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The effect of (ULTRA-short race pace) training on the record of swimmers in the 50-meter crawl stroke

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ABSTRACT

The effect of (ULTRA-short race pace) training on the record of swimmers in the 50-meter crawl stroke"

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The objectives of the research were to identify the effect of the ultra-short rest training method for racing speed on the maximum speed of the junior swimmers , the effect of the ultra-short rest training method for the racing speed on the pulse of the junior swimmers, and the effect of the ultra-short rest training method for the racing speed on the digital level for the junior swimmers in the 50- meter races. -100 meters, and the researcher used the experimental method for one group with (pre- and post-measurement). , swimmer stage under 15 years club (DR sports Academy) In the United Arab Emirates, participants in the Emirates Swimming Cup for the year 2019. The sample of the research was deliberately chosen for the swimming team under 14 years of age, who participated in the Emirates Swimming Cup, numbering 17 swimmers.

Abstracts:

Within the limits of this study and guided by its objectives and the steps followed in it to verify the validity of the hypotheses, in light of the measurements used, within the limits of the research sample and the statistical method used, the researcher reached the following conclusions:

1 -Digital development through the application of the training program in a manner(ULTRA-short race pace Throughout the training season, it is the mainstay of any training program

2 -use method ULTRA-short race pace As exercises throughout the training season to reach the extent of development through the application of the proposed training program

3 -The application of a codified training program that helps in reaching a rate of change in the improvement rates in favor of dimensional measurements over the course of the training season

4 -Rationing the training loads during the training season according to specific variables, including (record level for the 50 meters races)

Keywords: ULTRA-short race pace, swimmers in the 50-meter crawl stroke"

أثر التدريب بفترات الراحة والمسافة فائقة القصر بسرعة السباق على المستوي الرقمي للسباحين فى سباقات ال50 متر لسباحة الزحف على البطن "

المستخلص

جاءت أهداف البحث التعرف علي تأثير طريقة التدريب للراحة فائقة القصر لسرعة السباق علي السرعة القصوى للسباحين الناشئين و تأثير طريقة التدريب للراحة فائقة القصر لسرعة السباق على النبض للسباحين الناشئين وتأثير طريقة التدريب للراحة فائقة القصر لسرعة السباق على المستوى الرقمى للسباحين الناشئين فى سباقات ال50متر –100 متر واستخدم الباحث المنهج التجريبي لمجموعة واحدة ذات (القياس القبلي والبعدي).، سباحي مرحلة تحت ١٥ سنة بنادى (DR Sports Academy) بالامارات العربية المتحدة ، المشاركين في كأس الامارات للسباحة لعام 2019. وتم اختيار عينة البحث بالطريقة العمدية لفريق السباحة مرحلة تحت ١٥ سنة المشاركين ببطولة كأس الامارات للسباحة وعددهم 17 سباح.

وفيى حدود هذه الدراسة واسترشادا بأهدافها والخطوات المتبعة فيه للتحقق من صحة الفروض وفى ضوء القياسات المستخدمة وفى حدود عينة البحث والاسلوب الاحصائى المستخدم توصل الباحث الى الاستخلاصات التالية :

1- التطور الرقمي من خلال تطبيق البرنامج التدريبى بطريقة (ULTRA–short race pace على مدار الموسم التدريبى هو الركيزة الاساسية لاى برنامج تدريبى

2- استخدام طريقة ULTRA–short race pace كتدريبات على مدار الموسم التدريبى للوصول الى مدى التطور من خلال تطبيق البرنامج التدريبى المقترح .

3- تطبيق برنامج تدريبى مقنن يساعد فى الوصول الى معدل تغير فى نسب التحسن لصالح القياسات البعدية على مدار الموسم التدريبى .

4- تقنين الاحمال التدريبية خلال الموسم التدريبى وفقا لمتغيرات محدده منها (المستوى الرقمى لسباقات ال50 متر).

الكلمات المفتاحية: التدريب بفترات الراحة والمسافة فائقة القصر بسرعة السباق – المستوي الرقمي للسباحين –سباحة الزحف على البطن "

1. Introduction and Research Problem

Recent scientific research has focused on measuring and analyzing swimmers' functional efficiency and digital achievement. This evaluation is centered on examining classic training methods (classic Training Method (repetitive training, interval training - distance training, and Maglichko's divisions of aerobic and anaerobic activity) and striving to improve them and uncover creative scientific approaches that work. I need to increase swimmers' efficiency.

