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The effect of training methods on some physiological indicators and achieving a 100-meter backstroke swim

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Abstract

The goal of the research is to know the effect of training methods (rubber ropes, swimming paws) on some physiological indicators for swimmers (Al-Musayyab Club) specializing in 100-meter backstroke swimming. For the purpose of achieving the research goal, the research sample was chosen from swimmers specializing in the event (100-meter) backstroke swimming, with an age group of 14. -16 years old, intentionally. Since the number of sample members was (12) swimmers, the exploratory experiment was conducted on (2) swimmers, after which they were excluded, and the experiment was conducted on the rest of the swimmers by dividing them randomly into two equal groups, experimental and control, with (5) swimmers for each group. Both groups implemented the training curriculum paragraphs. Prepared by their trainer in all its details, except that the experimental group used resistance training methods within the vocabulary of the daily training unit, the control group used the traditional training method according to the method prepared by the trainer. The researcher conducted the test before and after the research period, which lasted for 12 weeks, with three training units per week, and the results achieved were analyzed statistically for both groups. Where the researcher found that the standardized training methods in implementing training loads of intensity, volume, and training intensity have an effect on physiological indicators, such as fatigue as a result of oxygen consumption and the accumulation of lactic acid in the muscles as a result of the waste of energy consumption resulting from the anaerobic oxidation of sugar. This means an increase in free hydrogen ions in the body, which leadseto a decrease in the leveleof the blood pH value, and this in turn affects all the functional processes that appear in the athlete's body and finally its effect in achieving the level of achievement. Both groups have developed, except that the group that used the training methods in the training curriculum was the best.

Keywords:
Training Methods, Physiological Indicators, Backstroke Swim.

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Introducing the research:

Introduction:

In the recent period, there has been an increase in studies and research related to swimming with the aim of finding and innovating training means and methods and knowing their impact in order to achieve achievement. There are many important sciences that have contributed to improving the level of sports performance and achievement. One of these sciences is the physiology of sports training, which is concerned with studying all the changes that occur in the body. Vital functional systems as a result of organized sports training. But there was some neglect of the use of this science, which shows the true condition of the swimmer and his vital indicators, and through which training curricula are developed according to the appearance of fatigue, without which time, effort and money are reduced in achieving the achievement. The swimming event, which is characterized by special physical requirements due to its difference in the environment in which it is practiced from the rest of the games, as well as its performance in a water environment and the variables that result from that, In addition, the diversity of swimming events from short, medium and long distances, as well as the diversity of its performance from freestyle, back, breaststroke, butterfly and medley also requires special requirements, and backstroke is one of these types which requires integration of physical and functional abilities, and this is done through continuous scientific training codified in Implementing training loads of intensity, volume, and training intensity and its effect on the functional aspect and the physiological variables that appear in the athlete's body, and finally its effect on achieving the level of achievement. The lack of biochemical analyzes during the training period is not compatible with the scientific progress taking place in sports training in the world at the present time, because it shows a clear picture of the effect of training loads and the extent of progress, which prompted the researcher to pay attention to this topic, which may help raise the level of the athlete's achievement and monitor the development of his capabilities to be at a high level. Therefore, attention to the physiological aspect is an important and necessary factor for evaluating the training situation, as it is impossible to ignore the variables that occur in the muscles and blood during physical effort, especially if there is intensity in performance. Its impact appears in terms of changes in the functional systems required by the 100m backstroke swimming event. This short swimming distance is also characterized by high intensity, which exceeds 90%, and the fatigue that occurs as a result of oxygen consumption and the accumulation of lactic acid in the muscles as a result of the waste of energy consumption resulting from the anaerobic oxidation of sugar. This means an increase in free hydrogen ions in the body, which leads to a decrease in the level of the blood pH value, and this in turn affects all functional and biochemical processes, and then the swimmer feels pain in his working muscles and the inability to continue at the same level of performance, so his speed slows down, but with the intervention of some training methods, rationing the loads, and raising the level of performance. Physical fitness, which leads to delaying the onset of fatigue, In addition to the chemicals that will restore the acid-base balance of the body and return the blood pH value to normal, as these substances work to inactivate free hydrogen ions, by interacting with them and within a very short time, approximately a fraction of a second. The most important of these chemicals are (bicarbonate, carbonic acid, hemoglobin), as these substances are called bioregulators (buffer). As stated, the importance of the research lies in

identifying the effect of training methods on some physiological indicators and the level ofdigital achievement in the 100 m backstroke swimming.

