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Dr. Wisam Sahib Hassan
Assistant Professor, Faculty of
Physical Education and Sport
Sciences, Al-Mustansiriyah
University, Baghdad, Iraq

A comparative study on some biochemical indicators of the efficiency of cellular regulation by different water temperatures and its relationship to the level of achievement among swimmers.

Dr. Wisam Sahib Hassan

Abstract

This study is one of the important topics that address a problem that still exists in the reality of our Olympic swimming sport due to changes that occur in the water temperature of the only swimming pool in which the training and competitions of swimmers of the national teams take place. The effect on the numerical level, as this study aims to identify the effect of some biochemical indicators at two different water temperatures on the achievement of swimmers. The experiment was conducted on them at two different water temperatures, which reached (27) and (21) degrees Celsius, and the changes that occurred in the biochemical indicators and on the digital level were observed. The researcher concluded that the temperature of the water ocean has a direct effect on the swimmer's body, which affects the functional organs, including biochemical, and low acid concentration. Lactic muscle and an increase in the concentration of sodium, potassium, and sodium carbonate within the normal limits, enabled the swimmers to achieve a better digital level.

Keywords: Training physiology/swimming

1. Introduction

1.1. Introduction and importance of the research

The temperature of the water ocean plays an important role in its impact on the athletic achievement of swimmers and on the functional organs of the body, including biochemical indicators, which in turn affect the digital level of the swimmers. Given the many factors and variables that affect the physical ability, it was necessary to conduct this study and search for positive and negative effects and try to take advantage of these variables or their isolation in order to avoid negative effects and find appropriate solutions to treat them, the difference that occurs in the water temperature and its impact on the swimmer and what happens to him during training or competition, which is the focus of research for cellular function, which is intercepted by metabolic waste, which accumulates after efforts and the transfer of minerals into and out of the cell as a natural result. Because of the interactions that meet the requirements of physical effort, the variation in water temperature will meet internal reactions of the cellular regulation mechanism, where vital organizations represent the first line of defense in the blood for any change in the value of pH (ph) and they work within a short period of time, fractions of a second to reduce the value of pH 69:1, the efficiency of this cellular organization, which represents the peak of the biological activity of cellular functions, maintaining the balance of concentrations of compounds and chemical elements, and liberating energy without stress or disruption in the system of its internal environment, so it is one of the internal indicators through which the athlete can achieve achievement.

The importance of the research lies in studying the variation of water temperature and the effects on the cellular organization of some biochemical indicators and thus their impact on the achievement of swimmers, which includes two theoretical and applied trends. Effects on swimmers' achievement. As for the practical importance, it benefits the swimmers themselves in knowing the negative and positive obstacles through which the digital level of swimmers is developed and improved, in an attempt by the researcher to supplement the scientific efforts to support those in charge of this sporting event.

1.2. Research problem

For every training process that is intended to be successful and progress in swimming,

Corresponding Author:
Dr. Wisam Sahib Hassan
Assistant Professor, Faculty of
Physical Education and Sport
Sciences, Al-Mustansiriyah
University, Baghdad, Iraq

in particular, it must take into account the various factors that may affect the training process, which are based on the scientific facts provided by field studies in various physical education sciences, which contribute to raising the level of achievement by maintaining the safety of swimmers, and this depends on simulating reality. The actual training environment and the continuous follow-up of everything in it, as from the researcher's observation when following the training of the national teams in Olympic swimming, talking with the swimmers and their coaches, and deliberating with specialists in the operation and maintenance of the only training pool for them, it was found that there is a discrepancy in the water temperature and this may affect the functional devices of the body. The swimmer, including some biochemical indicators, and thus affect their level of achievement, so it is necessary to delve into this study because of the importance of the impact of the water medium on the swimmer's body in order to contribute to the scientific efforts made in the physiology of sports training, which provides theoretical knowledge for coaches and those in charge of this game and applied to swimmers who want to swim. Reaching the best achievement in these Olympic events

1.3. Research objectives

1. Recognizing the differences in some biochemical indicators at two different temperatures.
2. To identify the effect of some biochemical indicators at two different temperatures on the achievement of swimmers.