Given the peculiarity of the energy system in contests and training, two types of energy sources contribute to its creation via the aerobic system. Aerobic training attempts to improve the swimmer's ability to swim swiftly without accumulating too much lactic acid in the anaerobic system.

The anaerobic system is classified into two types: adenosine triphosphate and creatine phosphate (ATP-PC) and the lactic acid system (anaerobic glycation). Aerobic training attempts to improve the swimmer's ability to swim faster in the end of the race, when the PH rate drops (acidity increases). To degrees that are painful.(1:29)

Training methods vary depending on the annual training plan's unique requirements. Swimming training methods are based on sports training approaches. Athletics athletes adopted the interval training approach in the early twentieth century, and swimming coaches used it in the mid-1950s and after World War II. Athletic athletes used the training method on a regular basis. Between rest and work, this strategy evolved into a method of regulating the energy and pace expended, and with the advent of modern swimming, interest in long-distance swimming increased steadily. In 1950, Robert Kifoth, a coach at Bell University and the United States Olympic team, developed a training approach known as (wind speed). Requirements for labor and rest periods (30 x 50 meters with a 30-second rest period), which follow the principle of increasing intensity.

Cecil Colleine points out that there are different types of interval training using different rates of work and rest according to the following: (Training over distance - Speed training - Repetitive training - Slow interval training - Breath holding training - Fast interval training). (3: 20) - Maglishco (1983) presented 5 forms (threshold differential - maximum oxygen consumption - lactate tolerance - speed regulation - speed) a detailed division for developing energy systems in swimming and relied on dividing the aerobic system into three levels to develop endurance and the anaerobic system into three levels to develop speed and its

requirements in swimming and included basic endurance - anaerobic threshold differential - increasing aerobic endurance - lactate tolerance - maximum lactate production - maximum speed). (1: 20(

Guy Edison, the international swimming expert for the American Association, indicates that "Counsilman" in (1968) issued the first swimming book and dealt with training methods in swimming, including (interval training, land training, and the method of progressing with these methods during the training season. (10) Maglichco (2013) presented a new system called the training plan used around the world.

Training Schemes used around the world.

-It differed from what he presented as a method of training in swimming in (1983), as the new formation includes the following: Endurance training (aerobic / anaerobic).

1. Recovery training.
2. Aerobic threshold training.
3. Anaerobic training for the lactate sample.
4. Aerobic / anaerobic training.
5. Maximum oxygen consumption training.
6. Super maximum oxygen consumption training.

a. Speed training.
b. Speed Load training Lactate.
c. Speed Lactate production training.
d. Speed Endurance training (lactate)(13).

In the recent period since the year (2011) where the innovative method "Rushall" appeared, which is based on the interest during the training units of the race system in terms of energy systems, technical performance and training on the speed of the race, where criticism was directed at the traditional method followed in the world since the year (1983) according to the training methods presented by Maglishco, where among the criticisms of the traditional method is that it does not deal with the specificity of the race and does not give an opportunity to improve race times, and many swimmers are exposed to burnout as a result of overtraining and are exposed to many injuries(14) .

"Rushal" (2014) presented a study paper to identify the main features of the proposed method for high-intensity swimming speed regulation training.

Ultra Short Race Pace Training (USRPT) and the traditional method.

"Rushal" indicates that the idea of modern training (USRPT) was addressed (50) years ago and is based on the physiological benefit of high-repetition work with short rests and the system followed in the modern method is not performed without attention to technique and

