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Anaerobic Endurance and its Impact on Some Physiological and Physical Variables of the 1500m Race for Youth

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Abstract
The ignored development has an endurance anaerobic effect, raising the functional efficiency. It can be proved from recorded to the continental and levels, so the research topic because this competition is regarded as one of the important runnings compete that require and to perform this effort. This indicates the importance of speed endurance element 1500-meter runners; the anaerobic energy systems are used to identify some information and scientific results based on foundations for the possibility of advancing in the competition under study. The aims of this study are:
1. Determine the youth 1500-meter race's anaerobic endurance.
2. Determine how anaerobic endurance affects a few of the 1500-meter race's physiological and physical variables.
The research hypotheses:
1. There are statistically significant differences between (the pre- and post-measurement) of the experimental groups in some physical and physiological variables of the 1500 m race in favour of post-measurement.
2. In certain physical and physiological aspects of the 1500-meter race, the experimental group exceeded the control group by statistically significant margins.
The researcher concluded the following:
1. Applying exercises to develop both general and specific physical qualities, as well as exercises to develop anaerobic endurance more than aerobic endurance, resulted in a noticeable improvement in the physiological capabilities under study for the 1500-meter running competition. This improvement was seen in the experimental group's level of aerobic and anaerobic endurance.
2. The physiological capacities of 1500-meter runners are positively impacted by anaerobic endurance growth and enhancement workouts.
3. The control group developed slight progress in the level of aerobic and anaerobic endurance as a result of regular training and as a result of applying exercises to develop general and specific physical qualities, which led to an improvement in the physiological capabilities under investigation for the 1500-meter running competition.
The researcher recommends:
1. Take advantage of the findings of this study to inform long-distance runner training programs.
2. Conduct such a study on other competitions in track and field games.
3. Pay more attention to developing anaerobic endurance within training units than growing aerobic endurance because of its favourable impact on increasing the physiological capabilities of 1500-meter runners.
4. Highlight the importance of monitoring blood lactic acid levels in order to control training loads.

Keywords: Anaerobic endurance; Physiological and physical variables; Youth 1500m race.

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Introduction and importance of the research

The ability of track and field athletes to smash records to the point of human miracles has advanced dramatically in recent years. This is because of the obvious advancements in a number of sports disciplines, including biology, biomechanics, biochemistry, sports medicine, and training science, as well as the tools these fields offer for creating programs of training and enhancing performance techniques. "Mohamed Othman (1990) also points out the process of specific reparations for long-distance players by providing them with a certain amount of both aerobics. It is also energy depends in its development on a good level of aerobic energy, meaning that the process of starting anaerobic training must the level of aerobic energy". (10: 299)

When using energy anaerobic to boost speed, "Abu Al-Ala Abdel Fattah (1985) notes that muscular effort can continue even if there is not enough oxygen present. He goes on to say that middle and long-distance runners who lack a strong level of anaerobic energy cannot do well at the international level". (1: 51-56)

"Bastawisi Ahmed (1999) explains that anaerobic endurance depends on the absence of phosphocreatine acid or anaerobic endurance to glucose". (4: 189)

"Farouk Abdel Wahab (1983) defines anaerobic work as work that is done in the absence of oxygen or without a sufficient amount of it". (9: 72)

"While Lamp (1984) sees anaerobic work as anaerobic variables that result in chemical changes that occur in the working muscles, through which the energy needed to perform the effort produced without using atmospheric oxygen". (16: 210)

According to "Abu Al-Ala Abdel Fattah and Ahmed Nasr El-Din (1993), physiological variables provide a broad evaluation of the respiratory circulatory system's effectiveness and the muscles' capacity to function without oxygen". (2:95) "They also add that speed endurance is needed by both short- and long-distance, as long-distance runners need to increase their speed, especially at the end of the race". (3:95)

"Adel Abdel Basir (1999) adds that there are two types of interval training methods: low-intensity interval training, which aims to develop general and specific endurance, as well as developing the work of the circulatory and respiratory systems and improving anaerobic capacity". "As for high-intensity interval training, it aims to develop speed, speed endurance, strength endurance, strength characterized by speed, and improving anaerobic capacity as a result of working in the absence of oxygen and high load intensity". (7: 199-121)

The Problem of the Study

Sports like athletics are known for their objective digital achievement, which is frequently a reliable indicator of a person's abilities and capacity to complete a race in the shortest amount of time. This is because athletics relies on the acquisition of high physiological variables that come in the process of adapting to various training doses, obtaining knowledge and sciences to the sport's training on the most recent advancements related to training.