Research Problem:

The modern approach to developing the body's physiological efficiency has become the focus of training curricula on developing the body's ability to work properly, by improving the work of the body's systems to confront fatigue resulting from performance and the accompanying waste of energy production, especially the anaerobic system (lactic acid). Which is the most influential energy production system on muscle cells because of the deposition of glycolysis products, represented by lactic acid and lactate, which causes obstruction of performance and continuation of work. The researcher noticed a discrepancy in the timing and performance level of swimmers in the 100m backstroke event, the researcher believes that the problem with this discrepancy is due to not using appropriate training methods and setting training loads correctly, as well as neglecting research into the physiological indicators that show the true condition of the swimmer and the extent of the impact of the curriculum on him. Therefore, the appropriate training method and a good integrated approach must be chosen, which is accompanied by a laboratory examination through which the coach helps to evaluate the athlete's condition physiologically and chemically and also to identify the amount of development occurring in swimming time. For this reason, the researcher decided to study this problem and develop solutions by developing a training curriculum using training methods and knowing the extent of its impact on the physiological indicators, and thus the level and extent of these variables' response to the training load and the extent of their impact on the completion of the 100-meter backstroke swim.

Research objective:

- Identifying the effect of training using training methods on some physiological and chemical indicators
- Identifying the effect of training using training methods in achieving the 100-meter backstroke.

1-4 Research hypothesis:

1- There is a positive effect of training methods in swimming on the level of physiological and chemical indicators and for the benefit of the experimental group.
2- There are statistically significant differences in improving achievement in the post-tests in favor of the experimental group in the 100-meter backstroke swimming.

1.5.Researchefield:

1.5.1.Humanefield: A sample of Al-Musayyib Olympic Swimming Club swimmers, ages (14-16 years).
1.5.2.Time field: from (23/3/2022) to 23/6/2022).
1.5.3.Spatial field: Water City (Marina) Babylon swimming pool (50m).

2. Methodologies for research and field operations:

2.1.Research Methodology:

The researcher used the experimental method because it suits the nature of the problem because "experimental research searches for the cause and how it occurs and reveals causal relationships between phenomena. It is a deliberate change by the researcher to certain elements in order to find out the immediate and temporal changes that occur and attempt to explain and interpret them within sound scientific logic" (Abu Al-Ala Ahmed Abdel Fattah, 1994).

2.2. Community and sample Research:

The research sample was chosen intentionally, and included (10) swimmers representing the Diwaniyah and Babylon clubs for the category (14-16 years) specializing in 100m backstroke swimming. They represent (68.5%) of the original community of (12) swimmers. Based on the characteristics of the research sample, the researcher divided its members into two groups, the first experimental and the second control, on the basis of the average times achieved and their standard deviations in the pre-test in the 100-meter freestyle swimming, in a random manner. In selecting the research sample, the researcher took into account the homogeneity of the members of the two groups in the research test, as in Table (1).

Table (1) shows the value of the coefficient of variation for the variables of height, age, and weight for individuals in the research sample

Variables	Mean	Std. Deviation	Coefficient of difference	Result
Length/Cm	164	1.247	0.753	Homogeneous
Age	15.06	0.184	1.41	Homogeneous
Weight	59.31	0.95	1.61	Homogeneous

2-3- Means and devices used:

- Arab and foreign sources and references.
- Lactate pro measurement device.
- An electronic device to measure height and weight.
- Stopwatch number (5).
- Medical cotton and sterile materials.
- Whistle.

