

The Effect of Special Training of the Dynamic Lactic Method in the Development of some Physiological Variables and the Jump Shot Accuracy for Young Basketball Players

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Abstract: The research aims at preparing dynamic tactical exercises for young basketball players identifying the effect of dynamic lactic exercises in some physiological variables and accuracy of jump shooting for young basketball players. The researchers use the experimental method through experimental design of equivalent groups pre and post measurements as it is appropriate to the nature of the research. The research community is determined by 15 basketball players from the Imam Al-Muttaqin Sport Club for the 2015-2016 season. The researchers use a comprehensive limited method when selecting the research sample. Physiological variables were studied (pulse rate, blood lactic acid concentration, maximum oxygen consumption Vo₂ Max). Some of the most important findings the researchers came up with was that dynamic lactate exercises had an effect in improving the heart rate before and after the fatigue as well as the level of lactic acid before and after fatigue and Vo₂ Max level.

Keywords: dynamic lactic, variables, physiological, jump shot, basketball.

1. Introduction

The goals of modern sport training are directed to develop energy production systems and functional variables attached to it, so whenever the anaerobic or aerobic athletic ability improves, it is directly reflected at the level of physical and skill performance, hence emerges the importance of setting training programs based on scientific principles. The basketball is one of the team games which requires special physical preparation in order to raise the efficiency and ability of the player.¹ The player must have high transmission speed and explosive power in jumping and accuracy in shooting, passing and streamlining in the shuffle. The jump shooting is one of the main offensive skills that help achieving victory as it scores three points from the farthest distance possible of the defenders, and this is what all basketball players aim for, which is the ability to score points especially when the match score is equivalent or nearly equivalent. The coaches have used various methods to get the player into the highest levels, and the dynamic tactic training method is one of the modern methods in training basketball players because it is of great importance in developing many functional variables and the player's skill performance.² As those exercises help the player to endure an increase in the accumulation of lactic acid and the increase of its disposal operations, and then stability in performance and reduction of the obstacles of lactate in its high concentrations. Therefore, the trainers must be familiar with and know about those important exercises in the basketball game which lead to elevate the level of the player's performance and focus, whether in training or in the match, including that of the tactical system (which includes dynamic lactic training). Hence, rises the importance of research in the use of dynamic tactic training which contributes to the development of some of the functional and skill variables, and then reflected on players' performance for a period of time.³

2. Research Problem

Through the researchers' observation and their follow-up to the first-class league, and through personal interviews conducted by the researchers with the players and coaches, it was found out that some coaches do not have sufficient interest in physiological training, which results poor performance of their players in general and the skill performance in particular. One of them is jump shooting, specifically in the third and fourth quarters of the match.

Out of the researchers' belief in scientific research as the best way to address problems, the researchers conducted an academic study that deals with studying the method of dynamic lactic training, so that it can be a solution for this deficiency, benefiting coaches and players.

3. Research Objectives:

1. Identifying the effect of dynamic lactic training on some physiological variables of young basketball players.

2. Identifying the effect of the dynamic lactic exercises on the accuracy of jump shooting by young basketball players.

4. Research Hypotheses

1. There is a positive effect of dynamic lactic exercises in some physiological variables on young basketball players.

2. There is a positive effect of the dynamic lactic exercises on the accuracy of jump shooting by young basketball players.

Research Areas

- **Human:** young basketball players from Al-Muttaqin Sports Club in Karbala Governorate.
- **Time:** 15/12/2018 – 18/3/2019.
- **Place:** The Physical Physiology Laboratory at the University of Karbala, College of Physical Education and Sports Science, and the gymnasium of Al-Muttaqin Sports Club.

5. Research Terminology

Dynamic Lactic Training

It is a form of training in which the production of lactate increases through high training intensity and decreases with periods with which the intensity of training decreases.¹ In addition, the exercises of this training aim at deliberately changing the level of lactate production in the muscle cells by increasing and decreasing the speed of running within the repetitions of one group, where the level of lactic production increases with the increase of running in distances determined for intensive running, and level of lactic accumulation decreases with the decrease of the periods in which running intensity decreases.² In this way the muscle cells adapt with the accumulation of lactate within them, as well as they adapt on how to get rid of it (the lactic accumulation) by using the produced lactate as a source of energy during the periods of recovery of less intensity,⁴ this means that lactate rates will be variable throughout the training period between ups and downs and this type of training gives the player the ability to endure the continuous changes in the players' tactics in the competition, especially in the medium and long distances running.