1.4. Research hypotheses

1. There are significant differences in some biochemical indicators at two different temperatures
2. There are significant differences in some biochemical indicators at two different temperatures on achievement

1.5. Research Areas

1.5.1. Human scope: The swimmers of the national Olympic swimming team for the advanced category.

1.5.2. Spatial domain: The Olympic Indoor Swimming Pool.

1.5.3. Time range: from 3/24/2022 to 3/28/2022

2. Methodology

2.1. Research Methodology

The researcher adopted the experimental method, which is defined as "the method in which we treat and control an independent variable to see its effect on a dependent variable while noting the resulting changes and doing their interpretation, whether the experiment includes an independent variable and a dependent variable or more than one independent variable or more than one dependent variable" 214:4 This approach is in agreement with the accuracy of its results. The researcher followed the design of one experimental group with two pre and post-tests for the purpose of comparing the variables that affect this group.

2.2. The research community and its sample

The available research community is defined as "the community that refers to the available number of the target research community that the researcher can refer to directly in withdrawing the sample's vocabulary from it." 18:2 This community is represented by the Olympic swimming for the

advanced category of (20) swimmers in the 2021 sports season -2022. The research sample was selected from among them (10) random swimmers, who represent 50% of the original community. One of the reasons for the researcher to go to this community was to ensure their presence due to their commitment to regular training and also to ensure that similar experimental studies were not conducted on them throughout the duration of the experiment, as well as the cooperation of trainers. This category is to facilitate the task of the researcher, as the researcher has deliberately sought homogeneity from the research sample in some extraneous variables that may constitute extremism in the results of the tests, as shown in Table (1).

Table 1: Shows the homogeneity of all sample members in terms of age, height, weight and training age

Number	Variables	s	Mediator	+ p	Skew modulus
10	Chronological age (year)	20.75	19.00	0.51	0.32
	Length (meter)	1.7500	1.7400	.053	.342
	Weight (kg)	72.4	73.5	2.59	-.031
	Training age (month)	59.29	48.00	26.99	.830

2.3. Research devices and tools and means of collecting information

2.3.1 Means of collecting information

The Internet, the international information network Arab and foreign sources

- Exam results registration form for swimmers
- A paper questionnaire form for the opinion of experts and specialists

2.3.2. Research devices and tools

- Device (cobase411) for biochemical analyzes of blood samples
- Centrifuge electronic blood separator (2-80).

Blood-preserving tubes that contain an anticoagulant

- A special case for keeping German-made blood samples, number (1)

Plastic syringes and a rubber band to draw blood

Closed legal swimming pool.

- Electronic stopwatch number (4). Fox type whistle (1)

Electronic scale for measuring weight and height

2.4. Tests of biochemical indicators of the efficiency of cellular regulation

2.4.1 Testing the level of lactic acid concentration in the blood

Objective of the test: To measure the level of lactic acid in the blood after effort (5) minutes

Procedures and Conditions

1. After performing the physical exam, achievement in swimming
2. The tester sits without any effort after this test for (5) minutes
3. Conducting the test in the closed Olympic swimming pool by the analysis specialist, where blood was drawn from the members of the research sample by calling the swimmer, who sits on the chair and put the hand in a

comfortable place and spread it so that the face of the hand is up and then tie (compressive strap) with sufficient strength above until the vein becomes clear and then Clean the vein area with a cotton ball until it dries, then straighten the vein area with the finger of the left hand and place one of the fingers before the vein site by lowering the needle tip with the right hand over the left hand finger until the injection takes a 45 degree angle. After the blood is drawn, the blood in the syringe is drained And the amount of (5cc) in tubes containing an anticoagulant substance (Sodium Citrate)) and written on it the name of the swimmer and the sequence. This is to treat it chemically.