A study found certain programs had flaws in that they failed to emphasize the growth of anaerobic endurance and how it can effectively improve critical efficiency. "This is evident from the recorded locally when compared to the global levels. Therefore, chose the research topic, as this compete is considered a running compete that requires continuity, which the importance of the speed endurance 1500-meter runners in the work of the anaerobic and aerobic

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energy system attempt to identify information and results based to be able to advance in the competition under study".

Research Objective:

1- Determining the youth 1500-meter race's anaerobic endurance.

2- Determining how anaerobic endurance affects some 1500-meter race-related physiological and physical factors.

Research hypotheses:

1- there are statically difference significant between (the per-and post-measurement) the experimental group) Some physical and physiological variables of the 1500 m race are in favour of post-measurement.

2- In certain physical and physiological aspects of the 1500-meter race, the experimental group outperformed the control group by statistically significant margins.

Research Fields:

1- Human field: Al-Rafidain Club long-distance players in Diwaniyah

2- Spatial field: Diwaniyah Stadium, track and field.

3- Time field: was conducted in the period from 20/4/2024 to 1/6/2024.

Research methodology:

The researcher used the experimental method with two experimental and control groups to suit the nature of the research.

Research Method:

First: Technical Procedure:

A- The researcher identified the most important physical tests to measure physical elements, which were reached through a comprehensive survey of scientific references and related studies.

Table (1): Results of Pre and Pre-test.

Post-Test		Pre-Test
30m Sprint Test	Anaerobic Endurance	30m Sprint Test
100m Sprint Test		100m Sprint Test
400m Sprint Test		400m Sprint Test
600m Sprint Test		600m Sprint Test
1000m Sprint Test		1000m Sprint Test
Long Jump Test from Standing.		Long Jump Test from Standing.
Lactic Acid after Exercise		Lactic Acid after Exercise
Maximum Oxygen Consumption		Maximum Oxygen Consumption
Vital Capacity		Vital Capacity
Pulmonary Ventilation		Pulmonary Ventilation

- Identifying the most important physiological tests:

- "Test to measure the concentration of lactic acid in the blood after exertion'. (6:182).

- Test the maximum limit of oxygen consumption Vo2 max by the Rover method. (6:174)

- A tubular spirometer to measure respiratory variables and vital capacity.

- Anaerobic capacity value (kg. m. s)

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"Devices and tools: medical to weigh, Restameter to measure height test strips (Lactate Test Strips) to determine the percentage the blood lactic acid in, a number of soft Clix lancets used for pricking, medical cotton and disinfectants, four stopwatches to measure time estimated in seconds up to 1/10 second, a divided box and medical balls and dumbbells", a measure the percentage of lactic in the blood. Accu Sport is a device for measuring blood glucose levels at rest and after exertion, and OneTouch is a spirometer for measuring respiratory variables and vital capacity.

Table 2: The arithmetic mean, standard deviation, median and skewness coefficient for each of the variables: age, height, weight and training age of the research sample members.

Statement	Unit measure	Arithmetic mean	Standard Deviation	Coefficient of skewness
age	year	18.41	0.41	1.33
Length	Cm	177.33	6.12	0.37
Weight	Kg	70.55	5.78	1.52
Training Age	Year	4.3	0.69	0.82

- Research Sample Equivalence

1-The experimental control group were compared using equivalency procedures in weight and training under duration, height, and the variable of age as shown (Table 3).

Table 3: Equivalence between the research sample and the variable age, weight, height and training age under study.

Statement	Unit of Measure	Total ranks		Average Rank		(the Value (Y) calculated Mann-Whitney test)	Significance level
		Experimental	Controlled	Experimental	Controlled		
Age	Year	72.0	65.0	9.00	8.00	28.00	Non-moral
height	Cm	61.0	81.0	7.13	9.33	22.00	Non-moral
Weight	Kg	56.3	82.2	5.9	8.93	17.2	Non-moral
Training Age	Year	80.4	57.6	8.86	6.45	19.3	Non-moral

"The tabular value of (Y) a significance level of (0.05) equals (13). Table (3) shows that there are no statistically significant differences between the experimental group and the control group in the variables (weight, training age, age, height), which indicates" the equivalence of the two groups. Applied to identify the levels of statistical significance of the difference experimental and control groups in the physical and under study physiological variable.

