

The effect of dynamic lactic exercises in the maximum oxygen consumption and lay-up shot endurance of under-20 basketball players

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ABSTRACT

The aim of this research was to prepare dynamic lactic exercises and identify their effect on the maximal oxygen consumption (VO₂max) and lay-up shot endurance of basketball players under 20 years old. As for the research methodology and its field procedures, researchers used the experimental method through experimental design of study groups with pre and post measurements, as it was appropriate to the nature of the research. The research community was determined by 16 basketball players from the Al-Tadhamun sports club of basketball. We chose a sample of them in a simple and random manner and their number consisted on 12 basketball players under 20 years old. They were divided into two groups (experimental and control) in the simple random way (lottery). We found that the duration of the dynamic lactic exercises, represented by the number of training units, was suitable to develop the experimental research group for the maximal oxygen consumption variable, and the development of the maximum oxygen consumption had a positive impact on the lay-up shot endurance for members of the experimental research group.

KEYWORDS

Dynamic lactic exercises; Maximum oxygen consumption; Lay-up shot endurance.

1. INTRODUCTION

There is no doubt that scientific research has become one of the necessities in our modern society in reaching the highest levels for all aspects of life by identifying the different energies and

abilities of humans to try to achieve the most benefit from scientific theories and their application to serve and develop the society, including the sports field (Ayoub et al., 2005). The basketball game is one of the games that are characterized by a large number of basic motor skills, both defensive and offensive, in which players exert a great effort during training or during the game, especially lay-up shooting and defensive follow-up, in which players need integrated physical and functional qualities. This is because of the difficulty of performing its complex skills and from this it was necessary to use the latest methods, training tools and advanced equipment in this game to raise the level of players to the best level, and this can only be done through good training and the use of other sciences. For this to succeed, the development must be in fitness to take advantage of attack and defense.

Dynamic lactic acid exercises are one of the modern exercises that contribute to provide the body with energy and vitality work with a high alternating effort. So, one of their is to develop the body systems, especially the ability to perform with the presence of lactic acid and benefit from it after converting it to energy. Through the experience of researchers being interested in the game of basketball and observing most of the matches of the youth premier league in general and Al-Tadhamun sports club matches in particular, they noticed that there is a noticeable decrease in skill performance when the level of technical performance is very high or when the time in the game progresses. This negatively affects the team and the inability to score goals that may be crucial to the match. The researcher believes that the reason may be a weakness in the functional and physical abilities of the players, which affects the level of performance, as well as the lack of use of modern training methods, including the method (dynamic lactic), which is one of the training methods that gives the player the ability to endure changes in player tactics in competition, as the researcher believes that it develops the functional side of the player.

The research problem can be summarized by the following question: Does the use of dynamic lactic exercises have a positive effect on the maximal oxygen consumption (VO_2max) and lay-up shooting endure of basketball players under 20 years old?

The researchers have determined the objectives of the research, which are to prepare dynamic lactic exercises in basketball and to identify their effect on the maximal oxygen consumption (VO_2max) and lay-up shooting endure of basketball players under 20 years old. The research hypothesis was that there is an effect of dynamic lactic exercises on maximal oxygen consumption (VO_2max) and lay-up shooting endure of basketball players under 20 years old.

2. METHODS

As for the research methodology and its field procedures, researchers used the experimental method through experimental design of study groups with pre and post measurements, as it was appropriated to the nature of the research.

2.1. The research community and the sample

The research community was determined by Al-Tadhamun sports club of basketball for youth and it consisted on 16 players. The researchers chose a sample of them in a simple and random manner and their number consisted on 12 basketball players under 20 years old. They were divided into two groups (experimental and control) in the simple random way (lottery).

2.2. Means of data collection

The means of data collection were: Arab and foreign sources and references, personal interviews, tests and measurements, and unique forms for recording test results of players.

