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## **Response of the level of hormonal activity regulating calcium action after anaerobic effort at different short distances in young free swimming**

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### **Abstract**

In this study, the researcher sought to know the work of hormones as physiological regulators, which are in various activities in a complex manner and are in a relationship of cooperation or antagonism, and this prepares the demand for a response to be able to self-stabilization. The blood whose secretion is affected in the event of a high or low level of calcium in the blood, and these hormones are (calcitonin and parathyroid hormone) in order to know the level of hormones regulating the action of calcium, as the athlete cannot achieve a better level unless the physiological functions of the body are compatible and this is what athletes aspire to, as The sample of the study was selected from the national team swimmers for free swimming, the youth category, who numbered (8) swimmers. A set of laboratory tests and analyzes in order to find out the response of calcium and the regulating hormones to it caused by the swimmer's body in an anaerobic effort with brain distances The distances of this effort were determined at a distance of (50 m) and (200 m) free swimming. After completing the experiment, the researcher collected the results and wrote down all the numbers that showed the results, and then they were statistically processed to know the final outcome of this study and in the light of what the researcher obtained from the results of this study It was concluded that there was an increase in the secreted values of calcium and calcitonin levels at a distance of 50 m freestyle and 200 m freestyle and the difference in height in favor of a distance of 200 m freestyle and also a decrease in the parathyroid hormone in a distance of 50 m freestyle and 200 m freestyle and the difference of the decrease in favor of a distance of 200m freestyle.

**Keywords:** Physiology of sports training/swimming

### **1. Introduction**

#### **1.1 Introduction and importance of the research**

It is clear that the development that comes when studies and experiments have a positive nature on the progress of science in various fields, so we have to focus on this study, which is in the field of sports physiology, which is one of the important sciences for workers in the field of sports, which contributes to the process of sports training, in which the light is shed On an important part in the human body and the development it takes place in the athlete's body, where hormones play an important role in providing muscles and nerves with energy, and they are also linked to restoring the formation of this energy 18:4. Sports training leads to various physiological changes that include all body systems, and the level of performance increases whenever these changes are positive in order to achieve the process of physiological change of the body's organs to perform the physical load and carry the performance with high efficiency. The process of physiological change and the response of the body's organs to the performance of the physical load takes place through the various body systems, including the hormonal system, the nervous system and the salts that help in this process, as the hormonal system works In addition to the nervous system, it regulates the rates of chemical activity of various cells and tissues of the body, where calcium ions play an important role in Many vital activities such as muscle contraction, blood clotting, enzyme activity, nerve irritation, hormone release, and membrane exudation, as well as being one of the important elements in the body's structure. One of the important functions of hormones is the balance of fluids and salts, the stability of the internal environment of cells, especially the composition of body solutions, and the responsibility lies with maintaining the stability of the concentration of calcium ions. In the body on hormones, so the importance of this study lies in determining the mechanism of action of hormones regulating the action of calcium after anaerobic effort by understanding this mechanism and its control over calcium and its provision in the work of muscle contractions in the short-distance variation in free

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swimming for young people and understanding the changes that occur in the anaerobic effort exerted in these Effectiveness, as the researcher believes in achieving results in this study that will be of scientific benefit to researchers and specialists in the field of swimming, including coaches and swimmers, to raise their abilities to achieve a better level of performance.

## 1.2 Research problem

The importance of the functional response caused by the athlete's body in sporting events must be of interest to researchers, knowledge of negative or positive changes and a full understanding of them to reach a better achievement, as it is not possible to reach a better level unless the physiological functions of the athlete are compatible with this level, as the research problem lies in the response that It is caused by the swimmer's body in an anaerobic effort at various short distances through the mechanism of action of calcium-regulating hormones and knowing the extent of the effect of these hormones on the work of calcium and the variables that occur on the values of these hormones, which have an impact on the level of performance of swimmers in achieving a better achievement in free swimming distances for young people

## 1.3 Research objectives

1. To identify the differences in the response of the level of hormonal activity regulating the action of calcium in tests before and after anaerobic effort at a distance of 50 m and 200 m free swimming for young people.
2. To identify the differences in the response of the level of hormonal activity regulating the action of calcium in the post tests after anaerobic effort between 50m and 200m free swimming for young people.

