


# The effect of economic training on some physiological variables and physical abilities for 1500 m run of advanced class

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## ABSTRACT

The study purpose is to identify the influence of economic training on some physiological variables and physical abilities of the athlete of 1500 m run for advanced class. Sport training is one of the important and basic sciences to prepare sportsmen to achieve the highest levels. The training should be built on right scientific and accurate basics in line with the latest development of different sport games. Also, it is a science that partially depends in its theories, basics and principles on other sciences as physiology, biochemistry and nutrition. All these sciences work together to enhance the training situation of the sportsman, which affects the players' levels positively. The study problem is that the accumulation of preparatory races during official championships of 1500 m until the final race, the athlete passes through more than one race within a short period of time, which negatively affects the player's performance. Consequently, it affects the player's results negatively, which will be a burden on the athlete. The results demonstrated that the use of economic training is an effective tool to develop physiological variables for 1500 m run. Also, it can be concluded that there is a noticeable development in the physical abilities of the experimental group due to use economic training for 1500 m run.

**Keywords:** Athletics; Physiological variables; Physical abilities; Sport training.

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## INTRODUCTION

Sport training is one of the important and basic sciences to prepare sportsmen to achieve the highest levels. The training should be built on right scientific and accurate basics in line with the latest development of different sport games. Also, it is a science that partially depends in its theories, basics and principles on other sciences as physiology, biochemistry and nutrition. All these sciences work together to enhance the training situation of the sportsman, which affects the players' levels positively.

Among the modern training ways is the economic training that depends on giving players certain exercises. These exercises are intensive and take short period of time. These exercises increase the player's tolerance especially athletics players due to their exposition to more than one race and competition in a week, which means the player will make benefit from this way of training within a short period of time. Moreover, it increases the period of recovery of players. Modern sports training depends on concentrating its goals to develop energy production systems and concomitant physiological changes. Whenever the athlete's aerobic and anaerobic abilities are improved, it will reflect on the athlete's physical performance directly. This improvement can be achieved through training programmes that based on scientific basics concomitant with abilities and the structure of training approaches.

Since such a training is fit for athletics in general and 1500 m run in particular, the competition needs special physical preparation to enhance the player's efficiency and ability that will affect the physical and functional abilities. The physical features are reflections for the exerted efforts that will affect increasing these capacities. So, the paper's importance is based on using a modern training programme suitable for the development in this field, which is called the economic training to detect its effect on the physiological and physical abilities for 1500 m athletes. The study problem is that the accumulation of preparatory races during official championships of 1500 M until the final race, the athlete passes through more than one race within a short period of time, which negatively affects the player's performance. Consequently, it affects the player's results negatively, which will be a burden on the athlete. Through the use of economic training, we can overcome this obstacle, and the study problem can be summarized by the following question: ( Is the economic training able to maintain the player's physical level due to the accumulation of races within a short period, which positively affects physiological variables related to it).

### ***The study purpose***

It is to identify the influence of economic training on some physiological variables and physical abilities of the athlete of 1500 M run for advanced class.

## METHODOLOGY AND PROCEDURES

### ***The study approach***

The researchers employ the experimental approach because it is appropriate for the nature of the problem.

### ***The study population***

The study population is the players of Iraqi clubs that includes (13) players for the season 2019- 2020. (10) players are selected to represent the study sample, which forms (%76.92). They are divided in two groups of (5) players each.

The first group uses the economic training.

The second group employs the normal.

**Pre-test**

The pre-test is conducted along two days starting from 26/2/2019 to measure physiological variables during rest in the physiology lab., college of physical education, university of Al-Qadisiyah. The pre-test includes measuring lung ventilation, and oxygen debt using (fit mate pro) device. Moreover, blood sample (5 cc) is to measure CPK and AST enzymes. The sample will be exposed to a stress then Bruce test is used to measure physiological variables. After that, blood sample (5 cc) is taken after the stress to measure CPK and AST enzymes. On Monday 27<sup>th</sup> Feb., 2019, the tests of aerobic and anaerobic abilities are conducted for each player in Al-Diwaniyah field.

**Economic training**

The researchers employ economic training 3 units per week for the experimental group for 8 weeks while the control group uses the coaches' trainings.

**Post-test**

The post-test is conducted along two days starting on 25<sup>th</sup> May 2019 to measure the physiological variables in the similar way the pre-tests have been conducted before the stress and after the stress. On Monday 25<sup>th</sup> May 2019, the tests of aerobic and anaerobic abilities are conducted for each player. The researchers are keen to provide the same conditions as place, time, instruments, assistant team and the application method.

**RESULTS ANALYSIS AND DISCUSSION****Introducing the results of the study variables for the experimental group**

Table 1. The means, standard deviation, T calculated value, and the significance of differences in the variables of the study variables of the experimental group.