attention to the specificity of combining the energy system and technique at a specific swimming speed and therefore it is the only method used to improve the technical performance of swimming and energy. (14)
Scientific research in the field of swimming indicates that individual races include the physiological system of stored oxygen without (lactate) and anaerobic energy is the prevailing system when dealing with fast muscle fibers type II "llb fibers" and is developed through the oxidative energy system and there are a few coaches who do not understand the nature of energy supply for the race as an activity as the large amount of energy comes from stored oxygen and represents the (lactate) system. After the start of the race, the rate of (lactic acid) increases according to the presence of oxygen consumption as the production of (lactate) increases and balancing processes occur to remove it so that the swimmer does not stop at the end of the race or his ability decreases.(18)
The following equation illustrates the contents of the innovative method "Rushall" where:
Ultra-short rest periods at race speed = technical swimming performance specialization + adjustment and guidance by the coach + specificity of the psychological aspect + special fitness for the race.
Carlly Forbs (2015) confirms that during a period of 30-40 years there were arguments about the modern method of speed training (USRPT) when it was compared to the method of slow swimming for long distances and was formulated and prepared to train young swimmers and that the modern method is more enjoyable than the traditional method and Rushall codified the modern method and subjected it to scientific application in 1960 and this method was used in the Tokyo Olympics and Germany and the Australian Olympics (9). Scientists wonder that many athletes are surprised why young swimmers perform long distances and swim at a slow speed when they are prepared for 50 m, 100 m, 200 m, 400 m races. Why do many swimmers get injured and do not reach their maximum capabilities and why do many talented swimmers reach the point of burnout and swimmers drop out as a result of injury(14) .
Geryson (2010) indicates that aerobic training is the most widely used factor in the traditional training method and recommends its use in training for pre-adult swimmers.(9) .
Thabata et al. (1996) indicate that high-intensity rapid training can improve aerobic capacity and many coaches and experts advocate this new concept (USRPT) in addition to traditional training for endurance training and many coaches support adding a sufficient amount of moderate, moderate and low intensity training.(17)

Rushall (2014) indicates that the modern method (USRPT) is concerned with the following:

- It is the only method that uses the specificity in the energy system for racing with good technical performance.
- Physiological adaptation occurs in the three energy metabolism systems that allow the development of other forms of the traditional swimming method program.
- It gives rapid effects over the traditional training method as it produces a large amount of specificity to stimulate racing techniques.
- Sensitivity in avoiding overtraining and enabling the swimmer to recover(19) .

The modern method (USRPT) is based on the use of training methods on the following physiological system:

- Aerobic energy for slow muscle fibers and is included under the groups of aerobic levels.
- Conversion to the basic part of aerobic work in fast muscle contraction fibers to use oxygen.
- Binding oxygen to hemoglobin and myoglobin to reach maximum performance and not only aerobic capacity and including oxidative intensity.oxidative capacity (18)

Through the previous review of the existence of two methods for swimming training and the presentation of each method and its scientific basis, the need for a study appears to identify the effect of the (ULTRA-short race pace) method on some technical variables in swimming and the digital level of swimming in speed races. This study may become clear to clarify the extent of adaptation as a way in which each method tries to perform the best for swimmers. It may be assumed through the study the adaptive return to raise the digital level. And the serious scientific attempts of scientists through scientific methodological steps to invent modern methods that help the trainer to reach the best results in speed races.

2. Research objective:

The impact of ultra-short race pace training on young swimmers' records in 50-meter competitions.

Research hypothesis:

1- There are statistically significant differences between the pre-measurement and post-measurement of the digital level of the 50-meter races.

Research terms:

1. **Ultra-Short-Race-Pace Training**
   Short-segment race pace training (USRPT) using a similar approach to HiiT- using more recovery periods with emphasis on learning skills.
2. **High intensity training**
   Involves performing long rest efforts such as 25 sec sprint over 3 sec.
3. **High intensity interval training**
   Features maximum effort training with short rest periods such as 8 x 25 / 10 sec.
4. **Traditional Training**
   High volume training with emphasis on aerobic intensity and training at speeds below race pace.