## 1.4 Research assignments

1. There are significant differences in the response of the level of hormonal activity regulating calcium action between two tests before and after anaerobic effort at a distance of 50 m and 200 m free swimming for young people
2. There are significant differences in the response of the level of hormonal activity regulating calcium action in the post tests after anaerobic effort between 50m and 200m free swimming for young people

## 1.5 Research Areas

**1.5.1** The human field: the swimmers of the national Olympic swimming team in the freestyle swimming for the youth category.

**1.5.2** Spatial domain: The Olympic Indoor Swimming Pool.

**1.5.3** Time range: from 3/6/2021 to 6/6/2021

## 2.1 Research Methodology

Choosing the appropriate approach and the nature of the research problem and its objectives are among the necessary requirements in scientific research. A method of thinking and action that the researcher adopts to organize his ideas, present them and analyze them in order to reach reasonable results and facts about the phenomenon under study" 5:217.

## 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 to which the researcher can refer directly to withdraw the sample items from it" 18:2

After the researcher deliberately determined the research sample, which is represented by the Olympic swimming in freestyle swimming for the youth category, which numbered (8) swimmers were chosen randomly and who represent (70%) of the original population. Extremism formed in the results of the tests as shown in Table (1)

**Table 1:** Shows the homogeneity of all sample members in the research variables

Variables	Arithmetic mean	Median	Standard deviation	Skewness
Calcium	8.2500	8.0000	.46291	1.440
hormone calcitonin	4.1250	4.0000	.83452	-.277
The parathyroid hormone	40.3750	40.0000	2.06588	.237

## 2.3 Research devices and tools and means of collecting information

### 2.3.1 Means of collecting information

Tests, measurements, modern technical devices and scientific sources have been used as means of collecting information

### 2.3.2 Research devices and tools

- Immulit1000 Elecsys2010 device for analyzing hormones in the blood.
- Spectrophotometer of ultraviolet and visible rays of English origin.
- Centrifuge of German origin
- Special kits for analyzing hormone and calcium levels, supplied by Bio-Merieux company
- HP type computer.
- Closed legal swimming pool.
- Electronic stopwatch (8). Fox type whistle (1)
- Electronic scale for measuring weight and height

## 2.4 Tests to measure the study variables

### 2.4.1 Tests to measure the level of the hormone (calcitonin, parathormone and calcium) in the blood

**Objective of the test:** To estimate the levels of hormones (calcitonin, parathormone and calcium) in the blood

**How to perform field tests:** In this test, it is measured in two ways

**First:** During the rest, where the research sample is organized and they sit in a designated place, then the specialist draws blood from the brachial vein of each swimmer of 5 cc and puts it in special anticoagulant tubes and writes the name of the swimmer on each tube and then is transferred to the laboratory for laboratory measurement. Upon completion of the laboratory treatment, all The numbers that showed the results and recorded and then were processed statistically to know the results of the measurements of hormones and calcium at the time of rest for the swimmers

**Second:** Immediately after completing the anaerobic effort

and their exit from the swimming pool, the research sample is organized in a designated place, then the specialist draws blood from the brachial vein of each swimmer of 5 cc and puts it in special anticoagulant tubes and writes the name of the swimmer on each tube and then is transferred to the laboratory for laboratory measurement. The completion of the laboratory treatment. All the numbers that showed the results are written down and recorded, and then they are statistically processed to know the results of the measurements of hormones and calcium after the anaerobic effort of the swimmers.

**2.4.2 Tests (50 m) (200 m) freestyle**

**Objective of the test:** Swimming at different distances with anaerobic effort (at full speed)

**How to perform the field test:** This is done by starting every two swimmers in a launch, which is after the swimmer is standing on the starting platform (START) and taking the correct position, which is that the feet are the width of the seat while standing and fix the toes around the edge of the starting base and then bend the upper part of the body forward and down and bend the hip joint with Bend the knees until he holds with his hands the front edge of the starting base. As soon as he hears the signal of the absolute, the swimmer begins to quickly push the arms forward to enter the body into the water, the arms and legs quickly, and when the swimmer reaches the end of the pool in a freestyle (50 m) swim, he exits the pool to perform the procedures for drawing blood either in Swimming (200 m) freestyle, doing the rotation and returning to the place from which he started, and so on until the required distance is completed, and after the swimmer finishes this distance, he exits the swimming pool to perform the procedures for drawing blood.