2-4: Fielderesearcheprocedures:

2-4-1: Pretests

The pre-tests were conducted at five o'clock in the afternoon on Wednesday, March 23, 2022 and Friday, March 25, 2022, in the Marina swimming pool. On Wednesday, the investigated variables were tested after the effort, due to the correlation of the concentration of these variables in the blood with the performance of the training curriculum, and after completion. From performing the training curriculum. On (Friday 25/3/2022) the completion test for the 100 m backstroke was conducted, and after (12) weeks had passed, which is the training period, post-tests were conducted for the two groups of the research sample (on Thursday - Saturday 25-32/6/2022) and the times were recorded. achieved and implementing the same procedures when conducting pre-tests.

Tests used in research

Tests are considered "one of the important means of evaluating the level reached by an athlete, and they also show the validity of any training program" (Abu Al-Ala Ahmed Abdel

Fattah,1982). Accordingly, the researcher resorted to using tests to evaluate the level of performance of the sample in the variables investigated. The researcher worked to consult some specialists (athletic physiology) regarding Physiological indicators

- Test to measure lactic acid in the blood (after exercise)
- Measuring blood pH (after exertion)
- Completing a 100m backstroke

- Measuring lactic acid in the blood (after exercise)

- Performance method:

The swimmer performs the training curriculum using training methods. The researcher gives a rest period for 5 minutes, and after (5 minutes) have passed (1) in order to give the lactic acid a chance to leave the muscle and into the bloodstream. We start by placing the drill in the piercing device, then the drill is placed on one of the fingers. The drill is pressed after placing it on the side of one of the fingers, and after the drill enters to penetrate the surface of the skin, a blood sample approximately in size (5 micrometers) will come out and it is placed directly on a lactic acid measuring tape (strip). It is placed in the measuring chamber of the device (Lactate Pro), after which a (beep) sound will come out. This means that the volume of the blood sample has touched the exposed surface of the strip and the beginning of the measurement process, which will start counting down from 60 to 1 second, after which the reading for lactic acid will appear. In order to give more clarification of the device used (lactate pro), pictures of the device

- Blood pH measurement:

-Measurement method:

A blood sample of 5 cc is drawn from the brachial vein in the elbow area by a specialist after tying the swimmer's arm with a compression bandage (turna) and opening it to allow the blood to flow before drawing. The blood is then emptied into tubes with the swimmer's number written on it and a symbol (B) representing the dimension of effort, and placed in a cool box to be transported to the laboratory to measure the two blood pH variables. The blood pH is measured using litmus paper. This paper is graduated from (6-9), and when an amount of blood serum is added to it (it is about 10 microliters), we notice that the color of the paper changes to dark and that the limit of this change is the blood pH value.

- Test of completing a 100-meter backstroke swim
- Purpose of the test: to measure the time of covering a distance of 100 meters on the backstroke at maximum speed.
Tools used: stopwatches, whistle, registration forms.
Description of performance: The swimmer enters the pool and holds the starting board, taking a prepared stance for that. Upon hearing the whistle, the swimmer jumps into the water on his back, trying to cover the distance as quickly as possible until reaching the final edge of the allotted distance.
Laboratory grade: minute, second and its parts.
- Training methods used:
The researcher used training methods (which are rubber ropes, a swimming raft, weights for weights, swimming paws, and fins). The aim of the training methods was to raise functional efficiency and achieve a 100-meter backstroke, which included the use of weights, rubber ropes, fins for the feet, and swimmer's paws as a means of increasing resistance. Water that a swimmer encounters while crawling forward, The researcher relied on the opinions of experts and foreign sources in modifying some paragraphs of the training curriculum prepared by the trainer of the research sample in terms of intensity and size and in a manner consistent with the nature of the sample. The training curriculum included (12) weeks, with three training units per week. The researcher used the method of raising the training intensity for the first, second, and third weeks and reducing it in the fourth week to be an overcompensation phase, and raising it in the fifth, sixth, and seventh weeks, and reducing it in the eighth week in preparation for the tests. Dimensionality (2), At the end of the eleventh week, it begins to decrease in preparation for conducting the post-test for the research sample, where the training volume for arm work for both groups reached 14% of the total training volume. Both groups implemented the components of the training curriculum in all its details except for one paragraph, which is that the experimental group used special training methods as a training tool that was implemented within a set of repetitions for training the arms, which consists of (200 m) in the form of a set of repetitions (2 x 4 x 25 m) or (4 × 50 m) in the backstroke method - arms once and legs once. And with a higher intensity for what the swimmer does during the competition, meaning that the swimming speed strategy during the (100m) freestyle swimming competitions changes between every 50m (pool). Some swimmers' swimming speed for the first (50m) is faster than the last, and for some it is equal in speed. These strategies also change in the qualifiers and finals and according to the participating swimmers' physical, functional and tactical ability to swim each pool. Therefore, the researcher recorded the time of each pool and then extracted its average and took it as a measure of the 50m speed as a training intensity. Therefore, the researcher asked the members of the research sample to perform the same performance recorded in the pre-test and to emphasize the correct technique when performing strikes (arms and legs), and to maintain the technique.
2-5 – Statistical methods:
The researcher used the following statistical methods to process the results of the research test.
1. Arithmetic mean (x)
2. Standard deviation (p)
3. T-test: for corresponding samples