Related Studies

1. The study of "**Mr. Fakhry" (2014) entitled "Blood lactate, critical speed, fatigue resistance and performance indicators during the training season in swimming**", and the study aims to determine the relationship between each of the critical speed and technical performance indicators for junior swimmers during the stages of the training season, and to determine the relationship between each of the blood lactate rate and fatigue resistance for junior swimmers during the training season, and the dynamics of the relationship between the values of blood lactate rate measurements, fatigue resistance and critical speed for junior swimmers during the sports season, and the study followed the descriptive approach, and the study sample was chosen intentionally for Nasr City Sports Club swimming for speed and distance swimmers and participants in the Republic Championships for the year (2013) under (14,13 years) and their number was (30) swimmers, and the results of the study concluded that the lower the blood lactate rate in a distance of (200 meters), the greater the ability to resist fatigue and the increase and improvement of the length rate The intensity increased, the stroke frequency rate increased, the critical speed rate increased and

improved, the digital level for swimming (200) meters decreased and improved, and the digital level for swimming (100) meters decreased and improved (4)

2. The study of **"Ahmed Samir Al-Shishtawy" (2015) entitled "Evaluation of some training programs for junior swimmers in the Arab Republic of Egypt"**, and the research aims to evaluate the training programs for junior swimmers in the Arab Republic of Egypt in order to identify the objectives and content of the training programs for the junior stages as well as the methods and techniques of implementing the programs and the human and material capabilities in implementing the training process. The researcher conducted the basic study on (44) trainers of junior swimmers' teams in the clubs that were previously tested randomly from various clubs in the Arab Republic of Egypt by distributing evaluation forms for the training programs for junior swimmers in the Arab Republic of Egypt that were prepared in advance. Many personal interviews were also conducted with the trainers within the sports clubs as well as during the Alexandria Winter Region Championships and the Egypt Cup. The most important results that were reached were the existence of weaknesses in the sports training planning process, the lack of familiarity by the trainers with the time limit for the long-term planning process, and the existence of some weaknesses in the sports preparation process, whether (physical, skill, tactical, mental, psychological). Most coaches are not familiar with the physical qualities that should be focused on at each age stage, as well as most coaches are not familiar with how to distribute training loads over the training season in terms of volume and intensity, and the lack of all the capabilities for sports training such as (measurement and evaluation tools through specialized tests in swimming, nutritional meals, player incentives, physical therapy), and the clubs' lack of interest in holding training courses that aim to refine coaches and provide them with modern developments in the field of swimming training (2).

Related English Studies

1- The study of **Christophe Zenner and others (2011) entitled "Comparison of three different stride tests for competitive swimmers"** aims to compare three tests to determine the differences in speed below the maximum under (3-4) millimoles of lactate

concentration. The study sample included (10) swimmers who performed the three tests. The tests included a system for a fixed distance of (200) meters, but the intensity of the effort was distributed and varied throughout the duration of the test. The third test included swimming for a fixed time of (3) minutes and the lactate concentration was measured at the end of each distance. In the system for the fixed time, swimming was performed slowly. The results of the study showed that swimming with the fixed distance system showed a speed lower than the maximum lactate rate, which ranged between (3-4) millimoles, which was compared to the fixed time (7).

2- The study of **Silva et al. (2013) entitled "Aerobic and Anaerobic Performance of Restricted Swimming**". The purpose of this study was to know whether the critical power and anaerobic capacity of restricted swimming are reflected in the aerobic and anaerobic performance of swimmers. The study sample included (12) swimmers who performed the restricted swimming test. Lactate, anaerobic threshold, maximum absorption of oxygen into the body, and power associated with maximum oxygen consumption were determined. The swimmers performed four alternating exercises (130, 120, 110, 100%) of the maximum oxygen consumption, in order to calculate the critical power, anaerobic capacity, and heart rate. The time was recorded during the performance of (400, 200, 100 m) for the anaerobic fitness of the swimmers outside of restricted swimming in an attempt to determine the swimmers' performance. In addition, there was a significant correlation between the critical power and the maximum oxygen consumption, and on the other hand, there was a significant correlation between the anaerobic capacity and anaerobic fitness. The results of the study concluded that through the critical power and anaerobic capacity, they can be used to evaluate lactate, the anaerobic threshold, and anaerobic fitness and to predict (400, 200, 100 m) freestyle swimming (17).

