



A proposed training program to develop the resistance of the fin swimmer's body to carbon dioxide for the under-12 category

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Abstract ;

Swimming in general and fin swimming in particular is a new sport at the national level, but it has gained enormous popularity at the local and international levels, as all practical efforts, scientific expertise and practical experiences have embraced towards developing this sport. Since the high level of most countries in the world has made the difference between us and them, it was necessary for us, as technical bodies, to look for ways to keep up with our athletes about this progress. From this, our study came by proposing a training program to develop the resistance of the fin swimmer's body to carbon dioxide for the under-12 category. From this, the following question was raised: How effective is a proposed carbon dioxide resistance training program for fin swimmers under 12 years of age? For the research sample consisting of 12 swimmers.

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1. Introduction

The past years have witnessed remarkable development and a scientific explosion in the field of sports in general and physical preparation in particular. This is based on technological development in developing training programs to improve players' physical and technical efficiency and obtain high-level results and sports form, which in turn achieve victories and medals.

Since swimming in general and fin swimming in particular is a new sport at the national level, but it has gained enormous popularity at the local and international levels, all practical efforts, scientific expertise and practical experiences have combined to develop this sport. Since the high level in most countries of the world has made the difference between us and them, it was necessary for us, as technical bodies, to look for ways to keep our athletes up to date with this progress, and this was done by planning and preparing standardized pregnancy programs based on scientific foundations to bring players to the highest possible level of physical fitness.

There are also many training methods that help fin swimmers develop their physical fitness and respiratory abilities. From it came the idea of proposing a training program for the body's resistance to carbon dioxide for swimmers under 12 years of age and its impact on developing the quality of speed and resistance underwater in order to obtain satisfactory results for sports teams. In this research, we implemented the proposed program in good conditions. All means of work were available to us, from an Olympic swimming pool, which is considered one of the best swimming pools in the country, to a gymnastics hall, and means of swimming with fins. Most of the time was available for us to work, and with this facilitation, we reached, at the end of this program, very

satisfactory results in obtaining the set goals of increasing the body's resistance to carbon dioxide, increasing underwater sliding, and staying underwater. For the length of time possible, for the length of distance, with numbers we did not expect, and background results behind our set goals, such as improving numbers in freestyle swimming and improving physical fitness in a short time.

The researcher divided his research into three aspects, including an introductory aspect, in which he discussed the problem, a general hypothesis, and partial questions. The researcher also touched on previous studies that spoke directly and indirectly about the subject. Then he touched on the theoretical aspect, which he divided into two chapters. The first talked about swimming in general and fin swimming in particular and methods of training them. He also touched on breathing, its types, the role of carbon dioxide in the breathing process, which is the basic element in research, and the foundations of training to develop the body's resistance to carbon dioxide. He also touched on the importance of training using CO₂ in the breathing process, then spoke about the precautions that must be taken before, during and after training.

The second chapter is no less important in sports in general and swimming in particular, which is nutrition, where he talked about nutrition in general, then nutrition for the swimmer in particular, and the importance of nutrition for the swimmer, then he touched on the details of the components of nutrition and hydration.

After that, the researcher touched on the third aspect and the applied aspect, which was divided into two chapters. The first was about the methods and methodology of the study, where the researcher talked about choosing the study method, which was the experimental method by taking one sample and making pre- and post-measurements,

which we decided would show the accuracy of the results in the proposed program.

Problem:

Sports training is considered the essential part of the sports preparation process, as it is considered a special scientific physical process based on the use of exercises with the aim of developing the physical fitness and skills necessary to achieve the highest possible level. It is a science, art, and method of education that prepares individuals to participate in sports competitions, get used to daily sports, and adopt them as a way of life. Sports training is based on pre-prepared plans subject to certain rules and standards, as it gradually prepares individuals to endure difficult sports training. It carries psychological and physical pressures, and it also takes into account the individual abilities of each person. Sports training varies depending on several factors, such as age and gender. Sports training is a process that depends on continuity and is not linked to specific seasons. Sports training brings many benefits to individuals and society, and sports training has many characteristics and features.

Recently, various trends have been developed, including special methods and techniques for training and raising the level of the disease.