4: Presentation, analysis and discussion of theeresults:

4-1: Show results:

In order to achieve the research objectives and hypotheses in knowing the extent of the impact of the training methods used, it is necessary to shed light on the nature of the performance level of the members of the research sample in the 100m backstroke swimming, in addition to knowing the extent of the dispersion of its values from the average level of performance in that test - which is the standard deviation, which helps the researcher to Detection, diagnosis and prediction", through the following tables: -

- Displaying and analyzing the results of theepost-exertionaleblood test for the pre- and post-exertion tests.

Table (2) shows the arithmetic means, standard deviations, and calculated and tabulated T-values for the pre- and post-tests, and shows the two post-tests for the experimental and control groups for testing the concentration of lactic acid in the blood after exertion.

Group	Test				Calculated T Value	Tabular Value	Sig Type
	Pre		Post				
	Mean	Std. Deviation	Mean	Std. Deviation			
Experimental	13,38	1,84	15,24	0,79	3,17	1,921	Sig
Control	12,58	1,52	13,98	1,29	1,61		Non-Sig
Experimental			15,24	0,79	2,36	1,772	Sig
Control			13,98	1,29			

Table (2) shows the results of the pre- and post-tests for the concentration of lactic acid in the blood after exertion for the experimental and control groups. The results of the experimental group showed that there were differences between the pre- and post-tests. The arithmetic mean for the pre-test was (13.38) mmol/100 milliliters of blood, with a standard deviation of (1.84).). While the arithmetic mean of the post-test was (15.24) mmol/100 milliliters of blood, with a standard deviation of (0.79), and for the purpose of testing the significance of the differences in the arithmetic means of the pre- and post-tests for the experimental group, t-tests were used, The results showed that there were significant differences between the two tests, as the calculated T value was (3.17), which is greater than its tabulated value of (1.921), under a significance level of (0.05) and with a degree of freedom (4). As for the control group, the test results showed that there were differences in the arithmetic means between the pre- and post-tests. The arithmetic mean for the pre-test was (12.58) mmol/100 milliliters of blood, with a standard deviation of (1.52). While the arithmetic mean in the post-test was (13.98) mmol/100 ml of blood, with a standard deviation of (1.29), and for the purpose of testing the significance of the branches in the arithmetic means of the pre- and post-tests for the control group, a t-test was used. The results of the test showed that there were no significant differences between The two tests, The calculated T value was (1.61), which is smaller than its tabulated value of (1.921), under a significance level of (0.05) and with a degree of freedom (4). For the purpose of testing the significance of the differences in the arithmetic means of the post-test for both the experimental and control groups, The t-test was used, and the results showed that there were significant differences, as the calculated t-value was (2.36), which is greater than its tabulated value of (1.772), under a significance level of (0.05) and with a degree of freedom (8).

- Displaying and analyzing the results of the blood pH test after exertion for the pre-eand post-tests.

Table (3) shows the results of the pre- and post-exertion blood pH tests for the experimental and control groups.