3- The study of **"He W" 1 & "Kiawi" & "Kwa Z" & "Fu Sj" He W 1, Xia W & Cao Zd & Fu Sj (2013) entitled "The effect of long-term training (endurance) on swimming performance and biochemical variables occurring during the Cyprinus Carpio cycle"**, the aim of the research was to identify the effect of using

long training periods (endurance training) on swimmers' performance (digital average) and the biochemical changes accompanying that performance during (Cyprinus Carpio). The researchers measured the critical speed for swimming as well as the excess oxygen consumption after this process (EPOC), the activity of red and white muscle enzymes (fast and slow) and tissue contents through the basic substrates (glycogen and glucose content in muscles and liver) and lactate concentration (plasma lactate in muscles) after training (60% Ucrit for a period of 4 weeks) for untrained swimmers, and measured the indicators Biochemical profiles of trained and untrained swimmers immediately after Ucrit critical velocity training, and after full-scale aerobic training (aerobic training) for the experimental group. The Ucrit critical velocity results indicated a significant improvement after endurance training, most likely due to improved tissue metabolic capacity. Improvement was found in red muscle tissue, and energy storage increased. Glycogen contents were found to be higher in the liver and muscles than in the rest of the components. However, tissue glycogen contents were lower after Ucrit, and lactate content decreased after Ucrit. This is due to the possibility of improved aerobic metabolic capacity. Lactate clearance in trained swimmers may contribute to improved aerobic swimming performance compared to Ucrit. Plasma achieved higher levels of muscle lactate content. The study showed that endurance training had no effect on anaerobic metabolic performance. Trained swimmers also showed a higher rate of energy production waste (lactate). Muscle lactate content was also lower after the recovery period following training compared to untrained swimmers. Glycogen contents in the liver and muscles decreased more after full-scale training in trained swimmers, indicating that aerobic work exercises can contribute to improved utilization of the supports during aerobic exercise (11).

4- The study of **Mario André et al. (2016) entitled "Critical anaerobic speed and sprint speed performance in swimming for elderly swimmers"** aimed to determine and analyze the relationship between critical anaerobic speed and short-distance swimming performance for senior level swimmers. The research sample consisted of (24) male swimmers. Critical anaerobic speed was measured by measuring swimming three distances (15-25-50 meters freestyle). The time data for the three distances were recorded for each swimmer using the relationship between distance and time and

comparing the best performance in swimming a distance of (100-200 meters). The researchers used the experimental method, and the results of the study concluded that critical anaerobic speed was better in swimming distances (15-25 meters), as their arithmetic averages ranged (0.22 ± 1.25 m.s), which is much lower than the critical anaerobic speed for swimming a distance of (15-25-50 meters). The arithmetic means for these distances ranged (0.23 ± 1.29 ms) and the arithmetic means for the critical anaerobic speed for swimming distances (25-50 m) were (0.22 ± 1.31 ms). A comparison was made and the relationship between the three distances was determined, as the critical anaerobic speed for swimming distances (15-25) was faster and better than swimming distances (25-50 m) and (15-25-50 m). The critical anaerobic speed was related to the strength of performance in swimming distances (25-50-100 m) freestyle swimming at a statistical significance level above (0.01%) and the "F" value was above (0.90%). The performance of swimming distances (25-200 m) was at a statistical significance level (0.01%) and the "F" value was less than (0.90%). Thus, the critical anaerobic speed can be used as a good indicator. For races (100 meters) and its use as a guide method for short-distance races (25-50 meters) race speed, monitoring, evaluation and determination of anaerobic training for swimmers of the highest levels, and it is an inexpensive and ordinary method through which the analysis of lactate in the blood can be evaluated (16).

5- The study of **Yuki Inoue et al. (2016) entitled "Using the critical stroke rate in the training period for competitive swimmers"** aimed to identify the effect of using the critical stroke rate in the training period for competitive swimmers and to know whether the critical stroke rate is a guide and indicator for determining the duration of the training intensity for competitive swimmers. The study sample consisted of (7) swimmers and the number of strokes and the time of swimming distances (200-400 meters) freestyle swimming were calculated. A (4 x 400) freestyle swimming test was conducted using the training speed. The results of the study concluded that the average swimming speed during the test performance is related to the critical speed, the duration of the test, the stroke length, and the measurement of blood lactate, and that the increase in the stroke rate increases the swimming speed. The critical

stroke rate can be used as an indicator of endurance training and the duration of training (24)

6- Maglishco's study (2013) aims to describe the theory of why high-intensity training is used to improve aerobic capacity, in addition to identifying some types of repetition groups that affect training of fast muscle mechanisms. (14)

3. Research Procedures

3.1.Research Methodology

The researcher used a single-group experimental approach with pre- and post-tests.

