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The effect of cardiorespiratory fitness training on developing speed endurance, heart rate adaptation, and men's 1500-meter running performance

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Abstract

The problem of the research is that there is a weakness in speed endurance, which has a direct impact on achievement, as it leads to early fatigue, lack of concentration, and a low level of effectiveness of performance, which made the researchers interested in this problem and finding solutions to it. Hence the importance of the research is evident: preparing cardiorespiratory fitness training to develop speed endurance and rate adaptation. The heartbeat that occurs in runners is a continuous result of training and the use of a type of training that suits the requirements of the 1500-meter running competition. The researchers used the experimental approach with pre- and post-testing for the experimental and control groups. The research community was identified as players in the 1500-meter competition for the elite men's category of the Iraqi Athletics Federation for the 2024 sports season. The number of them was (12 players), and the sample was divided into two groups, the experimental group and the control group, with (6 players) for each group. The researchers concluded that the results showed a noticeable superiority between the pre- and post-measurement of cardio-respiratory fitness training to develop speed endurance and adaptation of heart rate and achievement for the experimental group and in favor of the post-measurement. The researchers recommended conducting similar studies and research on different age groups.

Keywords: cardiorespiratory fitness, speed endurance, heart rate, and achievement

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Introduction

Sports games, including individual games, have become one of the modern manifestations that reflect the country's progress and advancement. The Olympic, international, continental and local world meetings are forums in which the splendour of physical performance is evident. In light of this, the special preparation processes for this event Through the exchange between the period of maximum effort and the period of rest, which is one of the fastest and most influential in cardiorespiratory fitness because it directly affects the heart muscle and blood vessels for the short periods of great, high effort that follow the rest times, from which the coach must strive to build exercises in order to develop endurance. Speed and heart rate adaptation using modern exercises and various training methods in order to raise the physical level and physiological aspect of the players to reach the desired level by controlling the intensity of the exercise and its duration or repetition times. According to the objectives of the training load, the requirements for running events in athletics are many and comprehensive for the organs and functions of the runner's body, especially the 1500-meter running competition with special physical specifications. Therefore, it is necessary for coaches to develop endurance and adapt to the runner's maximum heart rate when working at a pulse (170 – 180 V/min). Because achievement is one of the basic goals in the training process, which both the player and the coach aspire to . (HalahAtiyah et al., 2024) The problem of the research is that there is a weakness in endurance for speed, which has a direct impact on achievement It leads to early fatigue, lack of concentration, and a low level of performance effectiveness Which made the researchers interested in this problem and finding solutions to it, as the researchers decided to apply modern training methods based on actual experimentation that aim to develop achievement .(Kadhim, 2023b) to Numbers Cardiorespiratory fitness training to develop speed endurance, adapt heart rate, and complete the men's 1,500-meter run .

Many studies have been addressed, including the study (Muhannad Habib Matar Hussein, 2020), which aimed to prepare HIIT exercises in cardiorespiratory fitness, some physical abilities, and endurance of the offensive performance of young football players, and the experimental approach was used to achieve the objectives of the study ,, .The research community was defined by youth football players aged (18 - 20) years who were officially registered in Diyala Sports Club for the season (2019 - 2020), numbering (27 players). The research sample was selected for the entire community and they were randomly distributed into two groups equally (11 players for the control group and 11 players for the experimental group .(Kadhim, 2023a)As for the study (Sana Sami Rahim Kateb, 2022), the study aimed to prepare D. Cardiorespiratory fitness exercises according to some laws of biomechanics in the most important blood variables and lung efficiency for female students. The researcher used the (experimental) approach in the style of two equal groups with pre- and post-tests. The research population represents Al-Budour Al-Sata'a Secondary School for Girls affiliated with the Directorate of Education in Al-Najaf Al-Ashraf. Fourth-year science students were identified. They numbered (75) female students, and the researcher selected a sample of (30) female students from the community of origin in a random manner, and they were distributed to Two groups (experimental and control), with (15) each group .(Al-Dulaimi & Easa, 2023)

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Hence the importance of research into preparing cardiorespiratory fitness training To develop speed endurance and adapt the heart rate that occurs in runners as a result of continuing training and using a type of training that suits the requirements of the 1500 meter running competition.(Eisa & Qasim, 2024)

Method and tools

The researchers used the experimental approach with an experimental design with a pre- and post-test for two equal groups (experimental and control) to suit the nature of the research. The research population was identified as players in the 1500-meter competition for the elite men's category at the Iraqi Athletics Federation for ages over 20 years old for the 2024 sports season, and they numbered (12 players). The sample was divided into two groups, the experimental group and the control group, with (6 players) for each group ,The researchers homogenized the sample as shown in Table.(1)

Table (1) Homogeneity of the research sample members

Variables	Unit of measurement	Arithmetic mean	The mediator	Standard deviation	Torsion coefficient
height	**m**	**170.221**	**170.000**	**1.632**	**0.211**
Cluster	**kg**	**68.212**	**68.000**	**1.322**	**0.145**
the age	**year**	**24.114**	**26.000**	**1.476**	**0.387**

The value of the skewness coefficient is limited to ± 1, which indicates a moderate distribution of the population

The researchers also extracted parity between the two groups, as shown in Table.(2)

Statistical significance	Error level	Calculated t value	Control group		Experimental group		Variables
			A	Q	A	Q	
Not a sign	2.754	3.783	2.765	1.31.32	2.821	1.30.21	**Endurance speed He ran 600 metres**
Not a sign	2.632	4.763	4.821	178.12	2.562	177.11	**Heart rate**
Not a sign	4.659	5.486	2.491	3.59.10	6.476	3.58.12	**Achievement 1500 metres**