Variables		Unit	Pre-test		Post-test		T Calculated Value	Significance Level
Physiological variables	Lung ventilation/min.	Lit./min.	Mean	St. Deviation	Mean	St. Deviation		
	Oxygen debt	Lit./min	6.27000	0.405	8.196	0.293	7.9456	0.001
	CPK enzyme	IU.L	29.740	3.670	23.900	3.648	11.374	0.000
	AST enzyme	IU.L	69.400	9.289	82.200	4.764	4.7245	0.009
Abilities	Non-lactic anaerobic ability	Kg. sec.	33	1.078	36.400	1.140	4.5434	0.010
	Non-lactic aerobic ability	watt	57.5849	0.010	80.5629	1.468	28.676	0.000
	Oxygen ability		459.168	1.224	746.618	14.024	25.786	0.000
Achievement of 1500 m race		Min.	66.573	0.660	104.770	2.6217	28.197	0.000
			3.59	17.55	3.53	0.015	11.258	0.000

Note: Significant at freedom degree (4).

**Introducing the results of the study variables for the control group**

Table 2. The means, standard deviation, T calculated value, and the significance of differences of the study variables of the control group

Variables		Unit	Pre-test		Post-test		T Calculated Value	Significance Level
Physiological variables	Lung ventilation/min.	Lit./min.	Mean	St. Deviation	Mean	St. Deviation		
	Oxygen debt	Lit./min	6.088	0.405	6.904	0.603	7.573	0.002
	CPK enzyme	IU.L	32.420	4.265	28.180	3.027	3.257	0.031
	AST enzyme	IU.L	64.400	5.029	71.200	8.1055	2.5812	0.061

Abilities	Non-lactic anaerobic ability	Kg. sec.	32.800	1.643	33.800	0.8366	1.8257	0.142
	Non-lactic aerobic ability	watt	0.737	7.977	66.8768	1.567	11.110	0.000
	Oxygen ability		7.977	1.771	613.684	7.9158	35.418	0.000
Achievement of 1500 m race		Min.	66.573	1.771	0.014	88.8096	2.6110	13.762
			3.59	0.014	0.737	3.571	0.0185	1.6015

Note: Significant at freedom degree (4).

### Results of differences of the study variables between the experimental and control groups

Table 3. The means, standard deviation, T calculated value, and the significance of differences in the study variables of the control and experimental groups of the post-test.

Variables		Unit	Pre-test		Post-test		T Calculated Value	Significance Level
Physiological variables	Lung ventilation/min.	Lit./min.	Mean	St. Deviation	Mean	St. Deviation		
		Oxygen debt	Lit./min	4.3046	0.603	6.904	0.603	7.9456
	CPK enzyme	IU.L	3.315	3.027	28.180	3.027	11.374	0.011
	AST enzyme	IU.L	2.6160	8.1055	71.200	8.1055	4.7245	0.031
Abilities	Non-lactic anaerobic ability	Kg. sec.	4.1109	0.8366	33.800	0.8366	4.5434	0.004
	Non-lactic aerobic ability	watt	14.247	1.567	66.8768	1.468	28.676	0.000
	Oxygen ability		18.457	7.9158	613.684	14.024	25.786	0.000
Achievement of 1500 m race		Min.	66.573	9.6455	2.6110	88.8096	28.197	0.000
			3.59	3.8205	0.0185	3.571	11.258	0.000

Note: Significant at the freedom degree (8).

## DISCUSSION

Tables (1,2,3) show that there are differences between the pre-test and the post-test for the two groups, the experimental that uses economic training and the control employs the coaches' exercises for all study physiological, physical, and skill variables and in favour for the post-test. Since the main aim is to identify the effect of economic training, so the discussion will focus on the differences of the post-test between the experimental and the control groups. Table (3) shows that there are significant differences between the control and the experimental groups in the physiological variables (lung ventilation/min., oxygen debt, CPK enzyme, and AST enzyme) in favour for the experimental group that uses economic training.

The researchers explain the significant differences of the lung ventilation, oxygen debt variables and use of the economic training. The nature of the exercises used by the experimental group that related to 1500 m race add important and economic roles for the lungs and the muscles to provide the body muscles with oxygen to produce energy. Energy production increases through increasing lung ventilation, which imposes more pressure on the 1500 m player's organs especially the respiratory system. This process increases the player's respiratory ability for 1500 m race in which "the need of body oxygen leads to increase the size of oxygen that comes in and out the chest during the rest and the stress that improves the respiratory muscles" (Akhlas Hussein Daham Al-Mamory, 1998) Moreover, the economic exercises lead to decrease oxygen in blood reached to the operational muscles. After finishing each exercise, the body tries to compensate the shortage of oxygen (oxygen debt) through increasing breathing times and its depth. Since breathing muscles are skeletal muscles that can be developed by training and the elasticity of the muscles increases, so it leads to include a larger amount of oxygen in one inspiration, "because breathing muscles are skeletal muscles that can increase their strength and tolerance through exercises especially if the training focuses on

*developing the strength and tolerance of these muscles that control the lung ventilation"* (Abu Alula Ahmed Abdulfatah) Also, the effect of training organization on respiratory system functions that *"regular exercises leads to functional positive changes in the respiratory system, and these changes add extra flexibility in the chest muscles to increase its expansion and the inhaled air, which consequently helps to increase oxygen in the process of gas exchange between blood and vesiculae in addition to economy of breathing movement"* (Qasim Hasan Hussein, 1990) The results are obvious by using economic training through some exercises that minimizes time and effort of the regular training, and use more players through one exercise especially if there is more than one race the player will participate in a week.