3.2. *Research Population and Sample*

3.3 *Research Population*

Swimmers in the under-15 category at the DR Sports Academy Club in the United Arab Emirates, participating in the 2023 Emirates Swimming Cup.

3.4.Research Sample

The research sample was intentionally selected from the 17 swimmers in the under-15 category participating in the Emirates Swimming Cup.

Table (1)

Description of the Research Sample in Variables (Age – Height – Weight)

Variables	Mean	Standard Deviation	Median	Skewness
Age	18.041	2.053	18.500	-0.554
Height	166.33	3.806	166.500	-0.946
Weight	53.166	3.930	54.00	-0.229

It is evident from Table (1) that all skewness coefficient values for the variables (Age – Height – Weight) fall within the range of ±3, indicating that the data for these variables are normally distributed.

4. Research Steps:

4.*1.* Exploratory Experiment:

The researcher conducted the exploratory experiment on (5) swimmers of the same age group, outside the sample subject to the research. This was done to identify any difficulties the researcher might encounter during the main experiment and find appropriate solutions. The exploratory experiment aimed to:

- Train assistants to conduct the tests.
- Design a measurement and testing form for training methods.

4. *2.*Pre-test*:*

The pre-test was conducted at the beginning of the third week of general preparation on January 15, 2023.

5. Main experiment:

Timeline and topics of the training program

Table (2)

Training program axes

Program	Date
Emirates Cup 2023	28-29/06/2023
Training program	1/1/2023 – 29/06/2023
Number of Weeks training	26 weeks
Training Unit	156 unit
Number of unit per Week	6 training
Number of Hour trainig	312 Hour

Table (3)

Training season schedule

	Season periods		Number of weeks
1	Preparation period	General preparation	12 Weeks
2		Special preparation	8 Weeks
3	Competition period	Intense training (pre-competition)	5 Weeks
4		Tapering	1 Week

5.1.Training Program Design:

The training program was designed for a one-season (microcycle) swimming class to participate in the 2023 UAE Cup. The program included the following periods (general preparation, specific preparation, intense training (pre-competition), and cool-down or warm-up). The technical principles and foundations were taken into account when designing the training program:

- Taking into account the specificity of the age group in terms of (volume, intensity, and rest intervals.(
- Taking into account the gradual increase in training load during the various stages of the training season.
- Taking into account the timing of tests and measurements during the training season to standardize training loads.
- Taking into account the pre-test during the third week of general preparation and the post-test during the UAE Swimming Cup Championship for the 2023 season on June 28-29, 2023.
- Taking into account swimmers' continued attendance and adherence to the training program to ensure its implementation across all swimmers under study.
- The intensity was gradually increased from the first week through the fourteenth week of the intensive training period. The intensity was determined based on the threshold (the threshold tests at the beginning of the season.(
- Taking into account external factors that affect training (player absences, changing schedules.(
- Six training sessions have been launched since the beginning of the training season.
- The training season for one tournament runs from January 1, 2023, to June 29, 2023.

Table (4)

Sample weekly program (one micro cycle)

The third week of the Specific preparation period

	Sat	Sun	Mon	Tus	Wed	Thu
PM	En1	ULTRA	Sp3+En1	ULTRA	En3	ULTRA

Implementation of the Basic Experiment:

The researcher implemented the program on a sample of (24) junior swimmers under 17 years of age for a period of (26) consecutive weeks, from January 1, 2023 to June 30, 2023. The researcher conducted measurements of the variables (digital level) with the assistance of (3) assistant coaches.

Measurement Plan During the Training Season:

Measurements were conducted during the training season at the following times:

- Third Week (General Preparation): Digital level measurements were applied.
- (Competition Period): Maximum speed, pulse, and digital level measurements were applied.