Since swimming is part of this science that we know, Riyadh swims in the water for the purpose of competition. Swimming is a widely practiced recreational activity as well as a global and Olympic sport. Scholars in this field have worked hard to create new sports of swimming, as they added fins to this sport, and it was called fin swimming and was developed into several specializations on the surface and underwater, but it remains new in our world, so fin swimming relied on developing the respiratory system to improve sports results.

As a result of the lack of studies and research that have addressed the physical

development of the respiratory system and swimmers' resistance to carbon dioxide underwater, we have first highlighted this new sport and second proposed a training program for the body's resistance to carbon dioxide among fin swimmers under 12 years of age, which is considered an age group in the acquisition stage and we aspire to achieve high results. Based on this, we see the importance of answering the following question:

How effective is a proposed carbon dioxide resistance training program for fin swimmers under 12 years old?

From it came the sub-questions:

1- Are there statistically significant differences between the cardiac and post-test of the experimental group in improving the level of resistance

Body for carbon dioxide for fin swimmers under 12 years of age at a significance level of 0.05?

2- Are there statistically significant differences between the cardiac and post-test tests of the experimental group in improving the speed level in underwater fin swimming among swimmers under 12 years of age?

3- Are there statistically significant differences between the cardiac and post-experimental total tests in developing effort savings during underwater fin swimming among swimmers under 12 years of age?

-Research hypothesis:

The proposed training program affects the development of the resistance of the fin swimmer's body to carbon dioxide for a lower class

From 12 years.

-2-3 Partial hypotheses:

-1 The proposed training program contributes to developing the resistance trait of fin swimmers under 12 years of age.

2- The proposed training program helps save effort for fin swimmers under 12 years old.

-3 The proposed training program helps develop the speed trait of fin swimmers under 12 years of age.

1- Study methodology:

Curricula differ depending on the method of verifying the validity of the hypotheses and the essence of the difference between the curricula, as there are many curricula that differ depending on the nature and field of the problem that is the subject of the research due to its different time. Choosing the appropriate and suitable research method to investigate the problem depends on its type and nature. Therefore, the researcher adopted the experimental method using the single-group method to suit the nature of the research problem and its objectives. The experimental method is considered the most honest approach to solving many scientific problems in an effective and theoretical manner and its contribution to the progress of scientific research in the humanities and social sciences, including mathematics. 1 The experimental method is defined as being precise in the specific conditions of an incident and observing and interpreting the changes resulting from the incident itself.

2- Study community:

We identify the research community of swimming club swimmers at Al-Bukhari Palace of the Medea League for the Riyadh season 2023/2024, numbering 60 swimmers, as shown in the following table:

Table No. 01 shows the distribution of the sample by age group

Percentage	Number	Age Group
10 years	15	%25
11 years	25	% 41.66
12 years	20	% 33.33
Total	60	%100

3- Study sample:

The sample means some members of the community, and the use of the sample was random from various swimming sports associations, except that we chose the sample that lives closer to the pool to facilitate working conditions only.

Therefore, the study sample included 12 swimmers representing the study sample, and thus the sample percentage is .%20

4- Sample homogeneity:

In order to control all the variables that affect the accuracy of the results, the researcher resorted to verifying the homogeneity of the research sample in the variables of height, weight, and age, and by using the torsion coefficient, as shown in Table No. 02

Table No. 02 Characteristics of the study sample by age, height, and weight

	Number of swimmers	deviation	Average standard
Age	12	34.16	2.97
Length	12	126.16	7.84
Weight	12	10.83	0.577

5- Research tools:

5-1-Study tool:

In this study, the researcher relied on two tools: the first was a skill level test and a training program to develop the body's resistance to carbon dioxide in swimmers.

-1 Test to measure the skill level in underwater fin swimming and restraint: After reviewing the theoretical aspect and discussing with specialists trained in the Algerian Federation for Rescue, Ambulance and Water Activities, it was agreed on three axes: breathing on empty lungs in the air, underwater fin swimming and speed. The validity and stability of these axes were

tested, and the validity and stability coefficient was between) 0.85 to .(0.92

-5-2- Training program in developing the body's resistance to carbon dioxide:

A training program was prepared in consultation with trainers specialized in fin swimming, with three training sessions per week, at a rate of one and a half hours per session, over a period of 7 weeks. The training session was divided into three sections:

Warm-up: This includes warming up outside and inside the water for 30 minutes

The main part: It includes focusing on the physical and technical aspects and giving exercises using breathing exercises on empty lungs and using fins in the water. This part lasts for 45 minutes depending on the goal, and the performance of the swimmers underwater is filmed using a smartphone.