Group	Test				Calculated T Value	Tabular Value	Sig Type
	Pre		Post				
	Mean	Std. Deviation	Mean	Std. Deviation			
Experimental	7,18	0,038	7,06	0,044	7,94	1,941	Sig
Control	7,20	0,012	7,13	0,013	12,96		Sig
Experimental			7,06	0,044	3,76	1,780	Sig
Control			7,13	0,011			

*At a degree of freedom (4) and a significance level of 0.05 *At a degree of freedom (8) and a significance level of 0.05

The results of the experimental group indicated differences between the pre-test and post-test scores. The pre-test arithmetic mean was 7.18, with a standard deviation of 0.038. In contrast, the post-test arithmetic mean was 7.06, accompanied by a standard deviation of 0.044. T-tests were employed to assess the significance of differences in the arithmetic means of the pre- and post-tests for the group empiricism. The results indicated significant differences between the two tests. The computed t-value was 7.94, exceeding the tabulated value of 1.941 at a significance level of 0.05 and with 4 degrees of freedom. The test results indicated differences in the arithmetic means between the pre-tests and post-tests for the control group. The pre-test arithmetic mean was 7.20, accompanied by a standard deviation of 0.012. In contrast, the post-test arithmetic mean was 7.13, with a standard deviation of 0.013. A t-test was employed to assess the significance of the differences in the arithmetic means of the pre- and post-tests for the control group. The test results indicated significant differences between the two tests, as the calculated t value was 12.96, exceeding the tabulated value of 1.941 at a significance level of 0.05 with 4 degrees of freedom, aimed at assessing the significance of differences in the arithmetic means for the post-test. A t-test was conducted for both the experimental and control groups, revealing significant differences. The calculated T value was 3.76, exceeding the tabulated value of 1.780 at a significance level of 0.05, with 8 degrees of freedom.

- Table (4) presents the arithmetic means, standard deviations, and outcomes for the pre- and post-tests of the experimental and control groups regarding the 100-meter backstroke swimming time variable.

Group	Pre		Post		f	f1	T Value		Sig Type
	Mean	Std. Deviation	Mean	Std. Deviation			Calculated T Value	Tabular Value	
Experimental	112	1	105,8	0,836	9	0,41	21,95	4.60	Sig
Control	112,2	1,9	111,8	1,6	3,7	0,67	4,86		Sig

Below the degree of freedom (4) and the level of significance (0.05)

Analysis of Table (3) and subsequent statistical treatments indicate statistically significant differences between the pre- and post-test results for the two research groups regarding the 100-meter backstroke swimming time. The calculated t-values for the experimental and control groups were 21.95 and 4.86, respectively. They exceed the tabular (T) value of (4.60) for a degree of freedom (4) at a significance level (0.05). The post-test results indicate development

of the aforementioned variable in both groups, with a significant difference favouring the experimental group. This suggests a varying effect of the training methods employed by the research sample on this variable.

Table (5) shows the statistical results of the comparison between the experimental and control groups in the 100m backstroke swimming time variable in the post-test.

Group	Mean	Std. Deviation	Calculated T Value	Tabular Value	Sig Type
Experimental	108,5	0,836	6,26	2,31	Sig
Control	111,8	1,6			
Under a degree of freedom (8) and a significance level of 0.05					

Table (4) shows the statistical results for the experimental and control research groups in the 100-meter backstroke swimming time variable. The experimental group achieved an arithmetic mean of (105.8) with a standard deviation of (0.836), while the control group achieved an arithmetic mean of (111.8) with a standard deviation of (1.6), while the calculated t value between the two groups was (6.26), which is greater than the tabular T value of (2.31) under a degree of freedom (8) and a significance level (0.05), which indicates that there is a significant difference between the two groups in the swimming time variable. 100 m on the back and for the benefit of the experimental group, which the researcher attributes to the influence of the training methods used by the experimental group

4-2 Discussing theeresults of tests for biochemical variables after stress for the pre- and post-tests