Tools, devices and tests used in the research:

Tools and equipment used:

a. Swimming pool
b. Stopwatch
c. Medical scale for measuring weight
d. Restameter for measuring height

Tests and measurements used in the research:

1- Record for 50 M Freestyle

General framework for modern method training (USRPT)

1. Short T. Warm. U
2. Skills Technique Introduction
3. USRPT (First Set)
4. First Recovery
5. Second USRPT Set
6. Second Recovery
7. Third set (USRPT)
8. Session Recovery

Statistical processing:

The researcher conducted the appropriate statistical procedures for the nature of the research using the SPSS program, as follows:

1. Arithmetic mean

2. Standard deviation
3. Median
4. Skewness coefficient
5. Percentages
6. Significance of differences
7. Rates of change

6. Presentation and discussion of results:

Based on the study's hypotheses, the researcher deemed it necessary to clarify the direction of presenting and discussing the results:

1- The first direction states, "There are statistically significant differences between the pre- and post-tests in the numerical level of the 50m races, in favor of the post-test."

Table (5)

Significance of Differences and Percentages of Change Between Pre- and Post-Measurements in Performance Level of the Research Sample

Variable	Pre-Measurement		Post-Measurement		Mean Difference	Std. Deviation of Difference	Significance of Differences	Significance (p-value)	Percentage of Change
	Mean	Std. Deviation	Mean	Std. Deviation					
Performance Level	33.025	3.037	30.664	2.885	14.22	2.361	0.813	0.00	7.1

It is evident from Table (5) that there are statistically significant differences between the pre- and post-measurements in performance level, favoring the post-measurement. The percentage of change between the mean pre-measurement and the mean post-measurement was (7.1%).

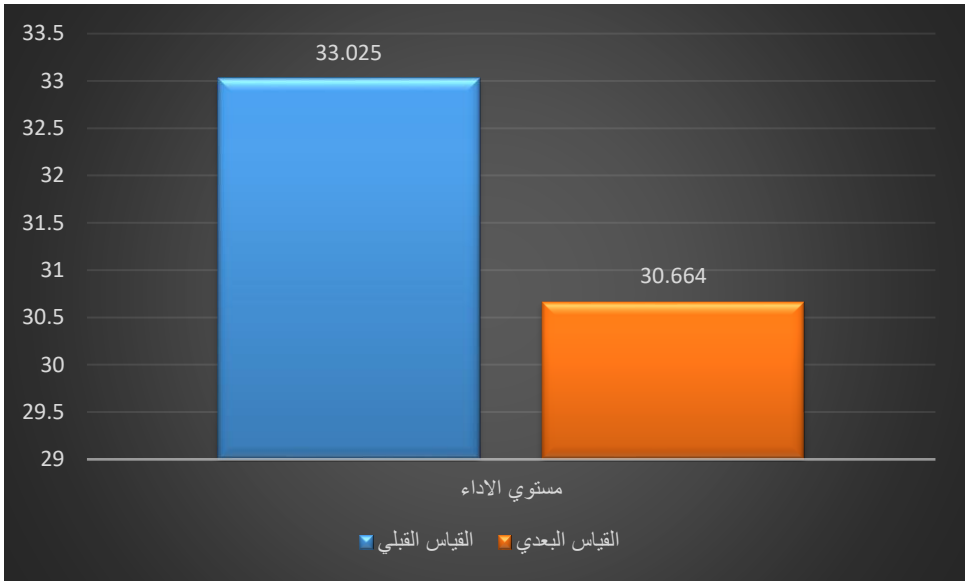

Figure (1)

Percentages of change between the pre-measurement and the post-measurement at the 50-meter digital level

Discussion of results:

Discussing the results of the first hypothesis, which states: "There are statistically significant differences between the pre-measurement and post-measurement of the digital level of the 50-meter freestyle in favor of the post-measurement".

The results of Table No. 1 and Figure No. 1 indicate that there are statistically significant differences between the pre-measurement and the post-measurement in favor of the post-measurement in the digital level variable for the 50-meter race at a significance level of (0.05) that reached (7.1%)

These results are consistent with the study of Sayed Fakhry (2014) entitled "**Blood lactate, critical speed, fatigue resistance, and performance indicators during the swimming training season**." The study aims to determine the relationship between critical speed and technical performance indicators for junior swimmers during the training season stages, and to determine the relationship between blood lactate levels and fatigue resistance for junior swimmers during the training season, and the dynamics of the relationship between blood lactate levels, fatigue resistance, and critical speed for junior swimmers during the sports season. The study also agrees with the study of Ahmed Samir El-Shishtawy (2015) entitled "**Evaluation of some training programs for**

junior swimmers in the Arab Republic of Egypt." The research aims to evaluate training programs for junior swimmers in the Arab Republic of Egypt in order to identify the objectives and content of training programs for junior stages, as well as the methods and techniques for implementing programs and the human and material capabilities in implementing the training process.