6. Research Methodology

The researchers used the experimental method with the experimental design of pre and post measurements equivalent groups as it is appropriate with the nature of the research.

Research Community and Sample

The research community was identified with young basketball players of the Al-Muttaqa Sports Club for the 2018-2019 season, and they were 13 players, as the researchers used the comprehensive limited method by selecting the sample of the research. The sample was divided into two groups (experimental - control), and each group (5) players, and (3) players were chosen for the survey experiment.

Research Apparatuses

1. Testing and Measurement
2. Observation and questionnaire.
3. Laptop (DELL).
4. SONY camera, made in Japan.
5. Cotton tape measure.
6. Medical scale (Buerer brand), made in China.
7. Lactate Pro2. device, made in Japan.
8. Treadmill, made in China.
9. FITMAT PRO device, made in Italy.
10. 4 plastic cones of different height.
11. 10 legal basketballs.

Identifying the physiological variables

Through the researchers' study and exposure to many of the scientific references in the field of physiology of sports training - basketball, it was reached to identify physiological variables as follows:

1. Pulse rate.
2. The percentage lactic acid concentration in the blood.

3. The maximum oxygen consumption, Vo2 Max.

Pulse rate measurement

A heart rate measuring device was used, which is placed on the left wrist with the palm of the left hand on the right shoulder and the right hand under the left arm, the player remains constant. The pulse rates are read directly and the measurement is made before fatigue and immediately after it.⁵

Blood Lactic Acid Measurement

The researchers used a handheld Lactate Pro2 concentration meter. The process of measuring the level of lactic acid in the blood was carried out in two stages, the first before fatigue and the second after (5) minutes of rest after fatigue, which is the best period for the discharge of lactic acid from the muscles to the blood³. The fatigue was the test for the endurance of the modified lactate⁴ and the test begins after the player finishes the appropriate warm-up for a period of 5 - 10 minutes. Then, the player is taken up on Tread mill as he starts operating the device within the specified speed (14 km / h). Worth to mention that the device begins to speed up gradually to reach the determined speed and this gives the tester the sufficient opportunity to work on the device in a coordinative manner. After reaching the determined speed, the stopwatch will be started by the timer and the player continues working on the device for two minutes.⁶

Measuring the maximum consumption of Oxygen (Vo. 2 Max)

The researchers used Vo2 Max measuring Fit mate pro. Before testing, the tester cleanses the VO2max respirator mask with the antiseptic solution, then connects the parts of the Fit mate pro system (Figure 2) together and attaches the pulse belt to the tester's chest and installs the pulse signal receiver (Bluetooth) in the Fit mate pro device, after entering the tester's information in the device, which includes the name, date of birth, gender, height and weight, and choosing the type of test to be performed, which is (VO2max) because the system contains several tests, and then installing the respiratory mask tightly through its belts and making sure that the breathing air does not leak from the mask, then the tested climbs on orbit bike. The tester gradually increases the speed and monitors it starting from (2.5 km/hr) to (7 km/hr), thus the orbit bike differs from the Tread mill by determining the speed and instigating the muscles of the body to work during the performance. The Fit mate pro device contains a graph screen showing the pulse and the maximum oxygen consumption (VO2max) with their respective ratios where they are monitored by the evaluator.⁷

The accuracy of jump shooting test

The researchers have examined many scientific references and studies specialized in basketball and the accuracy of jump shooting test was nominated. The researchers presented this test to a group of experts and specialists in the field of sports training and basketball in order to identify the suitability of this test for the sample and its suitability to measure the variable of jump shooting accuracy. After collecting the results, it was agreed to nominate the test by 100% by the experts.

Test name: a front jump shooting to the left of the free throw line, then moving half round to the center and right⁸

The purpose of the test: to measure the accuracy of jump shooting with a basketball.

Performance description:

- The player takes the standing position in the specified place outside the free-throw area, on the left (the first mark) with the ball.
- The player performs jump shooting with one hand towards the basket directly without the ball touching the target board.
- Each player is given (15) throws done in three sets, each group has five throws.
- The first set is performed from the mark on the left side of the free-throw line in a (30 cm) distance.
- The second set is performed from the mark in the middle of the free-throw line in a (90 cm) distance towards the distant shooting line (three-point throw).
- The third set is to be performed from the mark on the right of the free-throw line in a (30 cm) distance.
- The player leaves the place of jump shooting after each set and moves half-round to the center and right.
- Before starting with the second set, another player is allowed to perform his sets, and so on, alternately for both players and for the rest of the players.
- Each player has only one throw as a pre-performance training.