2.3. Instruments

The instruments used in this study were: 1 basketball court, 20 basketball balls, 1 measuring tape in cm, barriers of different heights (40, 50 and 60 cm), 16 signs with a height of 30 cm, 2 stairways with a length of 4 m, 1 canon camera, 1 Lenovo laptop, 3 sports stopwatch, 2 whistles, and office tools (papers and pens). In addition, the Fitmate Pro system of the Italian company COSMED has a respirator mask, a chest strap and a Bluetooth device to measure the maximum oxygen consumption (VO_2max).

2.4. Field research procedures

Measurement of the maximal oxygen consumption (VO_2max)

The maximal oxygen consumption (VO_2max) was carefully measured using the Fitmate Pro device. The data of the player (name, length, mass and chronological age) are entered before the start of the measurement, as well as the mask for the respirator for the test is cleaned with the antiseptic solution and the parts of the system are connected with the installation of the heart rate belt on the chest of the laboratory and the installation of the signal receiver for heart rate (Bluetooth) in the port assigned to him in the device. Then, Wingate was tested on the Monark physical stress bicycle. The VO_2max catcher was placed on the player's face. After completing all the requirements for working the devices and after completing entering the required data into the device as well as the program for

the physical effort bike, the test started according to the conditions of the Wingate test. The VO_{2max} rate data was recorded by the Fitmate Pro software. The Recovery option of the Fitmate Pro is to be specified while the holder remains installed on the player's face until the consumption of (O_2) is reached at the next rest period of physical exertion, and with the exact mechanism, the test was performed twice.



Figure 1. Measurement of the maximal oxygen consumption (VO_{2max})

Wingate test procedure

The tools used for this test were: stopwatch, calculator, bicycle effort type (Monark). The test is performed using a stationary bicycle (Monark) of Swedish type, which is constructed according to the following steps:

- The player's mass is rounded to the nearest correct kilogram.
- The player's data is entered into the computer and the resistance is placed according to the player's mass, which is 7.5% of his body mass.
- The player gets on the bicycle and the seat is adjusted according to his body length so that there is a very slight flexion at the knee joint in the range of (10°). The foot belt is then adjusted and the procedures are explained to the player so that he is made aware that he is moving when he receives the signal.
- The player performs the warm-up process on the bicycle over a period of 3-4 minutes, gradually increasing depending on the player's mass. Before the end of the warm-up process, the player moves the bicycle wheel at maximum speed for a period of 3-5 seconds and repeats this two to three times.

- The weight is lifted from the ballast basket, and the player begins to move the bicycle wheel at the highest possible speed for a period of no less than 80 cycles. After that, the weight is gently lowered and at the same time, the program start button is pressed to begin the measurement process and the player continues to move the wheel for a period of 30 seconds, encouraged and urged to maintain the speed of rotation as much as possible.
- The maximal oxygen consumption ($VO_2\text{max}$) is calculated directly from the device screen.

Lay-up shot endurance test

The purpose of this test was to measure the endurance of lay-up shooting. The player stands at the free-throw line, holds the ball with both hands, and upon hearing the beep, performs the lay-up shooting in any direction he wishes. Then, he returns to take a second ball on the chair and on the free-throw line to complete the lay-up shooting to 30 seconds, leaving the ball after the hit for another player to return it back on the chair. For each successful score, one point is counted and the number of successful attempts is calculated within 30 seconds.



Figure 2. The test of lay-up shot endurance

2.5. Main experiment procedures

Pre-test

After completing the reconnaissance experiment, researchers applied the main experiment through applying tests and metrics to the research community. The pretests were conducted on 24-25/11/2020, and were according to the following sequence: 1) Maximal oxygen consumption test ($VO_2\text{max}$). 2) Lay-up shot endurance test for basketball.

The researchers prepared and organized the dynamic lactic exercises based on the personal experience of the researchers and in addition to obtaining the opinions of some specialists in the field of sports training, physiology and basketball. It aims to develop the maximal oxygen consumption ($VO_2\max$) and endure lay-up shooting tests for basketball (Al-Sakkar, 1998).

