JOURNAL OF CRITICAL REVIEWS

ISSN- 2394-5125 VOL 9, ISSUE 04, 2022

THE EFFECT OF RECOMMENDED EXERCISES ACCORDING TO LACTIC ENERGY PRODUCTION SYSTEM ON THE ANAEROBIC ABILITY AND CAPACITY AND THE ACHIEVEMENT OF (200) METERS RUNNERS

Asst. Prof .Dr. Abdullah Bahr Fayyad / Open Educational College - Anbar Studies Center
Email : d.a.bahar1961@gmail.com

Research abstract
The study aimed to identify the effect of lactic energy production system training, which is characterized by high-intensity and low training volume on phosphatic anaerobic ability, anaerobic lactic capacity and achievement of (200) meters runners. The study was conducted on the Anbar Governate team for applicants with a running activity of (200) meters, and their number is (6) runners. The researcher hypothesized that the recommended training will increase the ability of biological variables under-study and achieve. The researcher used the experimental method for its suitability to solve the problem of his research, and the researcher concluded that these exercises led to developing the phosphorous and lactic ability of the research sample and their performance. The researcher recommended the acceptance of these exercises in developing the variables under-study, as well as emphasizing that the trainers have to follow up on the level of anaerobic phosphatic capacity and anaerobic lactate capacity among athletes, especially those who enter their activities within the anoxic energy production system due to its importance in achieving the best performance for the athlete.

1 - Research Introduction

1 – 1 Introduction and importance of research:

The Theories of modern sports training have taken many directions aimed at studying how to develop the level of performance among players based on accurate and objective scientific methods that work on improving the athlete in all respects, particularly the physiological and physical because of their role in increasing the efficiency of athletes, especially runners, to finish their races in best record time. And given the effectiveness of running (200) meters at a fast step from the beginning of the race to its end, which requires anaerobic ability and capacity which works on increasing the runner's proficiency to have the speed of frequency of running performance and a high technique in ball juggling, In addition to possessing the bodily capabilities of speed and strength endurance to finish the race optimally, it became necessary for the runner to possess a high anaerobic ability and capacity, which is included in the anaerobic energy production system. The importance of the research lies in highlighting the significance of anaerobic ability and capacity and its excessive role in increasing the runner's capability to tolerate the fatigue of the (200) meter race from the beginning to the end of the race and at the same level.

1 – 2 Research Problem:

Through the researcher's experience in athletics activities as a former runner and running coach, he noticed the lack of trainers' interest in physiological aspects during training and they depend on somewhat old-fashioned methods and tests, in which their main attention is on measuring the level of runner's physical performance, away from physiological tests and measurements that give us more accurate results of the runner's level of development and the degree to which his body's functional organs adapt to training loads, therefore, the researcher

ISSN- 2394-5125 VOL 9, ISSUE 04, 2022

decided to study this problem by preparing exercises according to the lactic energy production system, characterized by high intensity with rest times in-between commensurate with the runner's bodily and physiological capabilities. These exercises work on increasing the ability of the anaerobic ability and capacity, which may lead to the development of the performance of the research sample and reach their best levels.

1 – 3 Research Objectives:

- Preparing recommended exercises according to the research sample's anaerobic lactic energy production system**.**
- Identifying the effect of the recommended exercises on the anaerobic ability and capacity, and the achievement of the research sample.

1 – 4 Imposing Search:

- There are statistically significant differences between the pre and post-tests in the anaerobic ability and capacity, and the achievement of the research sample.

1 – 5 Research Fields:

1 – 5 – 1 The human field: Anbar Governate team runners of (200) meter running activity.
1 – 5 – 2 Temporal field: the period from 1/6/2020 to 3/10/2021
1 – 5 – 3 Spatial field: Al-Ramadi Club Stadium in Al-Anbar Governate.