Calculating points

Two points are given to the player for each successful throw (in the basket). One point is given for each throw that touches the ring and does not enter the basket. No points given when the ball touches the board and

does not enter the basket and the player's score is the total points obtained in the 15 throws. The maximum score for the test is 30 points

The researchers conducted a survey experiment on (12/25/2018) with the assistant team on (3) players from the research community, outside the main research sample, in order to:

- Identify errors, obstacles and negatives that may accompany the experiment.
- Identify the validity of the tools and devices used.
- Identify the intensity and time of the exercises of the research sample.
- Identify the time of the test performance.
- Extract the scientific principles of the test.

The Scientific basis of the test

First: validity of the test

The researchers used the validity of the content of the test in question. The skill test was presented to a group of 13 specialized experts, appendix(1), and they agreed that the test is valid and it measures the target quality.

Second: The stability of the tests

The researchers obtained the stability factors to test the accuracy of jump shooting through testing and re-testin

g, where the test was applied to a sample of (3) players from the research community on 2/1/2019 and the test was repeated on 10/1/2019. By using correlation SPSS, the stability factor was extracted, it reached a correlation value (0.884), which is a high value and indicates the stability of the test.

Third: The objectivity of the tests

The objectivity factor of the test was obtained by the evaluation of two arbitrators of expertise and experience, and by using the correlation factor between the grades given by the evaluators, the test obtained a correlation factor of (0.798) which is high and indicates the objectivity of the test..

Pre-tests

The pre tests were conducted on the individuals of the research sample on 14/1/2019 in order to determine the level of physiological and skill variables among the young players, and the physiological tests and measurements were conducted at 9 a.m. at the Physiological Laboratory in the College of Physical Education and Sports Science / University of Baghdad, and the skill test was conducted at 5 p.m. at the gymnasium in the Imam Al-Muttaqa Sports Club.

Equivalence of the research sample

To verify the equivalence of the two sample groups in relation to the physiological and skill variables under consideration, the equivalence results were as in Table (1) below:

Table 1. Equivalence of the research sample

Research variables	Units	Experimental Group		Standard Group		Man-n-Whitney calculated value	Significance level	Significance
		medium	Spring deviation	medium	Spring deviation			
Pulse rate before fatigue	Pulse/ Min.	70.51	3.76	71.46	3.37	30.98	0.072	insignificant
Pulse rate after fatigue	Pulse/ Min.	70.51	3.76	71.46	3.37	48.18	0.091	insignificant

Lactic acid before fatigue	Mmol / L.	185.76	5.87	182.23	4.99	30.11	0.876	insignificant
Lactic acid after fatigue	Mmol / L.	1.750	0.105	1.741	0.342	33.87	0.062	insignificant
Vo2Max	ml / kg / Min.	11.79	1.25	11.54	1.98	28.65	0.154	insignificant
Shooting accuracy	Points	40.78	2.80	40.54	1.87	29.88	0.093	insignificant

In a sample size (10) and significance level (0.05), Table (1) shows that the level of significance of all variables discussed is greater (0.05), and this means the absence of significant differences between the players of the two research groups,. It is a very necessary in the experimental method for all players of the sample to be on one starting line of initiation when starting the main experiment.

The main experiment

The researchers carried out stomach exercises and the exercises were carefully prepared.

- The researchers have taken into account the principle of diversity in the exercises used, see Appendix (2).
- The period of dynamic lactic training was at (3) training units, see Appendix (3), weekly on (Saturday, Monday, Wednesday) for (8) weeks starting from 15/1/2019 to 15/3/2019.
- The intensity of training ranged between 80% - 90%, from the maximum player ability, as the maximum intensity of the exercises used in the survey experiment was determined for each player.
- Those exercises were applied at the beginning of the main section of the training unit.

Post measurements and tests

The researchers conducted posttests on the players of the research sample on 3/18/2016. The tests were conducted under the same conditions and terms in which the pre measurements and tests were conducted as much as possible.

2.10. Statistical tools:

The statistical package (SPSS) was used to process data obtained by researchers from the pre and posttests.