Concluding part: Calming inside the water without fins.

6- The following tests were used in the field study:

6-1- Bolt test:

Test objective: Measure the maximum resistance of CO₂. **Tools used:** timer, whistle, mat.tapis

Procedures: The tester sits on the mat and takes a comfortable position, provided that the spine is straight. After the preparation process, he exercises the flexibility of the lungs and inhales/exhales, which serves as a warm-up for the respiratory system for 10 minutes before the test. The test begins by holding your breath without filling your lungs with air.

Table 03: Shows the Bolt test standard

Observation Age	good	well	average	minus
10-12	+25 s	20-25	10-20	-10 s
13-15	+30 s	25-30	15-25	-15 s
16-20	+40 s	30-39	15-29	-15 s
21-35	+45 s	30-40	15-29	-15 s
36-49	+4 5s	30-40	15-29	-1 5 s
+50	+40 s	25-39	15-25	-15 s

-6-2- Static diving test:apnée

Objective of the test: To measure the body's resistance to carbon dioxide underwater. **Tools used:** pool, timer, whistle.

Performance Description: The swimmer enters the water after the heating process. He begins to breathe while in a comfortable position and gives the signal. He descends quietly under the water and holds his breath for as long as possible.

Recording: The timer is calculated until the swimmer's head comes out of the water and he has the choice on a second attempt. **Image No. 02:** Underwater body position during the test.

Table 04 shows the statique.apnée test standard

Level	Diving Time
Beginner	0-40 s
Average	40s – 1mn 10s
well	1mn 10s – 1mn 30s
good	1mn30s – 2mn
excellent	+2mn

6-3- Speed test: Speed test for fin diving swimming for 25 m. **Objective of the test:** Speed measurement.

Tools used: timer, whistle, calculator.

Performance method: From the starting position, the laboratory swims by diving with fins as soon as the signal is heard until

the arrival point, which is 25 metres. Image No. 03 shows how to swim.

Table No. 05 shows the speed test standard

Level	Speed m/s	Speed km/h
Beginner	0.8 -1.2	2.9 – 4.3
Average	1.2 -1.6	4.3 – 5.8
Advanced	1.6 – 2.0	5.8 – 7.2
elitist	2.0+	7.2

7- Psychometric study tool:

7-1-Stability:

Tests	Self-honesty coefficient
Bolt test	0.845
Steady diving test	0.921
Speed test	0.861

It is that the test gives the same results if repeated on the same individuals and under the same conditions¹ In our research, the test and retest method was used, so that 05 players were selected from the group, and physical tests were applied to them, as the first test was taken on 02/22/2024 and the test was repeated on 02/27/2024. To obtain the results, we calculated the Pearson correlation coefficient.

Table No. 06 shows the stability coefficient for the tests.

We note from Table No. 07 that the correlation coefficients for each dimension, which represent the stability of these tests, are high and strong, and this reflects the stability of the tests.

7-2- Honesty:

Although the tests used in the current study have a reliability coefficient in many previous studies and research, the researcher chose the tests for the study after reviewing many theoretical studies and scientific references and their occurrence in

more than one reliable source The tests were presented to a group of specialists and experts in the field of sports. After retrieving the tests from the judges, the researcher arrived at the final form of those tests, taking into account the aforementioned observations and suggestions regarding adding, deleting, and modifying either the physical fitness elements or their tests by the judges.

To ensure the validity of the tests, we used the self-validity coefficient as the truest experimental score relative to the real scores, which is measured by calculating the square root of the stability coefficient of the test.²

Self-validity coefficient = stability coefficient $\sqrt{}$

Table No. 07 shows the stability coefficient for the tests.

From Table 08, we find that the results and values of self-honesty are high and range between 0.84 and 0.92, which confirms that these tests have a high degree of honesty.