2.4.2 Testing the concentration of sodium bicarbonate in the blood

The objective of the test: To measure the concentration of sodium bicarbonate in the blood after (5) minutes of exertion

Procedures and conditions after performing the physical exam Achievement in swimming

1. The tester sits without any effort after this test for (5) minutes
2. Conducting the test in the closed Olympic swimming pool by the analysis specialist, where blood was drawn from the members of the research sample by calling the swimmer, who sits on the chair and put the hand in a comfortable place and spread it so that the face of the hand is up and then tie (compressive strap) with sufficient strength above until the vein becomes clear and then Clean the vein area with a cotton ball until it dries, then straighten the vein area with the finger of the left hand and place one of the fingers before the vein site by lowering the needle tip with the right hand over the left hand finger until the injection takes a 45 degree angle. After the blood is drawn, the blood in the syringe is drained And the amount of (5cc) in tubes containing an anticoagulant substance (Sodium Citrate)) and written on it the name of the swimmer and the sequence. It is chemically treated

2.4.3 Test to measure the level of potassium and sodium concentrations in the blood

The objective of the test: To measure the level of concentration (potassium K^+ and sodium Na^+) in the blood after (5) minutes of fasting

Procedures and conditions after performing the physical exam Achievement in swimming

1. The tester sits without any effort after this test for (5) minutes
2. Conducting the test in the closed Olympic swimming pool by the analysis specialist, where blood was drawn from the members of the research sample by calling the swimmer, who sits on the chair and put the hand in a comfortable place and spread it so that the face of the hand is up and then tie (compressive strap) with sufficient strength above until the vein becomes clear and then Clean the vein area with a cotton ball until it dries, then straighten the vein area with the finger of the left hand and place one of the fingers before the vein site by lowering the needle tip with the right hand over the left hand finger until the injection takes a 45 degree angle. After the blood is drawn, the blood in the syringe is drained And the amount of (5cc) in tubes containing an anticoagulant substance (Sodium Citrate)) and written

on it the name of the swimmer and the sequence. It is chemically treated

2.4.4 200m freestyle test

The objective of the test: to measure the achievement of the 200-meter freestyle swimming for the applicants

Procedures and conditions

The swimmer stands on the starting platform (start), and when he hears the whistle, he jumps from the platform and swims quickly. After the swim is finished, the time he has covered the distance is calculated, and then it is recorded in a special form prepared for this purpose.

3.1. Pilot experiment

The exploratory experiment was conducted in the closed Olympic swimming pool of the people on 3/22/2022 at exactly 3:00 in the afternoon and it took two hours to choose swimmers from the research sample. Facing the researcher while doing the main experiment

First major experiment

The first main experiment was conducted on 3/24/2022 at exactly 3:00 in the afternoon, and it lasted for two hours, as shown in the following

- The swimmers, the research sample, warmed up outside the swimming pool for a period of (15) minutes
- Then the research sample is descended to the swimming pool, in which the water temperature was set by the maintenance department in the pool, and by following up on the researcher, which amounted to (27) degrees Celsius, and a 10-minute warm-up procedure in the water Then get out of the pool and give a 5-minute rest
- And then a 200-meter free-swimming test is conducted on the research sample at a water temperature of (27) degrees Celsius, and upon completion of the test, the time taken for this distance is recorded by the assistants.
- After completing the test, the swimmer is given a 5-minute period, and then blood is drawn from the swimmer

Second major experiment

The second main experiment was conducted on 3/28/2022 at exactly 3:00 in the afternoon, and it took two hours, as shown in the following

- The swimmers, the research sample, warmed up outside the swimming pool for a period of (15) minutes
- Then the research sample is descended to the swimming pool, in which the water temperature was set by the maintenance department in the pool and by following up on the researcher, which reached (21) degrees Celsius for a 10-minute warm-up inside the water Then get out of the pool and give a 5-minute rest
- And then a 200-meter free-swimming test is conducted on the research sample with a water temperature of (21) degrees Celsius, and upon completion of the test, the time taken for this distance is recorded by the assistants.
- After completing the test, the swimmer is given a 5-minute period, and then blood is drawn from the swimmer

3.7 Statistical means

The researcher verified the results using the statistical bag system (spss) version (v26).