2 - Theoretical Studies:

2 – 1 Anaerobic Ability:

It is the athlete's ability to use the anaerobic energy generated by the rapid energy production system of adenosine triphosphate (ATP) and phosphocreatine (CP)**[1].** The stored amount of (ATP) in the muscle is limited and is estimated at (3) mol for women and (6) mol for men, and this quantity is sufficient to perform a few muscle contractions that do not last for three seconds, and then ATP is produced from the (CP) compound that stores By five times the amount of (ATP) in the muscle, as the breakdown of (CP) begins as soon as the muscle stores of (ATP) expire immediately, then the amount of (CP) decreases by (50%) after the first ten seconds of starting the maximum bodily effort, and then begins to decrease The amount of (CP) degradation in the muscle reaches (2%) in the first thirty seconds of starting the high intensity bodily effort, after this period the anaerobic phosphagen energy production system ends and the anaerobic lactic energy production system begins to work to supply the muscle with (ATP) compound to perform the necessary muscle contractions To perform the required movements that are characterized by maximum or less than maximum intensity**[2].**

2 – 2 Anaerobic Capacity:

It is the ability to perform repeated muscle contractions of high intensity that depend on the anaerobic energy production system for a period ranging between (10 seconds to two minutes), hence, it is called anaerobic endurance **[3].** Anaerobic capacity is divided into three sections, the first one is Short-term Anaerobic capacity which includes an athletic performance that lasts for a short period of no more than (10) seconds. The second section is Intermediate Anaerobic capacity, in which motor performance ranges between (20-50) seconds. The third and last one is Long-term Anaerobic capacity, in that muscular performance ranges from (60 - 120) seconds**[4].** Anaerobic capacity depends mainly on the lactic energy production system, as (ATP) is produced by carbohydrate metabolism which chances into glucose stored in the blood and used directly to produce energy, and the excess is stored in the form of glycogen in the muscles and liver for use when needed. Due to the chemical interactions that occur when carbohydrates are decomposed, this causes the

ISSN- 2394-5125 VOL 9, ISSUE 04, 2022

accumulation of pyruvic and lactic acids in the muscles and blood, and this leads to muscle fatigue, since "The high intensity of bodily effort leads to an increase in the need for energy represented in the production of adenosine triphosphate (ATP), as most of the pyruvic acid is converted to lactic acid, resulting in three molecules of (ATP), and when we start producing energy from glucose, we will get two of (ATP) because one molecule of (ATP) is lost during the steps of glucose decomposition**[5]**.

3 - Research methodology and field procedures:

3 – 1 Research Methodology:

The researcher used the experimental method by designing one group with two tests, pre and post-tests, for its suitability to the nature of the research problem.

3 – 2 Research Sample:

The research sample was tested deliberately, and it consisted of (6) runners representing the Anbar Governorate team for (200) meter running activity. Table (1) shows the homogeneity of age, training age and achievement.

Table (1)
shows the homogeneity of the research sample

Variables	Measuring unit	Mean	Standard Deviation	Median	Kurtosis*
Age	**Year**	**24.5**	**3.674**	**24**	**0.408**
Training Age	**Year**	**4.666**	**2.803**	**4**	**0.713**
Phospho-anaerobic ability	**Kg*m*steps number / second**	**38.85**	**0.939**	**38.31**	**1.725**
Lactic anaerobic capacity	**Kg*m*steps number / second**	**38.89**	**1.119**	**38.17**	**1.930**
200m achievement	**Second**	**21.98**	**0.189**	**22.02**	**- 0.635**

*The distribution is moderated if the values of kurtosis are less than (±3)

3 – 3 Pre-Tests:

Per-tests were conducted on the research sample on (7/6/2021) in the Ramadi Sports Club stadium, as the researcher made the following measurements and tests:

3 – 3 – 1 Phospho-anaerobic ability test [6]:

Test name: The step for (10) seconds.
Purpose of the test: To measure the phosphor-anaerobic ability.
Tools: wooden box (40) cm high, stopwatch, Balance
The method of performing the test: The weight of the player is taken, and then the test begins with the player standing facing the box, as the player places one of his legs on the surface of the box and the other remains on the ground with a straight back so that it is not used to push up through the swing, and the count is one up (above the box) And two for the bottom

ISSN- 2394-5125 VOL 9, ISSUE 04, 2022

(down), and the work continues for (10) seconds up and down, and one step is counted for each going up and down.
Registration: The anaerobic ability is calculated by the following equation after converting the height of the box from (40) cm to (0.4) meters to unify the units:
Anaerobic ability = 1.33 (kg x m/sec) x weight (kg) x (0.4) meters x number of steps/time (10) sec