As for CPK enzyme, the researchers see that the main reason is the economic exercises are more focus on the accuracy of the player of 1500 m race in which the player needs Phosphagen to work efficiently. Since the player repeats the race several times, so it is required to exert his utmost abilities to win and the competition level is more effective on the level of (CPK) enzyme. It requires rapid release of energy to generate necessary energy for the race, and CPK is one of the important enzymes that accelerates energy in the body through rebuilding ATP in which *"Phosphagen system rebuilds ATP depending on phosphocreatine so CPK enzyme transports some phosphates from Creatine phosphate to Adenosine diphosphate (ADP) to form Adenosine triphosphate (ATP) and creatine or vice versa"*(Bahaulddin Ibrahim Salama, 2000).

Since CPK enzyme is important in stimulating energy production reactions of the muscular activity, so it is concentrated in the skeletal muscle and heart muscle, which is an important parts of sport actions. After sport training, CPK enzyme increases to higher level than in normal situation (Abdulrahman Abdulhameed, 1999). During the race of 1500 m, that the player depends on in the last 200 M. is an important issue to compensate the energy loss and continue performance depending on anaerobic system (phosphate and lactic). The body depends on rebuilding ATP and anaerobic system (phosphate system PC-ATP and lactic acid) (Asaad Adnan Aziz, 2016).

Also, the enzyme increases in the muscular cell, which rises the enzyme in the serum after the physical exercise due to cell permeability. This increase is normal for the athletes due to high permeability of cells, which allows tiny particles to pass through the muscle. It also allows CPK to infiltrate to blood due to physical stress that rises its level in the blood (Abdulrahman Abdulhameed, 1999). *"long and severe muscular exercise leads to high CPK level"* (Asaad Adnan Aziz, 2016).

As for AST enzyme, the researchers explain that the reason is the economic training because of the exerted efforts by the player in 1500 m race. The race stress causes changes during the race and leads to responses in bio-systems of the body that affects the level of AST enzyme. The competition of 1500 M race requires a great amount that compensates the lost energy through AST enzyme role, which increases the aerobic oxidization in voluntary muscles due to increase energy consuming level and the improvement of metabolism in the body cells (Amrullah Ahmed, 1998).

The enzyme works in aerobic physical exercise since it helps chemical reactions, where AST contributes to transform the results of metabolism as proteins and fat into ketonic acid in turn it transforms into amino acid to form new ketonic acid, which requires oxygen to complete metabolism process (Brent, 2003). Since the race of 1500 m is a competition where energy production systems participate in different parts, AST role is very important to reuse energy reserve so the player will be able to continue and avoid fatigue. This process is achieved in the body tissues with the help of certain enzymes that completes these reactions including AST (Asaad Adnan Aziz, 2016).

As for the variables of physical abilities (non-lactic anaerobic, lactic anaerobic and aerobic fitness), the researchers see that the reason is the use of economic training through several exercises that fit for the player of 1500 m but it depends on rationing and economic exercise. The economic training is prepared to increase the anaerobic physical exercises as the lactic ability (ATP-CP). The nature of the player of 1500 m should have an explosive and maximum strength in last 200 meters. So, the researcher employs economic exercises that develop anaerobic abilities to improve energy production systems, and negligence of scientific basics of training does not help developing these abilities (Mohammed Kadhim Khalaf, 2001).

For the anaerobic abilities as lactate, the use of tough and repeated exercises, where the exercise intensity fits the rest time so as to achieve the development of these anaerobic abilities through functional adaptation and the increase of these enzymes responsible for producing energy. The system needs two minutes to start working so the time of stress should not exceed (1-2) minutes. The long performance period does not develop this ability so exercises should be suitable in its repetition, rest time, and intensity.

Lactic acid is one of the major reasons to increase the body organs efficiency in which the lactate increase in blood is concomitant to activity increase of some vital organs (Bahaulddin Ibrahim Salama, 1992).

As for the aerobic fitness, the economic exercises, nature of the work, and the efforts of the player of 1500 m led to the emergence of these differences, where "*the scientific introduction to identify training load depends on the system of energy supply*" (Amrullah Ahmed, 1998).

## CONCLUSIONS AND RECOMMENDATIONS

- 1- The use of economic training is an effective tool to develop physiological variables for 1500 m run.
- 2- There is a noticeable development in the physical abilities of the experimental group due to use economic training for 1500 m run.
- 3- The duration of employing items of economic training is for two months was enough to observe the changes on the players of 1500 m run.

### **Recommendations**

- 1- Focus on using economic training that includes physical exercises suitable for the player of 1500 m and ensure the existence of physiological measures due to their importance in achieving the goals of the training.
- 2- Approaching Iraqi clubs and teams to use the economic training to identify the above mentioned variables to use them as a means to increase the scientific level of the national staff for 1500 m run.

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