- Arithmetic mean
- standard deviation
- T-test for unrelated samples
- T-test of related samples

4. Presentation and discussion of the results

4.1 Presentation, analysis, and discussion of the results of the biochemical indicators tests for the research sample.

Table 2: Shows the statistical values of the experimental group in the biochemical indicators of the research sample

Variables	Comparison	s	p	x y	p	T	rror rateE	ndicationI
Lactic acid / mg / liter	(21) degrees Celsius	168.552	0.801	5.970	4.754	3.767	0.005	Moral
	(27) degrees Celsius	163.782	4.76					
Potassium mmol /L	(21) degrees Celsius	3.68	0.172	0.767	0.107	8.082	0.000	Moral
	(27) degrees Celsius	4.45	0.045					
Sodium mmol /L	(21) degrees Celsius	138.33	1.508	6.3	1.861	9.023	0.000	Moral
	(27) degrees Celsius	143.73	0.754					
Sodium bicarbonate mmol /liter	(21) degrees Celsius	12.23	0.973	1.33	0.884	5.466	0.003	Moral
	(27) degrees Celsius	14.13	0.403					

Through the above table, it is clear that there are significant differences in the test of biochemical indicators for the efficiency of cellular organization, where the arithmetic mean of lactic acid at water temperature was (21) degrees Celsius (168.552) and with a standard deviation of (0.801), while in the water temperature (27) degrees Celsius it was The arithmetic mean was (163.782) and the standard deviation was (4.76). The arithmetic mean of the differences between the two tests was (5.970), the standard deviation of the differences was (4.754), and the calculated t-value was (3.767) with an error rate of (0.005). Thus, the difference is statistically significant between the two tests. The mean The arithmetic mean for potassium at water temperature (21) degrees Celsius (3.68) and standard deviation (0.172), while in the water temperature (27) degrees Celsius, the arithmetic mean reached (4.45) and standard deviation (0.045), and the arithmetic mean of the differences between the two tests reached (0.767), and with a standard deviation of differences (0.107) and the calculated (t) value (8.082) with an error rate (0.000), and thus the difference is statistically significant between the two tests. At water temperature (27) d As a percentage, the arithmetic mean was (143.73) and the standard deviation was (0.754), and the arithmetic mean of the differences between the two tests was (6.3), the standard deviation of differences (1.861), and the calculated (t) value (9.023) with an error rate (0.000), and thus the difference is statistically significant between the two tests. In the two tests, the arithmetic mean of sodium bicarbonate at water temperature was (21) degrees Celsius (12.23) and standard deviation (0.973). Between the two tests (1.33) and with a standard deviation of differences (0.884) and the calculated t-value (5.466) and with an error rate of (0.003), so the difference is statistically significant between the two tests

In the light of the results of the tests for the biochemical indicators of the efficiency of cellular organization at water temperatures (21) and (27), it was found that there was a statistically significant increase in the biochemical indicators in favor of water temperature (27) degrees Celsius. Moderating the water temperature (27) by affecting the efficiency of the cellular organizations working in the muscle cells. This moderate temperature of the water helped activate the work of carboxylate transporters with the help of enzymes by slowing the accumulation of lactic acid as a result of high effort and thus raising the level of physical effort to the level of muscular ability On the one hand, it helps to get rid of metabolic waste, on the other hand, compared to the degree (21) which is the coldest, by affecting the efficiency of cellular organizations working in