Presenting and analyzing the results of the pre and posttests of the experimental group

Through the data obtained from the (pre-post) test, and to prove the research hypothesis and achieve its goals, and to know the effect of dynamic lactic exercises, the researchers used Wisconsin statistical method as shown in Table (2):

Table 2. The table shows the median values, the spring deviations, the Wilcoxon value, and the statistical significance of the test variables investigated for the experimental group

Variables	Units	Pre		Post		Wilcoxon Value	Significance level	Significance Of Differences
		Medium	deviation	Medium	deviation			
Pulse rate before fatigue	Pulse/Min.	70 51.	3. 76	66. 76	2.8 7	3.98	0.01	Significant
Pulse rate after fatigue	Pulse/Min.	18 5.76	5. 87	17 9.76	5.3 2	Zero	0.02	Significant
Lactic acid before fatigue	Mmol / L.	1. 750	0. 105	1.3 83	0.1 17	1.09	0.00	Significant

Lactic acid after fatigue	M mol / L.	1179.	1.25	9.76	2.87	5.76	0.04	Significant
Vo2Max	M l / kg / Min.	4078.	2.80	45.67	3.65	Zero	0.03	Significant
Shooting accuracy	P oints	1609.	4.58	20.76	4.76	Zero	0.00	Significant

Sample size (5) and significance level (0.05)

Table (2) shows that the level of significance between the results of the pre and posttests of the experimental group of the researched variables (heart rate before fatigue, heart rate after fatigue, the lactic acid before fatigue, the lactic acid after fatigue, the maximum consumption of oxygen (Vo2max), and the accuracy of jump shooting have reached (0.01) (0.02) (0.00) (0.04) (0.03) (0.00) respectively, and they are less than the significance level (0.05), which means that the differences between the pre and posttests were statistically significant in those variables.

Presenting and analyzing the results of the pre and posttests of the standard group

Table 3.The table shows the medium and spring deviation values, as well as the Wilcoxon value, and the statistical significance of the researched variables of the standard group.

Variable s	U nits	Pre		Post		Wil coxon Value	Signi ficance level	Signifi cance Of Differences
		medi um	dev iation	m edium	dev iation			
Pulse rate before fatigue	P ulse/ Min.	71.46	3.37	7098.	2.99	0.04	0.01	signifi cant
Pulse rate after fatigue	P ulse/ Min.	182.23	4.99	180.43	3.88	0.03	0.02	signifi cant
Lactic acid before fatigue	M mol / L.	1.741	0.342	1.831	0.24	0.27	0.00	Insigni ficant
Lactic acid after fatigue	M mol / L.	11.54	1.98	1186.	2.01	0.09	0.04	Insigni ficant
Vo2Max	M l / kg / Min.	40.54	1.87	4183.	2.86	0.00	0.03	signifi cant
Shooting accuracy	P oints	17.65	2.43	1790.	2.85	0.19	0.00	Insigni ficant

Sample size (5) and significance level (0.05).

Table (3) shows that the level of significance between the results of the pre and posttests of the standard group of the variables (heart rate before fatigue, heart rate after fatigue, maximum oxygen consumption (Vo2max) have reached (0,04) (0,03) (0, 00), respectively, and it is less than the significance level (0,05), which means that the differences between the pre and posttests were statistically significant and in favor of the post-tests in those variables. As for the lactic acid variables before the fatigue and lactic acid after the fatigue and the accuracy of jump shooting, it reached (0.27) (0.09) (0.19) respectively, which is higher than the significance level (0.05), which means that it is not statistically significant and there are no differences between the pre and post measurement in those variables.

Presenting and analyzing the results of the post-test for the experimental and standard group

Table 4. shows the medium values of the control and experimental groups and the statistical significance of the post tests of the researched variables

Variables	Unit s	Experimental Group	Standard group			Significan ce
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		medi um	devi ation	me dium	dev iation	Mann -Whitney value	Signifi cance level	Of Differences
Pulse rate before fatigue	Puls e/ Min.	66.7 6	2.99	70. 98	2.9 9	zero	0.00	significant
Pulse rate after fatigue	Puls e/ Min.	179. 76	3.88	180 43.	3.8 8	zero	0.00	significant
Lactic acid before fatigue	Mm ol / L.	1.38 3	0.24	1.8 31	0.2 4	3.99	0.02	significant
Lactic acid after fatigue	Mm ol / L.	9.76	2.01	11. 86	2.0 1	2.09	0.00	significant
Vo2Max	Ml / kg / Min.	45.6 7	2.86	41. 83	2.8 6	2.98	0.04	significant
Shooting accuracy	Poin ts	20.7 6	2.85	17. 90	2.8 5	zero	0.02	significant

Sample size (10) and significance level (0.05).