Table (4): Significance of statistical differences between the pre-measurements of the experimental and control groups in the physical variables under study:

Physical Variables	Unit of measure	Controlled group N=8		Experimental group N=8		The value of (Y) calculated from the Mann-Whitney test	Significance level
		Total ranks	Average Rank	Total ranks	Average Rank		
30m run	S	55.34	6.44	82.22	9.35	16.67	Non-moral
100m run	S	60.44	6.23	76.33	8.12	24.12	Non-moral
400m run	S	56.43	5.95	79.23	9.13	20.65	Non-moral
600m run	S	56.00	6.11	81.12	9.34	18.34	Non-moral

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1200m run	S	53.11	5.75	83.00	9.43	16.43	Non-moral
Broad jump from standing	Cm	67.00	6.99	71.12	8.23	29.45	Non-moral

"It is clear from Table (4) that there is no statistical difference significant between the experimental groups and the control groups is the physical variable, the calculated (Y) was greater than the table (Y), indicating the equivalence the two group in the physical variables under study".

Table 5: The significance of the statistical difference in the pre-measurement of the experimental control groups in the variables under study.

Physiological variables	Unit of measure	N=8 Controlled group		Experimental groups N=8		(the value of (y) calculated from Mann-Whitney test)	Significance level
		Total ranks	Average Rank	Total ranks	Average Rank		
Lactic acid after exercise	Milli	51.50	5.56	82.50	9.44	15.50	Non-moral
maximum oxygen consumption	liter	60.00	6.62	74.00	8.38	24.00	Non-moral
Vital Capacity	liter	85.50	9.81	48.50	5.19	12.50	Non-moral
pulmonary ventilation	L/P	57.50	6.31	76.50	8.69	21.50	Non-moral

"It is clear from (5) that there are statistically significant differences between the control group and the experimental groups in a physiological variable; the calculated (Y) value was greater than the table (Y) value, indicating the equivalence of the two groups is the physiological variable under study".

The researcher conducted a survey study to reach the optimal method of work during the basic study from Sunday, 21/4/2024, until Wednesday, 24/4/2024.

Load characteristics of the training program:

- The training program was implemented (6) weeks, with (3) weekly training units. (The training units included running and jogging exercises), and exercises using the stands.

- The level of load intensity was determined according to heart rate per minute based on the training pyramid for developing energy fitness as follows:

For running and jogging exercises on Saturday, Sunday, Tuesday, and Thursday, training was done at a moderate intensity and up to the limits of ability with a gradual increase in load.

Table 6: The significance of (statistical difference between the measurement of the control groups) the specific physical under variable study.

Physical Variables	Unit of measure	number		Total ranks		Average Rank		The calculated value of y and x	Significance level
		+	-	+	-	+	-		
30m run	s	6	2	1	33	1	5	1	moral
100m run	s	7	1	2	34	2	5	1	moral
400m run	s	0	8	0	35	0	4.5	0	moral
600m run	s	0	8	1	32	1	4.3	0	moral
1200m run	s	1	8	0	33	1	4.5	0	moral

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Broad jump from standing	cm	7	1	32.5	2.6	4.65	3.4	2.5	moral

The tabular value of (y) at a (significance (0.05) = 3

"It is clear from (Table 6) that there are significant statistical differences between pre-and post-measurement of the control groups in the physical variable in favour of the post-measurement at level a significance of (0.05)."

Table 7: The significance of the statistical difference between (pre- and post-measurement) control groups in the physiological under study variable.

Physiological Variable	Unit of measure	number		Total ranks		Average Rank		The calculated value of y and x	Significance level
		+	-	+	-	+	-		
Lactic acid after exercise	Milli	0	8	0	35	0	4.5	0	moral
maximum oxygen consumption	liter	8	0	35	0	4.5	0	0	moral
Vital Capacity	liter	8	0	35	0	4.5	0	0	moral
pulmonary ventilation	L/P	8	0	35	0	4.5	0	0	moral

The tabular value of (y) at a significance level of (0.05) = 3

"is clear from (Table 7) that there are significant statistical differences between the pre-and post-measurement of the control groups in the physical's variable in favour of (the post-measurements) levels a significance of (0.05)."

Table 8: The significance of statistical differences between the pre-and post-measurements of the experimental group in the specific physical variables under study.

Physical Variable	Unit of measure	number		Total ranks		Average Rank		The calculated value of y and x	Significance level
		+	-	+	-	+	-		
30m run	s	1	8	1	33	1	4.3	1	moral
100m run	s	0	8	1	36	2	4.5	2	moral
400m run	s	1	8	0	38	0	4.2	1	moral
600m run	S	1	8	1	35	1	5.1	1	moral
1200m run	S	8	8	0	38	0	5.2	1	moral
Broad jump from standing	Cm	8	0	35	1	4.5	0	0	moral
Vertical jump	P	8	1	35	0	4.5	1	0	moral

The tabular value of (y) at a significance of (0.05) = 3.