muscle cells, which is more restrictive in the cold water, and this was confirmed by (Wilmore & costill.1994) 1: 1 That cooling the muscle causes its weakness, as mentioned (Ganong.1981) 6: 76 that cold weather makes the muscles weak in efficiency, as this change reduces the efficiency of muscle work and reduces the speed and strength of the muscle as When the temperature decreases, the increase in sodium carbonate in the moderate temperature (27) is a physiological response of the working cells to meet the requirements of energy supply in the cellular environment, as they tend to the basic ones to ensure the continuation of the efficiency of chemical reactions and this was confirmed by (2006, Muhammad Ali Al-Qat) 92:3 That sodium bicarbonate and hemoglobin are the main regulators of blood, and the importance of blood regulators appears in that they delay the decline in blood PH. It is clear from the results of increasing the concentration of sodium and potassium within their normal limits that the efficiency of biological control in working cells has been in a positive direction has helped in the continuation of the time of competition through The duration of the effort to reduce muscle pain, which instructs the kidneys to reduce their secretion, as these mineral elements are available in the working cells and enable them to complete the contractions in a stable chemical environment and under a moderate body temperature and this was evident at a temperature (27) Celsius, as potassium, sodium and magnesium work on The regulation of the base acid inside the muscle cell and requires its replacement in order to maintain this in high physical activity that results in the reaction Chemical agents that increase basicity as well as their role in regulating osmotic pressure 312:5.

4.2 Presentation, analysis and discussion of the results of the achievement tests for the research sample

Through the above table, it is clear that there are significant differences in the achievement test, where the arithmetic mean at water temperature was (21) degrees Celsius (2.18.4) and with a standard deviation of (0.846), while in the water temperature (27) degrees Celsius, the arithmetic mean was (2.15.8), with a standard deviation of (1.708) and the calculated t-value (2.788) with an error rate of (0.013), and thus the difference is statistically significant between the two tests.

In light of these results, it is clear that the swimmer’s ability to achieve a better digital level at water temperature (27), which is moderate and suitable for his body during the competition, through which he can achieve a better

achievement compared to the water temperature (21) and this was confirmed by (Foss & keteyin, 1998) 529 7: When the individuals are sufficiently isolated from the influence of cold water, the muscle strength, muscular elongation and achievement in the exercise are not negatively affected, but when the isolation is not sufficient, the muscular strength, muscular elongation, achievement and muscular coordination weaken, and (Oska & Colleagues) conducted an experiment by throwing several medical balls Different weights from above the head after exposure to a warm and cold environment for 60 minutes. They noticed that the

speed of the ball, as well as skin temperature and muscle temperature, were less in the cold environment, and these changes are accompanied by 30% to 42% increase in time to reach a level of muscle activity than in the warm environment, and also that the muscle Corresponding to the deltoid muscle, its activity increased as a result of the effect of the cold environment on it, and thus it negatively affected the muscular compatibility. The recruitment of motor units is negatively affected as a result of the cooling of the muscle. The temperate water has better performance than the cold water ocean.

Table 3: Shows the statistical values of the experimental group in the achievement test for the research sample

Variables	Comparison	s	p	T	rror rateE	ndicationI
Completing the 200m freestyle (minute)	egrees CelsiusD (21)	2.18.4	0.846	2.788	0.013	oralM
	egrees CelsiusD (27)	2.15.8	1.708			

5. Conclusions

In light of the foregoing, the researcher concluded the following

- The temperature of the water environment has a direct effect on the swimmer’s body, which affects the functional systems, including biochemicals. The decrease in the concentration of lactic acid in the muscles and the increase in the concentration of sodium, potassium, and sodium carbonate enabled the swimmers to achieve a better digital level.
- The water temperature (27) degrees Celsius is the most appropriate degree to achieve a better digital level for swimmers
- The water temperature (21) is considered a cold degree and affects the digital level of swimmers

5.1 Recommendations

In light of the foregoing, the researcher recommends the following:

- Conducting exercises in a moderate water environment, and the most appropriate degree for this is (27) degrees Celsius
- Researching different body indicators and functions in the swimmers’ body to know the extent of the effects that occur due to changes in the temperature of the water environment, which affects the swimmers’ achievement
- Researching different activities and categories in swimming and water sports
- Generalizing the results of this study to swimmers, coaches and those interested in sports and benefiting from its results

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