Tables (2) and (3) show the results of tests for biochemical variables (lactic acid, blood pH) after exertion. When observing these results for the experimental and control groups and for the pre- and post-test, we note that they were all significant and in favor of the post-test and for the two groups, except for the lactic acid test for the control group

it was random, and this does not mean that the lactic acid was not increased in this group. When we observe its results, we notice that it was much higher than it was in the pre-test, and this confirms that the experimental sample performed a high physical effort, which is the use of training methods. Since the intensity that was performed in this test was very high, the concentration of lactic acid increased with this intensity. This is confirmed by McCall and Katchi, who state, "During low effort and constant effort, the percentage of lactic acid in the blood does not increase beyond the range of the biological limit during rest, and when the intensity of the effort increases, the percentage of lactic acid rises above the normal limit (Abu Al-Ela Ahmed, 1996)." In addition, the researcher attributes the reason why lactic acid in the control group did not rise to the level of the experimental group, although it was significant in the control group, it did not reach the level of the experimental group, and this we notice in the significance of the post-tests. It was significant in favor of the experimental group because the high-intensity, codified training methods based on scientific foundations developed by the researcher and performed by the experimental group had a more effective effect than the traditional method. This is what was confirmed by "Muhammad Hassan Allawi" and "Abu Al-Ala" in legalizing the training load, as they stated that "the training load is the main means of producing physiological effects on the body, which achieves the improvement of its responses and then adapts the body's systems and raises the level. However, the use of the appropriate physical load is the important thing" . So that the physical loads are not less than the player's level and are not greater than the player's ability, which leads to poor health and causes stress and injuries. Therefore, rationing the training load is one of the most important factors for the success of the training program and thus improving performance" (Miyashita,M., 1997.p.p.4-

9). In addition, high and regular intensity is one of the basic components on which the training process is based, as both "Robergs" and "Roberts" define it as "the level of pressures used during the period of exercise" (Ahmed Mahmoud Al-Khadim, 1999) through which the body can increase its tolerance to the accumulation of lactic acid. It makes it a weak acid to the point where the pH balance in the muscle tissue does not tend to decrease quickly (Osama Riyad, 1987). When observing the results, we notice that as a result of the increase in lactic acid in the muscles, the blood pH value and the intensity of training decreased, and this result is consistent with what "Raysan Khuraibet" mentioned, that the blood pH depends to a large extent on the presence of lactic acid in the blood, just as the arterial blood pH decreases in extreme cases in athletes with High efficiency can drop to (7) and perhaps somewhat less than this" (Abu Al-Ela Ahmed Abdel Fattah, 2003).

4-3: Discussing the results of the 100m backstroke swimming test:

Analysis of Tables (4) and (5) indicates a significant difference in 100-meter achievement between pre- and post-tests, favouring the control group. Conversely, the experimental group showed no improvement, which the researcher attributes to the impact of training methods on swimming ability development. Thus, its effect on performance levels. Maglischo (2003) indicates that exercises utilising training methods for developing ability should be characterised by similarity and speed of movement, akin to competition. This principle was applied by both groups during the ability development exercises targeting the arms and legs within the training curriculum. The training regimen implemented for each participant resulted in a training effect and adaptation that enhanced performance time. The employed training methods, specifically swimming paws and fins, significantly influenced the muscular adaptation in the arms and legs, ultimately contributing to the improved performance time observed in the experimental group. Analysis of Table 5 indicates a clear and statistically significant improvement in the results of the two groups. The experimental and control tests for the post-test on performance time indicated an enhancement in achievement levels in the 100 m backstroke for both groups. The researcher attributes this development to the influence of auxiliary training methods, which significantly impacted the functioning of the arms and legs and the strengthening of their joint muscles. These factors are crucial for generating the driving forces necessary for moving the body forward while swimming on the back (Miyashita, M., 1975). "The maximum capacity for propulsion in the water is reached by pushing a large amount of water for the longest possible distance," the strength of the movements of the arms and legs. The researcher finds that the increase in loading achieved through the use of auxiliary training aids has achieved the goal of their use, and this is what It is consistent with what was indicated by (Beltz, J.D., D.L.Costill. 1988) that an increase in aerobic and anaerobic loading causes changes in the concentration of high-energy phosphate in the muscles performing the exercise. This explains the reason for the improvement in the level of performance of the arms and legs as a result of the loading of the experimental group, by increasing the resistance they face with the auxiliary training means compared to the loading in the control group. Also, the results of the physiological variables showed complete clarity about the effectiveness of the training means and helped to regulate the loads and pressures throughout the period training (Erik Bollen, et.al., 1989).