In agreement with the study of He W1, Xia W, Cao Zd & Fu Sj (2013) entitled "**Effect of long-term (endurance) exercise on swimming performance and biochemical variables occurring in the cycle of Cyprinus carpio**", the results of the critical speed (UCRIT) indicated a significant improvement after endurance exercise, most likely due to improved tissue metabolic capacity. Improvement was found in red muscle tissue, energy storage was increased, and glycogen contents were higher in the liver and muscles than in the rest of the components, but tissue glycogen contents were lower after UCRIT. Lactate content was decreased after UCRIT, possibly due to improved aerobic metabolic capacity and lactate clearance in trained swimmers.

He W1, Xia W, Cao Zd & Fu Sj (2013) studied "**Effect of prolonged endurance exercise on swimming performance and biochemical variables in Cyprinus carpio**". The researchers measured critical swimming speed, excess post-exercise oxygen consumption (EPOC), red and white muscle enzyme activity (fast and slow), tissue contents of substrates (glycogen and glucose content in muscle and liver), and lactate concentration (muscle plasma lactate) after training (60% Ucrit for 4 weeks) in untrained swimmers.

These results are consistent with the study of Silva et al. (2013) entitled "**Aerobic and Anaerobic Performance of Restricted Swimming**". The purpose of this study was to determine whether the critical power and anaerobic capacity of restricted swimming are reflected in the aerobic and anaerobic performance of swimmers. The study sample included (12) swimmers who performed the restricted swimming test. Lactate, anaerobic threshold, maximum oxygen uptake, and power associated with maximum oxygen consumption were determined. The swimmers performed four alternating exercises (130, 120, 110, 100%) of maximum oxygen consumption, in order to calculate the critical power, anaerobic capacity, and heart rate. The time during the performance (400, 200, 100 m) was recorded for the anaerobic fitness of swimmers outside of restricted swimming in an attempt to determine the swimmers' performance. In addition, there was a significant correlation between the critical power and maximum oxygen consumption.

The study agreed with the study of Christophe Zenner et al. (2011) entitled "**Comparison of Three Different Stepping Tests for Competition Swimmers**." The study aimed to compare three tests to determine the differences in speed below the maximum under (3-4) mmol lactate concentration. The study sample included (10) swimmers who performed the three tests. The tests included a system for a fixed distance of (200) meters, but the intensity of the effort was distributed and varied throughout the duration of the test. The third test included swimming for a fixed time of (3) minutes, and the lactate concentration was measured at the end of each distance. In the system for the fixed time, swimming was performed slowly. The results of the study showed that swimming with the fixed distance system showed a speed lower than the maximum lactate rate, which ranged between (3-4) mmol, which was compared to the fixed time.

Conclusions:

Within the limits of this study, guided by its objectives and the steps followed to verify the validity of the hypotheses, and in light of the measurements used, within the limits of the research sample, and the statistical method employed, the researcher reached the following conclusions:

1. Digital development through the implementation of the training program using the Brent Rushall method over the course of the training season is the fundamental pillar of any training program.
2. Using the Brent Rushall method as training throughout the training season to determine the extent of development through the implementation of the proposed training program.
3. Implementing a standardized training program helps achieve a rate of change in the percentages of improvement in favor of the dimensional measurements over the course of the training season.

Recommendations:

1. Use the Brent Roshal method in the training program, with the possibility of combining it with other methods.
2. Utilize the Brent Roshal method by using maximum speed as a determinant of the development of the training program during the training season.

3. Utilize the numerical level and pulse as a determinant of the development of the training program during the training season.
4. Continuously monitor the development of swimmers' numerical level during the training season.
5. Develop short- and long-term training programs utilizing various training methods, such as the Maglichio and Brent Roshal methods, to monitor development throughout the season.
6. Develop a clear strategy for using the Brent Roshal method for juniors, based on well-studied scientific methods and standardizing the training programs.

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