The details of dynamic lactic exercises in the training curriculum were as follows:

- 1- The total number of training units that included the dynamic lactic exercises was 24 units.
- 2- The number of weekly training units in which dynamic lactic exercises were applied was 3 units for 8 weeks.
- 3- The time for dynamic lactic exercises in a training unit is 25-35 minutes (main section only).
- 4- Training days during the week are Saturday, Monday and Wednesday.
- 5- The goal of dynamic lactic exercises is to develop a maximal oxygen consumption ($VO_2\max$).
- 6- Dynamic Lactic exercises aim to develop endurance in lay-up shooting in basketball.
- 7- Consideration of labour exchange between muscle groups.
- 8- Planning the formations of dynamic lactic exercises during weekly and daily units are 1-2.
- 9- The curriculum begins on Saturday, 30/11/ 2020.
- 10- The curriculum ends on Wednesday, 22/3/2021.

Post-test

With the assistance of the assistant staff, the researchers carried out the post-tests of the research community after the completion of the dynamic lactic exercises on 26-27/3/2020, with the same sequence as the pre- tests. The researchers took the same conditions as the pretests where sequence tests.

2.6. Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) was used to analyze the research results (Ayoub, 2005). Pre and post-test were used to analyze the differences between the control and experimental groups.

3. RESULTS AND DISCUSSION

The results presented in Table 1 and Table 2 show statistically significant differences between pre and post-test of the control and experimental groups.

Table 1. Pre-test and post-test results of the control group of the studying variables.

Variables	Measuring unit	Pre-test		Post-test		T value	P value
		Mean	SD	Mean	SD		
Maximum oxygen consumption (VO ₂ Max)	L / min	37	1.788	38.66	1.5	2.712	0.042
Endure lay-up shooting	number	6	0.894	7.33	0.816	4	0.010

Table 2. Pre-test and post-test results of the experimental group of studying variables.

Variables	Measuring unit	Pre-test		Post-test		T value	P value
		Mean	SD	Mean	SD		
Maximum oxygen consumption (VO ₂ Max)	L / min	37.33 3	2.50	41.166	1.471	3.005	0.030
Endure lay-up shooting	number	6.166	1.169	9	0.894	7.059	0.001

Table 3 shows that there are statistically significant differences between the results of the post-test of the control and experimental groups.

Table 3. The results of the post-test of the two groups (control and experimental).

Variables	Measuring unit	Control		Experimental		T value	P value
		Mean	SD.	Mean	SD		
Maximum oxygen consumption (VO ₂ Max)	L / min	38.66	1.5	41.166	1.471	2.9	0.001
Endure lay-up shooting	number	7.33	0.816	9	0.894	3.371	0.007

The results presented in Table 1 and 2 show significant differences between the pre and post-test of the control and experimental groups. The researchers attribute the reason for this difference to the members of the control group, which attribute the significant differences in the maximal oxygen consumption of the control group members are attributed by the researchers to the fact that the exercises that the trainer used, played a role in this difference, through exercises and repetitions, performed by the players during the training unit prepared by the coach, as well as participation and continuation in the training process, which leads to the occurrence of functional adaptations. This is what Hussein (1990) indicated that practicing sports training regularly leads to positive functional changes (Hussein, 1990).

As for the members of the experimental group, the researchers believe that the reason for the occurrence of significant differences is due to the nature of the exercises in the dynamic lactic method they prepared in their training program, as it focused on the work that strongly corresponds to the maximal oxygen consumption, as it was based on scientific and physiological foundations. The components of the training load were taken into account (intensity, size, density) and that this variable is related to the work and efficiency of several systems, namely (the periodic, respiratory, muscular system), in order to bring about positive changes in this real indicator of the training situation several aspects must be considered; the vocabulary of the training unit is aimed to improve the work of these systems, because the process of consuming the maximum amount of oxygen is related to the efficiency of the gas exchange that occurs in the lungs, as well as the ability of the circulatory system to deliver the largest amount of oxygen, and this is confirmed (Al-Sakkar, 1998). "Maximum oxygen consumption is one of the most important measurements that reflect the functional state of the athlete's body, because oxygen plays an essential role in the processes of

energy production, especially wind energy, in performing physical effort with the efficiency of the periodic and respiratory systems from meeting the requirements of this performance" (Al-Sakkar, 1998).