**3.1 Exploratory experiment**

The exploratory experiment is one of the tasks on which the researcher depends, so on 3/6/2021 the researcher conducted the exploratory experiment on a sample consisting of (3) swimmers from the research sample. This experiment aimed to identify the nature of work by the assistants and identify the main obstacles that may face The researcher during the conduct of the main experiment and also to ensure the safety of the devices and tools and how to perform the tests and the time taken for the tests, as well as how to deal with blood samples taken for the purpose of blood separation and to ensure the safety of the devices and tools used in that

**3.2 The first major experiment**

The researcher deliberately conducted tests and

measurements on 5/6/2021 on the research sample, with the help of the work team, and included the following:

- Performing the procedures for drawing blood from the research sample at rest time, then a warm-up was conducted for a period of (15) minutes, and after the completion of the warm-up, the swimmers were given a rest for a period of (5) minutes, and then
- Conducting a (50 m) free-swimming test for the research sample with two swimmers taking off in each launch and at full speed, provided that the swimmers keep warm and ready to start until their turn in the test arrives and immediately after completing the test
- Swimmers leave for a second blood draw
- Then all the numbered tubes of the swimmers for the two tests were collected at rest time and after effort and put them in a special folder and sent to the laboratory to be analyzed in the laboratory

**3.3 The second main experiment**

The researcher deliberately conducted tests and measurements on 6/6/2021 on the research sample, with the help of the work team, and included the following:

- Performing the procedures for drawing blood from the research sample at rest time, then a warm-up was conducted for a period of (15) minutes, and after the completion of the warm-up, the swimmers were given a rest for a period of (5) minutes, and then
- Conducting a (200 m) free-swimming test for the research sample with two swimmers taking off in each launch and at full speed, provided that the swimmers keep warm and ready to start until their turn in the test arrives and immediately after the completion of the test
- Swimmers leave for a second blood draw
- Then all the swimmers' tubes for the two tests were collected at rest and after effort and put them in a special folder and sent to the laboratory to be analyzed in the laboratory

**3.4 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 tests for the variables of the research sample**

**Table 2:** shows the statistical values of the experimental group in the tests before and after the effort in the variables of the research sample

Variables	Distance	The exams	Mean	P	S	P	T-test	Error ratio	Indication
Calcium mmol/L	50 m swimming	before the effort	8.2500	.46291	-.6250	.7402	-2.376	.049	Moral
		after the effort	8.8750	.64087					
	200 m swimming	before the effort	8.2500	.46291	-2.1250	1.24642	-4.822	.002	Moral
		after the effort	10.3750	.91613					
hormone calcitonin picogram/ml	50 m swimming	before the effort	4.1250	.83452	-1.0000	.53452	-5.292	.001	Moral
		after the effort	5.1250	.83452					
	200 m swimming	before the effort	4.1250	.83452	-2.1250	1.12599	-5.338	.001	Moral
		after the effort	6.2500	.46291					
hormone parathormone picogram/ml	50 m swimming	before the effort	40.3750	2.06588	4.5000	2.50713	5.077	.001	Moral
		after the effort	35.8750	.99103					
	200 m swimming	before the effort	40.3750	2.06588	7.0000	1.51186	13,096	.000	Moral
		after the effort	33.3750	.91613					

Through the above table of the statistical values of the research sample group in the two tests before and after the effort, it was found that there were significant differences in the test of calcium level in the blood, where the arithmetic mean of the test before the effort for a distance of (50 m), free swimming (8.2500) and a standard deviation of (.46291) and the arithmetic mean In the effort dimension test (8.8750), with a standard deviation of (.64087), the mean differences were (-.6250), the deviations were (.74402), the t-value was (-2.376), and the error rate was (.049), which indicates that there are significant differences Significantly between the two tests before and after the effort and in a distance of (200 m) free swimming, the arithmetic mean before the effort was (8.2500), and the standard deviation was (.46291) and the arithmetic mean in the test after the effort (10.3750) and the standard deviation was (.91613) and the mean differences reached (-2.1250) and differences The deviations are (1.24642), the (t) value is (-4.822) and the error rate is (.002), which indicates that there are significant differences between the two tests before and after the effort.