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Table 9: Significance statistical difference between (the dimensional measurements) of (experimental in the physiological) under study variables.

Physiological Variables	Unit of measure	number		Total ranks		Average Rank		The calculated value of y and x	Significance level
		+	-	+	-	+	-		
Lactic acid after exercise	Milli	1	7	0	35	1	4.3	1	moral
maximum oxygen consumption	litre	9	1	33	1	4.3	1	0	moral
Vital Capacity	litre	7	0	36	0	4.7	0	1	moral
pulmonary ventilation	L/P	0	8	1	34	0	4.4	1	moral

The tabular value of (y) at a significance level of (0.05) = 3

It is clear from Table (9) that there are statistically significant differences between the pre-and post-measurements of the experimental group in the physiological variables in favour of the post-measurement at a significance level of (0.05).

Table 10: The significant statistical difference in the dimensional measurement of the control and (experimental group) in the specific under-study physical variable

Physical variables	Unit of measure	N=8 Controlled group		Experimental N =8		The value of (Y) (calculated from Mann-Whitney test)	Significance level
		Total ranks	Average Rank	Total Rank	average Rank		
30m run	s	47.11	6.22	96.24	11.76	8.34	function
100m run	S	50.22	5.94	90.34	10.34	11.76	function
400m run	s	47.34	6.34	89.21	11.45	10.43	function
600m run	S	44.23	5.21	93.67	14.67	2.34	function
1200m run	s	46.35	5.67	96.45	12.14	5.48	function
Broad jump from standing	cm	48.34	6.26	95.11	11.23	6.78	function
Vertical jump	p	51.12	6.37	87.39	12.45	10.18	function

"Table (10) shows that there are statistically significant differences in the post-measurement between the control and experimental groups in the physical variables in favour of (the experimental group), as the calculated (Y) value was less than the Table (Y) value, which indicates the presence of statistically significant differences at the significance level (0.05), indicate the superiority, over variable under study, and this to the effect of the training program proposed ".

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Table 11: Significance of statistical difference between the dimensional measurement of the control and experimental groups in the physiological under study variable:

Physiological variables	Unit of measure	N=8 Controlled group		Experimental group N=8		The value of (Y) calculated from the Mann-Whitney test	Significance level
		Total ranks	Average Rank	Total ranks	Average Rank		
Lactic acid after exercise	Milli	37.48	5.21	96.34	13.12	11.21	function
maximum oxygen consumption	liter	50.34	7.11	89.45	11.22	13.34	function
Vital Capacity	liter	50.32	6.58	87.48	10.23	13.12	function
pulmonary ventilation	L/P	49.12	7.23	92.12	12.24	11.57	function

"It is clear from Table (11) that there are statistically significant differences in the post-measurement between the control and experimental groups in the physiological variables in favour of the experimental group, as the calculated (Y) value was less than the table (Y) value, which indicates the presence of statistically significant differences at a significance level of (0.05)".

Table (5) shows a significant difference at a level of (0.05) in all physical levels between (the pre- and post-measurement) of the control group in favour of the post-measurement. It is also clear (7) that there are statistically significant differences at a level of (0.05) in all physiological variables, the pre-and post-measurement of the control group in favour of the post-measurement. From this, the extent of progress in the measurement becomes clear, as the researcher attributes this progress to the effectiveness of the training programs, as they worked to improve, which in turn were reflected in.

This is consistent with the study ("Awis Al-Jabali (1985) (8: 94) that the maximum oxygen, pulse and lactic acid concentrations were the ones that differed greatly and were lower at the thirtieth of training. They agree with support the results reached by the researcher, which lead to achieving the first hypothesis through the results".

(Table (8) shows that significant difference statistically at the level) of (0.05) in all physical between (pre- and post-measurement) experimental groups in both (speed - speed endurance - speed-specific strength - strength endurance - respiratory endurance). The researcher attributes these differences and progress in the experimental group to the improvement in the physical condition of the players, which in turn was reflected in recording better numbers in the physical elements, in addition to following the scientific method in building the training program. This consistent study of "Hamdi Muhammad Ali (2004) (5: 67) that improvement is a result of improving physical abilities and physiological abilities and applying anaerobic endurance training", as well as the study of "Awis al-Jabali (1985) (8) on the relationship between the pulse during the recovery period and the increase in the intensity of the physical load used". Table (9) shows that there are statistically significant differences at the level of (0.05) in all physiological variables between the pre-and post-measurements of the experimental group in favour of the post-measurement in all physiological variables (lactic acid concentration - vital capacity - pulmonary ventilation - maximum oxygen consumption). These