Therefore, the development of this indicator is extremely important, because it is the real indicator of the development of training and the physiological condition of the work of the body systems. This was taken into consideration when forming the training units for the experimental group through the use of dynamic lactic exercises, because this method is characterized by an important ability, which is the ability to continue to perform the exercises, as well as the use of the active resting method between exercises. What the athlete does in the periods between the rapid repetitions of the new introductory training (dynamic lactic) is active hospitalization (running), because the effect of this hospitalization is to mobilize, support, and develop an integration relationship between the lactic system and the aerobic energy system, improving performance in various areas and distances, so that the athlete runs faster, for a longer distance and with a higher economy (Al-Sakkar, 1998).

During the researcher's observation of the computational media in Table 3 in the post-test of the maximum oxygen consumption and the calculated value of (T) for the independent samples of the control and experimental groups, we found that there are statistically significant differences between the two tests and in favor of the experimental group. The researchers believe that the reason for the occurrence of statistically significant differences is due to the nature of the exercises that were applied to the study sample. The training in the modern method (dynamic lactic) led to an increase in the burden on both the circulatory and respiratory systems and thus aimed to develop the competence of the members of the experimental group. The researcher interprets this as a result of the development in the variables of the lungs and the result from the response of the experimental group to the exercises that were prepared and included exercises similar to the state of competition that led to an increase in the efficiency of the circulatory and respiratory systems and the increase mitochondria within the muscle fibers, which affected the ability of the muscles to consume oxygen from the blood, because the more muscles have the ability to consume, the higher the maximum oxygen consumption. This is due to the nature of the codified physical effort according to the correct scientific method and during the period of carrying out the exercises prepared by researchers, which was appropriate and sufficient to accomplish this development. This is confirmed by many scientists, because the physiological changes that occur in the body's systems come as a result of the regulated physical effort that lasts for more than 8 weeks, and these changes are responsible for increasing the muscle's ability to consume oxygen and produce aerobic energy (Bassett & Howley, 1997).

The researchers believe that the basketball player who exerts physical effort during training and matches, VO₂max is one of the basic requirements that must be taken into account when creating training curricula and preparing exercises for basketball players, as it directly affects the non-oxygenic threshold, which is a primary indicator of the player's ability and effectiveness during the game, and from here we emphasize the necessity of developing this physiological variable through training, since training longer than two months is sufficient to increase the player's ability to perform duties with the maximum consumption. This is what researchers were able to achieve this by the exercises prepared for the experimental research sample that had a role in regular training and led to an adaptation of the respiratory system and an increase in its efficiency, which was reflected in the ability of the muscular system to extract oxygen, which is reflected in the ability to increase consumption, as the correlation of the pulse rate with the maximum in relation to the heart muscle and the calculation of the work rate according to the amount of oxygen consumed by the heart rate at the moment of the end of the effort, which reflects the specificity of cardiovascular fitness (Al-Bassati, 1998).

Since the exercises in the training curriculum were alternating between aerobic and anaerobic work, this helped to increase the efficiency of the circulatory and respiratory systems in delivering oxygen to the muscles, as well as the ability of the muscles to consume oxygen in order to rebuild it, which was evident in the results of the experimental group that used exercises in a dynamic lactic method, resulting in statistically significant differences in favour of the experimental group.

Based on the results presented in Table 1 and 2 for the pre and post-tests for the individuals of the control and experimental groups, the researchers attributed the development of the members of the control group to the fact that the trainer used the exercises with training methods applied to the control group, since the training provides results and improvements for the athlete, even if the components of pregnancy training were not regularized due to the athlete's exposure to a physical effort, the adaptation occurs at a certain level. However, there were no statistically significant differences for the members of the control group.