As for the calcitonin hormone test, the arithmetic mean of the test before the effort for a distance of (50m) free swimming was (4.1250), with a standard deviation of (.83452) and the arithmetic mean in the test after the effort (5.1250), with a standard deviation of (.83452), and the mean differences reached (-1.0000) and differences The deviation is (.53452) and the value of (t) is (-5.292) and the error rate is (.001), which indicates that there are significant differences between the two tests before and after the effort and at a distance of (200 m) free swimming. The arithmetic mean before the effort was (4.1250) and with a deviation Standard (.83452) and arithmetic mean in the test after effort (6.2500), standard deviation (.46291), mean differences (-2.1250), differences of deviations (1.12599), value (t) (-5.338) and error rate of (.001), which indicates that There are significant differences between the two tests before and after the effort.

As for the parathyroid hormone test, the arithmetic mean of the test before the effort for a distance of (50 m) free swimming was (40.3750), with a standard deviation of (2.06588), and the arithmetic mean in the test after the effort (35.8750), with a standard deviation of (99103), and the mean differences reached (4.5000) and the differences of deviations were (2.50713.) and a value (t) (5.077) and an error rate of (.001), which indicates that there are significant differences between the two tests before and after the effort and at a distance of (200 m) free swimming. The arithmetic mean before the effort was (40.3750) and with a standard deviation (2.06588) and average My arithmetic in the effort dimension test (33.3750) with a standard deviation (.91613) and the mean differences reached (7.0000), the differences of deviations (1.51186), the value (t) (13.096) and an error rate of (.000), which indicates that there are significant differences between the two tests Before and after the effort.

**4.2 Discussion results**

Through the results of the statistical values in Table No. (2) in the tests before and after the effort at distances of (50 m) and (200 m) free swimming for the research variables, these values showed significant differences in all the results of the tests. The researcher attributes the effect that occurs in the body as a result of physical effort from A change in the level of calcium concentration, as high physical exertion requires the amount of fast and strong muscle contractions, and thus leads to an increase in the demand for calcium, due to its importance in muscle contraction and the transmission of the nerve signal to the muscles. Calcium 107:7, that is,

when calcium ion and (ATP) are available in sufficient quantities, the filaments react to form actinomyosin and shorten by sliding on each other, and the effective passage of electrical excitations along and below the sarcolemma, calcium pumps release calcium ion from the sarcoplasmic reticulum to the sarcoplasm and then It works later to activate and contract the hairy row, this excitation begins with the arrival of the nerve stimulus to the muscle membrane through the motor end plate (motor unit) and this It agrees with what was mentioned by (Abdul-Fattah 1993) 3:100 [3] that reducing the latency period that precedes muscle contraction leads to an increase in the strength and speed of contraction. The shortness of the time of arousal irritation leads to an increase in the strength of arousal, and then an increase in the participation of the largest number of motor units, and this leads to an increase in the force of contraction. The moral differences of the hormones showed that they act as one unit in the balance of calcium in the body, which is evidence of the body's need for calcium in this effort and this was confirmed by ((Becker, *et al*, 2001, 478:6 [6] The balance of calcium and the influential systems through which it changes in the circulation of hormone levels such as parathormone, vitamin D3 and calcitonin depend on maintaining the Ca2+ balance. Therefore, we notice an increase in the level of the hormone calcitonin as this hormone is secreted in response to an increase in calcium in the blood, by inhibiting the work of bone-breaking cells, which are the cells responsible for breaking down bone tissue, which leads to the transfer of calcium into the blood. And its storage in the bone is 293:1, as the concentration of calcium ions in the plasma is the main catalyst for the secretion of calcitonin, and the rate of its excretion increases dramatically when the level of calcium increases. In the blood. The increase in the proportion of the hormone calcitonin is accompanied by a decrease in the parathyroid hormone, and through this discussion and through the results, the researcher sees that the variation in hormone levels is the result of the effect on the level of calcium in the swimmer's body and this came through the anaerobic effort at distances (50 m) and (200 m) free swimming Which brought about clear changes in the proportions of variables from rest to the effort that was put on the body, the hormonal effect regulating calcium has a primary role in maintaining calcium balance in extracellular fluids, and the result of the balance that occurs in this activity is to achieve a physical benefit for the swimmer's body, which is reflected in the level of performance Thus, achieving a better digital level, as some research and studies confirm that extreme effort in some sports may work on calcium deposits in the bones and then increase their resistance to external stress.