Conclusions and recommendations:

Conclusions:

- It has been shown that training using appropriate training methods to increase water resistance works to develop muscular ability in 100-meter backstroke swimming events.
- There is a clear discrepancy between the results of the experimental and control groupHassan Mohammed Baqirin the post-test in the 100-meter backstroke swimming time, in favor of the experimental group.
- The training program using standardized and traditional training methods contributed to an increase in the concentration of lactic acid in the blood after exertion, but its increase in the program using training methods was greater than the traditional program.

Recommendations:

- Using training methods to strengthen the muscles of the arms and legs to increase water resistance and its importance in developing the levelHassan Mohammed Baqirof achievement in the 100-meter backstroke swimming event:
- The necessity of relying on biochemical variables when evaluating training programs, and it is preferable to use them directly in the field and not on devices to obtain accurate results.
- It is preferable to use modern devices to measure biochemical levels that eliminate the need for laboratory analyzes and the difficulty of transporting blood samples, such as the device that was used by the researcher to measure lactate pro, due to its ease of use directly in any place and to give the result at the same time.

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Appendix

A model of training units for a training week for swimmers' training for ages 14-16 years

Sunday

Curriculum Content And Objective	Organization	Training Method
Warm up	200m backstroke + 100m pull-up + 4 x 50m (60 s)	Continuous swimming time: 10 minutes - heart rate 120-150 beats/minute
Endurance swimming	4 x 100m (25m right + 25m left) arm pull + 50m paw swim	Interval – 2 minutes (work + rest) 75% intensity*
Lactate production exercises	6 x 50 + 50m light swimming between each repetition	Repeat 90 seconds (work + rest), intensity up to 90%
Bearing swimming is a topical basis	4 x 100m, two legs only, long swimming fins	2.5 minute interval (work + rest) 75% intensity
Overload exercises	(8 x 20 m) using rubber ropes. Experimental swimmer M	Maximum intensity 90 seconds (rest + work) Maximum intensity
Recovery	400m gentle downhill swimming	Continuous swimming time: 6 minutes, light intensity
Size	2200m	
Tuesday		
Curriculum Content And Objective	**Organization**	**Training Method**
Warm up	600m (200m medley + 200m backstroke + 200m medley)	Continuous swimming time: 12 minutes, pulse up to 150
Endurance swimming	8 x 50m (25m right + 25m left) pulling arms and legs	Interval – 90 seconds (work + rest), 75% intensity
Capacity development exercises	2 (8 x 25 m) using experimental swimming ropes	Maximum intensity 60 seconds (work + rest) Maximum intensity
Bearing swimming is a topical basis	4 x 100m, two legs only, fins	2.5 minutes (work + rest), 75% intensity
Anaerobic threshold training	6 ×100m	90 seconds of repetition (work + rest) submaximal intensity
Recovery	4 x 100m increments (increasing the time to cover the distance for each repetition)	8 minutes, light intensity
Size	3000m	
Thursday		
Curriculum Content And Objective	**Organization**	**Training Method**
Warm up	600m (50m freestyle + 50m butterfly + 50m backstroke + 50m breaststroke x 3...)	Continuous swimming time: 12 minutes, pulse up to 150
Endurance swimming	8 x 100m (25m) arm pull + 25 legs 50m full swim	Interval – 2 minutes (work + rest) 75% intensity
Lactate production exercises	3 (8 x 25 m) swimming specialty	90 seconds (work + rest) + 3 dBm, intensity 90%
Bearing swimming is a topical basis	4 x 100m, two legs only, fins	2.5 minutes (work + rest), 75% intensity
Overload exercises	(8 x 20 m) using swimmer ropes. empiricism	Maximum intensity 90 seconds (rest + work) Maximum intensity
Recovery	400 m gentle downhill swimming	Continuous swimming time 8 min
Size	3200m	