3 – 3 – 2 Lactic anaerobic capacity test [7] :
Test name: Step for (30) seconds.
Purpose of the test: To measure the anaerobic lactic capacity.
Tools: wooden box (40) cm high, stopwatch, Balance
The method of performing the test: The weight of the player is taken, and then the test begins with the player standing facing the box, as the player places one of his legs on the surface of the box while the other leg is free on the ground, and when the timing begins, the player begins to raise the free leg, placing it next to the leg above the box and repeating this Perform by following two counts (one - two), and the tested player must perform the largest number of steps within (30) seconds.
Recording: the tested player calculates the number of steps it performs during (30) seconds during the test performance, and then the following anaerobic capacity equation is applied:
Lactic anaerobic capacity = 1.33 (kg x m/sec) x weight (kg) x (0.4) m x number of steps/time (30) sec

3 – 3 – 3 Achievement Test:
Test name: Running activity (200) meters.
The objective of the test: is to measure the achievement of a 200-meter run.
Tools used: playground and field, stopwatches, whistle, registration forms, timers.
Performance description: The runners take their seat behind the line at the start of a 200-meter run, then when the beep is heard as a signal to start the race, the runners run after allocating a timer for each runner. The clock starts at the start signal and stops when the runner's chest reaches the finish line.
Recording: The runner's time is recorded in the registration form in seconds, rounded to the nearest tenth of a second.

3 – 4 Main experience:

The researcher prepared exercises that are included in the anaerobic energy production system, whose performance ranges between (10-120) seconds, based on his experiment, his field and training experiences, and his access to Arab and foreign sources. The duration of the exercises took (10) weeks, four training units per week, as the number of units reached (40) training units, two of them to develop speed and two to develop muscular strength. The researcher used exercises with training loads that reach maximum and less than maximum intensity for each exercise, as the intensity of those exercises ranged between (80 - 90%) for speed exercises and ranged between (75 - 85%) for strength exercises from the maximum ability of the sample. The sample began by applying the exercises of the training curriculum on (8/6/2021), and the aim was to increase the anaerobic phosphorous ability and the anaerobic lactate capacity, as well as the development of speed of all kinds, especially the abilities related to speed, which is the main factor for the runner to reach the best achievement, as these exercises included on speed and strength training, especially exercises that improve the anaerobic energy system, both phosphate and lactic. Most of the exercises were covered for improving anaerobic phosphate ability that included training whose duration ranged between (10-30) seconds at maximum intensity and with many repetitions, such as

ISSN- 2394-5125 VOL 9, ISSUE 04, 2022

running for a distance of (80, 100, 120, 150, and 200) meters, as for the exercises for developing anaerobic and lactic capacity, they included exercises of less than maximum intensity, the duration of which ranged between (30 - 120) seconds for one repetition, interspersed with suitable rest times, such as running for distances of (300, 400, 500, 600) meters, while muscular strength training included exercises with weights of up to (100%) of the body weight, such as the Deep-knee exercises with weights equal to the weight of each runner to develop strength for the muscles of the legs, bench-press exercises with a maximum intensity or a little less to develop the muscles of the arms and chest, and exercises to develop the muscles of the abdomen and back, among others. One of the similar exercises that work to increase the ability of the working muscles needed by the running skill, and the purpose of these exercises was to increase the susceptibility of the functional organs of the runner's body and stimulate them with stimuli that positively affect the working tissues of the body to achieve the goal of training in gaining the high speed needed by the runner to finish the race at the best level.

3 – 5 Post-Tests:

The post-tests were carried out in the same way as the Pre-tests, as the researcher took the required measurements on (20/8/2021).

3 – 6 Statistical Means [8]:

Mean, median, standard deviation, Kurtosis, t-test.