**Table 3:** shows the statistical values of the differences between the two distances in the variables under investigation in the test after effort

Variables	Distance	S	P	T	Error ratio	Indication
Calcium mmol/L	50 m swim	8.8750	.64087	-3.795	.002	moral
	200 m swim	10.3750	.91613			
hormone calcitonin picogram/ml	50 m swim	5.1250	.83452	-3.334	.005	moral
	200 m swim	6.2500	.46291			
hormone parathormone picogram/ml	50 m swim	35.8750	.99103	5.239	.000	moral
	200 m swim	33.3750	.91613			

And through the above table for the statistical values of the differences between the two distances after the effort for the calcium test, where the arithmetic mean in (50m) freestyle was (8.8750) and with a standard deviation of (.64087).

The arithmetic mean in (200 m) freestyle was (10.3750) with a standard deviation (.91613) and the t value was (-3.795) with an error rate (.002), which indicates the existence of significant differences between the two tests.

In the calcitonin hormone test, the arithmetic mean in (50 m) freestyle was (5.1250) and standard deviation (.83452) and the arithmetic mean in (200 m) freestyle was (6.2500) and the standard deviation was (.46291) and the value of t was (-3.334) with an error rate (.005), which indicates that there are significant differences between the two tests

In the parathyroid hormone test, the arithmetic mean in (50 m) freestyle was 35.8750, with a standard deviation of (.99103), and the arithmetic mean in (200 m) freestyle was (33.3750) and with a standard deviation of (.91613) and the value of t was (5.239) and an error rate (.000), which indicates that there are significant differences between the two tests

### 5. Discussion results

Through the statistical values in Table (3), there are significant differences between the two distances in the research variables in the tests after the effort. Hormonal, where we see that the intense effort in the time period for a distance of 200 meters increases the amount of muscle contractions and contractions. When the swimmer performs intense physical effort, some muscle contractions occur accompanying that effort and as a result of the body's need at this distance, which affects the supply of the body with greater quantities of calcium and that this causes an excitation of hormones Regulating calcium and creating a balance in it, and this is what is indicated by (Sperelakis & Banks, 1996) [9] 581:9 that intense exertion leads to a loss in bone mass, because the kidneys are rapidly affected by any change in the concentration of the parathyroid hormone in the blood, and it is initially responsible for regulating calcium in the blood. In a minute, we notice a greater difference in the deficiency of this hormone compared to a distance of 50 m, which is the time period and effort less 273:8, as the concentration of calcium ions in the plasma is the stimulus the chief secretion of calcitonin. The rate of secretion increases significantly when the level of calcium in the blood increases. The increase in the proportion of the hormone calcitonin is accompanied by a decrease in the parathyroid hormone. This was evident in the 200m freestyle distance and also reflected on the hormone calcitonin, which rises and is affected by the increase in calcium levels in the blood. It directly affects the levels of calcium and hormonal activity that provokes an increase and decrease in the secretion of calcitonin and parathyroid hormones. It has been observed, according to the statistical values in this table, that the greater the intensity of the effort for a greater distance, the more muscle contractions and the increased demand for calcium in the blood, thus increasing the secretion of calcitonin and the increase in the decreased level of the parathyroid hormone, and this It was clear in the statistical values with the results of 200 m freestyle swimming, so we see the difference in increase in favor of this distance at the expense of the 50 m freestyle distance and this is what was proven in the study that high levels of calcium in the blood are accompanied by a rise in the secretion of the hormone calcitonin and reversed by a decrease in the secretion of the parathyroid hormone, but the differences were according to the secretion amounts in The variables investigated by anaerobic effort and by varying the intensity and time of the effort with the distance

accomplished.

### 5.1 Conclusions

In light of the foregoing, the researcher concluded the following

- There is a significant effect between rest and after anaerobic effort on the levels of secretion in the research variables
- There is an effect of the distance and intensity of effort on the quantities secreted in the research variables
- An increase in the secreted values of calcium and calcitonin hormone levels at a distance of 50 m in freestyle and 200 m in freestyle, and the difference in height in favor of a distance of 200 m in freestyle
- Decrease in parathomon hormone in the 50 m freestyle and 200 m freestyle distances, and the difference in increase in the decrease in favor of the 200 m freestyle distance

It is noticeable that high levels of calcium are offset by an increase in the secretion of the hormone calcitonin and reversed by a decrease in the secretion of the parathyroid hormone.

### 5.2 Recommendations

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

- Conducting other studies on different swimming activities of different ages
- Conducting other studies in aerobic effort and at different distances on swimming activities in the research variables
- Generalizing this study to trainers and swimmers in order to know the mechanism of action of calcium and the hormonal activity that regulates its work and to benefit from their results.

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