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results agree with the study of "Youssef Dahab (1984) (13) that concentration lactic in the blood of runners and walkers increases according to speed rates", and that players with a high level can maintain the speed of performance without increasing the accumulation of lactic acid in the blood. It also agrees with the study of" Lambert et al (1998), that the heart rate increases during the competition by 200 beats/min in the same race than in non-competition, and the heart rate can be used to improve performance in the field of long-distance running. (17: 685-690)" From the above, the researcher believes that the training program applied to the experimental group, which contains exercises to develop general and specific physical qualities Training to improve and develop an aerobic and anaerobic analysis for members the experimental, and thus hypothesis second was achieved.

Table (10) "shows that there are statistical differences at the level of (0.05) in all physical variables between the experimental and control groups in favour of the experimental group". The researcher attributes the existence of these differences to the effect of the proposed program for developing anaerobic endurance on developing anaerobic physical qualities in its phosphate and lactic systems, as well as through volumes, intensity, rest periods, and improving all physical qualities. "Abu Al-Ala Abdel Fattah (1997) confirms that using training doses with multiple effects at the beginning of the training season works to develop different physical qualities in a balanced manner, with an equal effect between periods of fatigue and rest", which in turn works to develop functional qualities, most notably aerobic work, as he warned against using training doses with a uniform effect at the beginning of the training season, and it is preferable to rely on doses with multiple directions. He pointed out that using doses with a uniform direction leads to improving results and improving the special physical qualities and functional capabilities of the body's systems, but it may expose the athlete to severe fatigue (stress) during the training program". (3: 279)

The researcher concluded that the recovery period is affected by individual differences, as despite the similarity of athletes' conditions in terms of functional and physical capabilities, athletic level, and training volume, recovery processes may differ between them in light of individual differences, as some need a relatively longer period to get rid of fatigue, while if this period is prolonged for others, it may have a negative effect on the level that the athlete can achieve in the championship or competition. This is confirmed by" Muhammad Hassan Alawi (1994 AD) (10: 121).

Table No. (11) "Shows statistically significant difference in the experimental group in the physiological variables under study". The researcher attributes this difference to the fact that the training level of the sample members was relatively high, and the period of applying the research was sufficient to cause a change in heart rate as well as develop anaerobic capacity, aerobic capacity, pulmonary ventilation, and maximum oxygen consumption. "Abu Al-Ala Abdel Fattah (1997) explains that continuing training increases lactic anaerobic work and reduces the concentration of lactic acid in the blood when performing a standardized physical load as a result of saving effort and increasing the efficiency of getting rid of lactic acid. (2: 34, 35)"

The researcher attributes the remarkable progress in both physical efficiency and maximum oxygen consumption to the increase in fitness, as Muhammad Hassan Alawi (1994) indicated the association of various physical characteristics with the process of upgrading and improving the work of the various internal organs of the individual's body, which confirms and

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ensures his motor activity. (10: 133) These results agree with the results of "Youssef Dahab (1984) (11: 143), Awis Al-Jabali (1985) (8: 120), Billat (1996) (14: 157-175), and study of Sayed Bassiouni (2002) (6: 78), and Hamdi Muhammad Ali (2004) (5: 110), which indicated that standardized training programs affect the level of functional status positively and lead to a substantial improvement in the ability of players to exert more effort and improve the processes of transporting and delivering oxygen to the working muscles and delaying the onset of fatigue"

Conclusions

1. (The experimental developed significant progress) in the levels of aerobic and anaerobic endurance as a result of applying exercises to develop general and specific physical qualities in addition to applying exercises to develop anaerobic endurance more than aerobic endurance, which a significant improvement in capabilities under investigation for the 1500-meter running competition.

2. Anaerobic exercise endurance development has a positive effect on improving the physiological capabilities of a 1500-meter running player.

3. The control groups developed slight progress in anaerobic aerobics and endurance as a result of regular training and applying exercises to develop general and specific physical qualities, which led to improved physiological capabilities under investigation for the 1500-meter running competition.

Recommendations

1. Benefit from the results of this study when planning training programs for long-distance runners.

2. Conduct such on other competitions in track and field such as

3. Pay more attention to developing anaerobic endurance within training units than developing aerobic endurance due to its positive impact on improving the physiological capabilities of 1500-meter runners.

4. Emphasize the use of measuring the percentage of lactic in blood to regulate training loads.

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