Table (4) shows that the level of significance between the results of the post tests of the experimental and standard groups of the researched variables (heart rate before fatigue, heart rate after fatigue, lactic acid before fatigue, lactic acid after fatigue, the maximum consumption of oxygen (Vo2max), and the accuracy of jump shooting have reached (0,00) (0,00) (0,02) (0,00) (0,04) (0,02), respectively, and they are less than the level of significance (0,05), which means that the differences between the post tests for the experimental and the standard groups were statistically significant in those variables in favor of the experimental group.

7. Results Discussion

Based on the results shown in Table (2.3) of the research variables under study for the experimental and standard groups, we see that there are significant differences between the pre and posttests of the experimental group after carrying out the exercises prepared by the researchers. Also, there are significant differences in the variables (heart rate before fatigue, heart rate after the fatigue, and the maximum oxygen consumption (Vo2max) of the standard group.⁹Table (4) shows that there are significant differences between the post tests of the experimental and standard groups and in favor of the experimental group, as each training leaves an effect on the functional systems of the trainee, especially with regard to the heart because it is the basis for pumping and distributing blood to all parts of the body and this effect increases and appears in a way that reflects the adaptations of the extent of the athlete's functional performance whenever the training is organized and this is confirmed by the training prepared by the researchers for the experimental group (dynamic lactate) in addition to the functional improvement that occurred in the cardiovascular system, as the athletic body building is distinguished by quickly adapting the training loads when subjected to repetitions in the training process, as the exercises to which the athletic loads were subjected have led to increase the efficiency of the heart function,¹⁰ as well as an increase in the economy in the function of the heart muscle and a decrease in the number of beats per a minute during rest time as a result of the increase in the volume of blood in each heartbeat. Furthermore, the results showed that there were significant differences between the pre and posttests of the experimental and standard group in the rate of heartbeats after the physical fatigue. The researchers attribute that the lower heartbeats rate after the fatigue in the post test compared to the pretest as a result of the effect of the exercises in obtaining the organized adaptation that led to that change (low pulse rate),¹¹ and this is consistent with what athletic training results in slow heartbeats during rest time for two main reasons: the first one is associated with an increase in the amount of acetylcholine present in the tissues of atria after athletic training and a decrease in heart tissue sensitivity to the catecholamine hormones that appears after training, the second reason is the increase in the activity of the parasympathetic nerve that controls the rate of launch speed due to the decrease in the activity of the sympathetic nerve.¹²

It is clear from the results that appeared in Table (2.3.4) for the test of lactic acid before and after the fatigue of the two research groups that there are significant differences in favor of the experimental group. The researchers attribute those differences to that (dynamic lactate) exercises helped improve the course of biochemical processes that occur in the body significantly through the adaptation of the bodies of the players to produce relatively large quantities of lactic acid formed during high tension and the ability of the body to oxidize it during the positive rest time, which was reflected in transferring of large quantities of lactic acid formed in the fast fibers to slow muscle fibers and heart muscle fibers, which turn to play the main role in the muscular action during the positive rest time,

which led to its oxidation and then used as fuel during the muscular function. Brooks confirms, reporting from both through the shuttle transfer theory of lactate,¹³ that lactate moves between muscle cells to supply other muscle cells with energy. Slow red fibers have more ability than white fibers to use lactic acid as a fuel, Brooks also adds that the means of transferring the lactate between muscle cells is proliferation or transport, and if this system is controlled, then it becomes possible to delay the onset of fatigue and increase the period of physical performance.¹⁴

That the maximum absolute and relative oxygen used increases as a result of regular training, and this increase happens as a reaction between the muscles fatigue and their adaptation of extracting the largest possible amount of (O₂), which qualifies the muscle to increase its sufficiency and decrease the acidity resulted from metabolism to the minimum"¹⁵. In addition, the physiological development is positively reflected on the player's dribbling, chest pass, and shooting, as the exercises used had a great impact on developing the working muscles, arm or leg muscles, where the development of the muscles of the arms improved the player's ability to hold the ball throw on the basket reaching the highest possible level in the air and direct the ball during passing with the arms. When performing the pass, we need "the strength element to develop it, especially when merging or linking two or more skills because they are associated with performance techniques or positively affect skills development.

8. Conclusions

1. The dynamic lactate exercises improved the heart rate before and after the fatigue, the level of lactic acid before and after the fatigue, and the level of Vo₂ Max.
2. The dynamic lactate training improved the jump shooting accuracy.

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