Significant below a significance level of ≤ 0.05 and below a degree of freedom of 10

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For the study variables, a group of specialized professors and coaches in athletics were consulted, and the research variables were determined as follows:

-Speed endurance, running 600 metres Fahem Abdul Wahid Easa. (2021)

-Heart rate (F. A. W. Easa et al., 2022)

- **The sample began implementing training on 1/7/2024 until 3/7/2024.**
- **Duration of the training program: (8) weeks.**
- **Number of total training units: (24) training units .**
- **Number of weekly training units: (3) units.**
- **Weekly training days: (Sunday - Tuesday - Thursday) .**
- **The training method used: high-intensity interval training. And iterative**
- **Training intensity used.(%100 - 80) :**

After implementing the training program The researchers conducted post-tests on Thursday, March 10, 2024, at the stadium of the Specialized School for Talent Care in the Ministry of Youth and Sports / Baghdad Governorate .(L. D. F. A. W. Easa, 2021)

Statistical methods used in the research : The researchers used the statistical package (SPSS) to find appropriate statistical treatments .

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Results

Presenting and analysing the results of the differences between the two research groups (experimental and control) for the variables under study

Table(3) It shows the results of the pre- and post-tests of the experimental group on the research variables Analyse and discuss it

Physical variables	Pretest		Posttest		A F	Calculated t value	Error level	Statistical significance
	Q	A	Q	A				
Endurance speed Heran 600 metres	1.30.21	2.743	1.29.14	2.567	2.576	5.843	0.000	Dal
Heart rate	177.10	2.534	175.12	3.487	3.589	3.435	0.002	Dal
Achievement 1500 metres	3.58.12	3.867	3.57.14	1.259	0.767	6.489	0.000	Dal

Significant below a significance level ≤ 0.05 and below 5 degrees of freedom

Presenting, analyzing and discussing the results of the pre- and post-tests of the research variables in the control group

Table(4) It shows the results of the pre- and post-tests for the control group regarding the research variables

Physical variables	Pretest		Posttest		A F	Calculated t value	Error level	Statistical significance
	Q	A	Q	A				
Endurance speed Heran 600 metres	1.31.32	2.456	1.30.17	2.623	1.468	5.421	0.001	Dal
Heart rate	178.12	3.678	177.02	3.356	2.534	4.893	0.002	Dal
Achievement 1500 metres	3.59.10	0.489	3.58.23	2.496	0.345	6.564	0.000	Dal

Significant below a significance level ≤ 0.05 and below 5 degrees of freedom

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Presentation, analysis and discussion of the results of the post-tests on the research variables for the control and experimental groups

Table(5) It shows the results of post-tests on the research variables for the control and experimental groups

Physical variables	Experimental group		Control group		Calculated t value	Error level	Statistical significance
	Q	A	Q	A			
Endurance speed He ran 600 metres	1.27.22	0.634	1.29.10	1.654	5.389	0.000	Dal
Heart rate	173.31	1.498	176.01	2.378	6.845	0.001	Dal
Achievement 1500 metres	3.55.01	0.145	3.57.03	0.421	7.462	0.000	Dal

Significant below a significance level of ≤ 0.05 and below a degree of freedom of 10

Discussion of results :

The pre- and post-tests showed the results of the variables investigated for the research sample, and the results showed that there were significant differences in the post-test in favor of the two groups, the researchers attribute the reason for these differences to the training method, (KAREEM, n.d.) as it was based on cardiorespiratory fitness training to develop speed endurance, adapt the heart rate, and achieve a 1,500-meter run for men. (Hammood-Lec & Easa, 2024) the importance of codifying the training load used so that it matches the level of the players .This indicates the development of the level of performance of this group that was exposed to speed endurance training, which was reflected in performing the maximum possible degree of speed relatively and in the shortest possible period of time (Mohamed, A. F & ,.Al-Shamaa, H. F. (2021), and the researchers believe that endurance training methods Speed for the experimental group It raised the level of achievement for 1,500-meter runners, indicating that speed endurance training leads to an adaptation of the heart rate at rest and to less-than-maximal loads, and to an increase in the stroke volume (Sharky B.J. (1997). In this regard, a decrease in the pulse rate at rest is considered the outcome of speed endurance training (Wilmore J.H. and Costfl D (1994) is that a good runner in moderate running must have special physical abilities. Accordingly, the basis is training during the preparation period to focus on endurance training while maintaining adaptation of the heart rate to contribute to achievement (Spencer, M.R.; Gastin, P.B (2001).

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-Conclusions

-The results showed a noticeable superiority between the pre- and post-measurement of cardiorespiratory fitness training to develop speed endurance and heart rate adaptation for the experimental group, in favor of the post-measurement.

-The results showed a significant difference between the pre- and post-measurements Cardiorespiratory fitness training to develop men's 1500-meter running performance for the experimental group and for the benefit of the post-measurement.

-Paying attention to cardiorespiratory fitness training to develop speed endurance, adapt heart rate, and complete the men's 1,500-meter run.

-Conduct similar studies and research on different age groups.

Appendices

T	week	Training unit	Distance	Severity %	Repetition	Rest period in minutes according to pulse rate	Totals
1	the first	1	150m	80	5	Pulse returns to normal 120 N.D	2
		2	300m	80	4		1
		3	600	85	4		1
2	the second	1	400m	85	4	Pulse returns to normal 120 N.D	2
		2	800m	85	4		1
		3	1200 AD	80	3		2
3	the third	1	150m	85	4	Pulse returns to normal 120 N.D	2
		2	300m	80	6		1
		3	1200 AD	80	5		2

The training model used

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