4 - Presentation, analysis and discussion of the results:

4 – 1 Presentation and analyze the results:

Table (2)
Statistical treatments for the pre and post-tests of the research variables

Variables	Pre-test		Post-test		X Variance	S Variance	T-test Cal.	Results
	X	S	X	S				
Phospho-anaerobic ability	**38.85**	**0.939**	**40.86**	**1.201**	**2.013**	**0.118**	**17.059**	**Significant**
Lactic anaerobic capacity	**38.89**	**1.119**	**40.83**	**1.712**	**1.931**	**0.264**	**7.314**	**Significant**
200m achievement	**21.98**	**0.189**	**21.59**	**0.179**	**0.471**	**0.047**	**10.021**	**Significant**

The results of table (2) related to the pre-tests and post-tests of the research variables (phospho-anaerobic ability, anaerobic capacity, 200-meter achievement) indicated that differences were recorded between the pre-tests and post-tests amounting to (2.013, 1.931, 0.471) respectively, while the deviations of those differences were (0.118, 0.264, 0.047) respectively, and thus the (T-test) value calculated for the search variables reached (17,059, 7.314, 10.021) respectively, and when compared with the tabular score of (2.571) at the significance level (0.05) and the degree of freedom (6 - 1 = 5) To obtain the significance of the differences between the two tests, it was found that the calculated (T) value is greater than its tabular value about phospho-anaerobic ability, anaerobic lactic capacity and 200-meter achievement, whose differences were significant in favor of the post-test for all research variables.

4 – 2 Discussion of Results:

ISSN- 2394-5125 VOL 9, ISSUE 04, 2022

The researcher attributes the significant differences obtained by the research sample between the pre-tests and post-tests in the phospho-anaerobic ability and anaerobic capacity to the exercises that he prepared according to the anaerobic energy production system of its two types, phosphatic and lactic systems, as these exercises led to an improvement in the ability of these two systems to perform the high-intensity bodily effort because "Bodily training for anaerobic effort increases its efficiency, which leads to adaptations of the functional organs of the athlete's body, such as increasing phospho-anaerobic ability, anaerobic capacity and lactic acidity, increasing the size of muscle fibers, increasing enzyme activity, as well as improving anaerobic performance "**[9].** The bodily attributes and capabilities of anaerobic energy production systems include phosphoric system exercises such as maximum strength, speed, explosive strength and speed characteristic, while the lactic energy production system exercises include exercises to develop speed endurance and strength endurance that "improve the oxygen exchange of muscles and increase the athlete's ability to work under The pressure of the oxygen debt and delaying the onset of fatigue by adapting to the training loads that enter within the scope of the lactic energy production system"**[10]**. Anaerobic effort leads to the accumulation of lactic acid due to the anaerobic decomposition of glucose to produce the energy needed for muscle work, as "the hydrogen atoms combine with the pyruvic acid resulting from the anaerobic metabolism of carbohydrates to form lactic acid" **[11]**. And given the increase in energy production waste resulting from metabolic processes for energy production and the extent of its impact on the functional organs of the athlete's body, whether from the physiological or bodily aspect, the runner (200) needs alternatives to withstand the performance of competition or high-intensity exercises by "increasing the susceptibility to phospho-anaerobic ability and Lactic anaerobic capacity to bear the fatigues of exercise or competition that requires high effort and great endurance" **[12].** This is what happened to the research sample, which was proven by the results through the significant differences of these two variables in favor of the post-tests in the evolution of anaerobic ability and capacity as a result of their application of the exercises prepared by the researcher, which was characterized by high-intensity performance for short periods, which led to an increase in anaerobic energy production and an increase in its stores in muscles, especially triple Adenosine phosphate (ATP) and phosphocreatine (CP), as "the increase in the efficiency of energy production processes and anaerobic effort usually results from high-intensity exercise in its various forms" **[13].** As for 200-meter achievement the prepared training curriculum, which included exercises to develop speed and strength of all kinds, led to the development of the ability of muscles and functional working devices, especially the respiratory system, to withstand the performance of sports competition at a high level, as this sports event requires difficult physical and harmonic capabilities due to its maximum rapid performance, which requires great anaerobic ability and capacity to finish the race at the required level, so "the coaches must know the amount of energy that the runner needs to finish the race, taking into account the individual differences between the runners" **[14].** On this basis, this sporting activity needs the interrelationship of most of the elements of bodily strength among themselves, as the runner of (200-meter) needs the explosive force for a quick start and the force characterized by the speed in most race distances, in addition to his necessary and important need for rapid muscular contractions at the same level of speed endurance to finish The race as fast as it started, as "this sporting activity requires fast muscle contractions that last for relatively long times and depends on the speed endurance of the functional muscles and the anaerobic ability and capacity of the athlete" **[15]**. This is what happened to the research sample in the development of physiological variables, which was demonstrated by the significant differences of the post-test, and thus led to the development of the research sample level in the 200-meter achievement.