As for the development of the members of the experimental group, the researchers attribute this to the use of the exercises prepared according to scientific foundations in the dynamic lactic method, taking into account the components of the training load, since these exercises aim to develop endure lay-up shooting for the players. This is confirmed by Al-Bassati (1998) when he pointed out that continuous sports training achieves functional adaptation and increases the level of physical fitness, especially the comprehensive development of endurance and strength and speed and periodic

and competitive endurance. These elements require determination and robust performance during a performance (Al-Bassati, 1998).

Following the scientific foundations and principles of dynamic lactic training in the preparation of exercises by researchers has helped to make the required positive impact, since the basketball game is within a lactic energy system significantly. This has helped to make reasonable adaptations in the body systems by developing particular endurance components and increasing muscle efficiency to withstand a high degree of acidity caused by the accumulation of lactic acid and muscle metabolic residues in the muscles, at the same time increasing the efficiency of the heart and the circulatory system in delivering sufficient quantities of oxygen to the muscles to complete the metabolic processes to produce the energy needed for performance, and ridding the muscles of the waste resulting from these processes.

In addition, following the principle of rippling in the implementation of training loads was one of the most critical factors that contributed to the significant development the endure lay-up shooting of the members of the experimental group, where researchers focused on not being training loads on the same frequency (high or low intensity) but instead following the principle of ripple between high and low in training stresses. This is consistent with what Ibrahim (2008) referred that the training intensity in the different games is very complicated because the pace of the gameplay is fast. Intensity changes and constantly alternates between extreme and low intensity. In order to meet these demands, the trainer must include in his training curriculum the use of a variety of stresses continuously (Ibrahim, 2008).

In what was presented in Table 3, it was found that there were statistically significant differences in the post-test between the two groups (control and experimental) in the test of tolerance of peaceful correction and in favor of the members of the experimental group. We attribute it to the willingness to pay attention to this important skill that is necessary for the players and give it a sufficient amount of their training program, as well as the use of modern training methods appropriate to what is happening in the game, as well as interest in skill without the ball and linking it to offensive skills with the ball was very important for the young players who are the research sample to have a base in how to move on the field and how to use spaces and to get rid of the defender to get the ball in a good position, so you can score with a lay-up shooting. The researchers also attribute the reason for the difference between the two groups in this skill to the effectiveness of the exercises which were prepared by using the dynamic lactic method, as well as the player's interest in this impressive skill. So, the researcher aimed to improve the endure lay-up shooting through skillful exercises that all players performed with precision and high proficiency. "Because these exercises

aim to raise the physical ability of the athlete using skills and a kinetic direction close to the type of specialization (similar to the required sport)" (Al-Bishtawi & Al-Khawaja, 2010). Also is the researcher's choice to develop the lay-up shooting skill because it is important and in most cases it constitutes the element of winning the match. Due to this widespread interest in this skill, this remarkable development was achieved by the members of the experimental research group at the expense of the members of the control group.

4. CONCLUSIONS

The duration of the dynamic lactic exercises, represented by the number of training units, was appropriate in creating functional adaptations that reflect the extent to which the experimental research group has developed the VO_2max variable. The exercises prepared and applied by the researchers in the dynamic lactic method, contributed to the development of enduring lay-up shooting of the experimental group. Also, the development of the maximal oxygen consumption (VO_2max), positively impacts the development of enduring lay-up shooting for members of the experimental research group.

5. RECOMMENDATIONS

Through the researcher's conclusions that prove the effectiveness of using dynamic lactic exercises, the researcher recommends several recommendations:

- 1- The researchers recommend using the exercises according to the dynamic lactic method's training bases to improve the aerobic and anaerobic efficiency of the basketball players during matches and competitions.
- 2- Also, it is necessary to codify the training load for dynamic lactic exercises that suits the quality of practitioners in terms of gender, biological and training age, as they have a high impact on the body during a performance.
- 3- Carrying out similar studies on other individual and group activities and on different age groups.

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CONFLICTS OF INTEREST

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