency and reducing lactic acid accumulations and the speed of getting rid of it. This did not happen in the members of the control group, unlike the members of the experimental group, who showed a noticeable improvement, especially in speed endurance and strength endurance, which confirmed the superiority of the .members of the experimental group over the control

As for the variable of achieving 400m under 20 years, the researchers attribute the reason for the development of the experimental group members and their superiority over the control group to the use of various circuit training exercises that were prepared according to the variation in speed and time, and that these training exercises included various and standardized exercises in terms of the components of the training load, which contributed greatly to increasing the efficiency of the work of the nervous and muscular systems and increasing the degree of compatibility between them and the number of units participating in the muscular work, which gave stronger and faster performance and endurance of that performance throughout the race distance (special endurance), which also contributed to enduring the accumulations of high performance such as the accumulation of lactic acid and working to delay the appearance of fatigue, and this greatly helped in developing physical abilities (fast strength and special endurance), which gave high returns to improve the achievement .of the members of the experimental group over the control group

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