5 - Conclusions and Recommendations:

5 – 1 Conclusions:

- The exercises according to the lactic energy production system led to an increase in the phospho-anaerobic ability and the anaerobic lactic capacity of the research sample.
- The exercises according to the lactic energy production system led to the development of the 200-meter achievement running for the research sample.

5 – 2 Recommendations:

- Using the exercises according to the lactic energy production system in developing 200-meter achievement running.
- Emphasis on short-distance runners' trainers by including in their training curricula exercises to improve phospho-anaerobic ability and anaerobic lactic capacity.
- The trainers should follow the phospho-anaerobic ability and the anaerobic lactate capacity because of their important role in achieving short-distance runners.
- Conducting research to study the effect of exercises according to the lactic energy production system on physiological variables other than the variables under study.

References:

1. Can Ozgide. (2010).**"Four Weeks of Respiratory Muscle Training Improves Intermittent Recovery Performance but Not Pulmonary Functions and Vo2 Max Capacity in Young Soccer Players".** (Unpublished Dissertation), Middle East Technical University, Department of Physical Education and Sports; Orta Dogu Teknik Universitesi, Cankaya, Ankara, Turkiye.
2. Hoppe, MW, Baumgart, C, Sperlich, B, Ibrahim, H, Jansen, C, Willis, SJ, and Freiwald, J.(2013). **Comparison between three different endurance tests in professional soccer players.** Journal of Strength &Conditioning Research. 27(1), P34.
3. Thomas, NE. & et al.(2009). **The effect of anaerobic exercise on salivary Cortisol, testosterone and immunoglobulin (A) in boys aged 15-16 years.** Eur J Appl Physiol, P109.
4. Adams G. M..(1990). **Exercise Physiology Laboratory Manual.** Wm. C Brown Publishers 1 St Ed USA.
5. Zimek, Jaime, Wiewelhove, Thimo, Ferrauti. (2012). **High-Intensity Interval Training vs. Repeated-Sprint Training in Tennis.** Journal of Strength & Conditioning Research. 26(1): P56.
6. Ahmed Nasralddin Sayed (1998); **Sports Physiology, Theories and Applications.** (Cairo, Dar Al-fekr Al-Arabi) p162.
7. Tomas S, Chamari K, Castagna C, Wisloff U. (2005). **Physiology of soccer: an update.** Sports medicine, 35(6), 127.
8. Davis, C. S. (2002). **Statistical methods for the analysis of repeated measurements (No. 04; QA278, D38.).** New York: Springer.
9. Meckel, Y, Gefen, Y, Nemet, D, and Eliakim, A. (2012). **Influence of short vs. long repetition sprint training on selected fitness components in young soccer players.** Journal of Strength & Conditioning Research 26(7), P1847.
10. Wong, P-L, Chaouachi, A, Chamari, K, Dellal, A, and Wisloff, U. (2010). **Effect of preseason concurrent muscular strength and high-intensity interval training in professional soccer players.** Journal of Strength & Conditioning Research. 24(3): P656.
11. Gerhart. D Haden, (2013). **A Comparison of Cross fit Training to Traditional Anaerobic Resistance Training in Terms of Selected Fitness Domains**

Representative of Overall Athletic Performance. University of pmeylvania, august, Indiana.

12. Marcus, C. Scheid. (2004). **The relationship between running speed and measures of anaerobic power output in collegiate track and field athletes.** Master of Science Thesis, Major in Health, Physical Education, Recreation, Unpublished Master Thesis, Dakota State University.
13. Litmaneman, J. (2006). **The Effect of the training program on the physiological Aspects and the stand and the skills in football matches,** patently U.S.A.
14. Naoyuki Ebine, Hoby Hasina Rafamantanantsoa, Youichirou Nayuki, Kunio Yamanaka, Kouzou Tashima, Takeshi Ono, Shinichi Saitoh & Peter J.H. Jones. (2002). **Measurement of total energy expenditure by the doubly labelled water method in professional soccer players.** Journal of Sports Sciences, 20:5, P396.
15. Meckel, Y. Gefen, Y. Nemet, D & Eliakim, A (2012). **Influence of short vs. long repetition sprint training on selected fitness components in young soccer players.** Journal of Strength & Conditioning Research 26(7), P1849.