7-3-Objectivity:Barrow and McG defined it as "the degree of consistency between different individuals of the same sample", and Van Dalen defined the objectivity of a test. "A test is considered objective if it gives the same score regardless of who corrects it."¹

The tests used in this research are easy and clear to understand, addressing every detail

Tests	Stability coefficient
Bolt test	0.85
Steady diving test	0.90
Speed test	0.89

and requirement of each test. Based on these data, we conclude that these tests are highly objective.

8- Statistical methods used in the study:

Muhammad Abu Saleh and others say that statistics is the science that studies, organizes, displays and analyzes all data

And making decisions based on them 2 From here we conclude that the goal of using statistical methods is to arrive at indicators

It helps us analyze, interpret, interpret and judge. In this study, version 22 was conducted in order to calculate SPSS: using a statistical data processing program.

A- Arithmetic mean. b- Standard deviation.

T- Simple Pearson correlation coefficient. Th- The mode.

C- Semantics test. T h- Percentages.

- Presentation and analysis of results:

1- Presenting and analyzing the results of the first hypothesis:

Which says, "The proposed training program contributes to developing the resistance trait of fin swimmers under 12 years of age."

Table No. 08: Shows the differences between the pre- and post-measurement of the (Bolt test)

The group	Experimental	arithmetic average	standard deviation	Calculated T	Scheduled T	significance level
Pre-measurement		11.50	2.64	17.36	1.79	0.0
Dimensional measurement		37.500	4.33			

Analysis:

We note from Table No. 09 that the arithmetic mean (Bolt test) for the pre-measurement was 11.50 with a standard deviation of 2.64

The arithmetic mean of the dimensional measurement was 37.50 with a standard deviation of 4.33. We note that the calculated T value is greater than the tabulated T with a significance level of 0.05, which means that there are statistically

significant differences with regard to (Bolt test (in favor of the dimensional test.

Table No. 09: Shows the rate of development for the pre- and post-Bolt tests.

Bolt test			
pre-test	post-test	The amount of change between Averages	Development % rate
11.50	37.50	27	%69.33

Table No. 09 shows the amount of development between the arithmetic averages of the "Bolt" test for the pre- and post-tests of the group, where the amount of development reached 69.33%. This amount indicates the effectiveness of the proposed training in improving the body's resistance to CO₂, as the difference between the arithmetic averages of the two tests (pre- and post-tests (was 27, and this means that there is development in the "Bolt" post-test of the group. Which shows the differences between the values of arithmetic averages.

2- Presenting and analyzing the results of the second hypothesis:

Which says: The proposed training program helps save effort for fin swimmers under 12 years old.

Table No. 10 shows the differences between the pre- and post-measurement of the speed test.

experimental group	arithmetic average	standard deviation	Calculated T	Scheduled T	signific
Pre-measurement	0.96	0.18	20.64	1.79	
next measurement	1.61	0.12			

- Analysis:

We note from Table No. 10 that the arithmetic mean of the speed test for the pre-measurement was 0.96 with a standard deviation of 0.18

The arithmetic mean of the post-measurement was 1.61 with a standard deviation of 0.12. We note that the calculated T value is greater than the

tabulated T with a significance level of 0.05. This means that there are statistically significant differences regarding the stability diving test in favor of the post-test. Interpretation of the results:

Table No. 11: Shows the rate of development for the pre- and post-speed test tests.

speed test			
pre-test	post-test	The amount of change between averages	% Development rate
0.96	1.61	0.65	%40.37

Table No. 11 shows the amount of development between the arithmetic averages of the "speed" test for the pre- and post-tests of the group, where the amount of development reached 40.37%. This amount indicates the effectiveness of the proposed training in improving speed, as the difference between the arithmetic averages for the pre- and post-tests (was 0.65, and this means There is development in the group's post-speed test. Which shows the differences between the values of arithmetic averages.

We notice this clearly through column chart No.. And tribalism for this test.

3- Presenting and analyzing the results of the third hypothesis:

Which says: The proposed training program helps develop the speed trait of fin swimmers under 12 years of age

Table No. 11: Shows the differences between the pre- and post-measurement of the stability diving test.

experimental group	arithmetic average	standard deviation	Calculated T	Scheduled T	significance level
Pre-measurement	39.16	11.60	10.64	1.79	0.0
next measurement	67.4	6.68			

Analysis:

We note from Table No. 11 that the arithmetic mean of the speed test for the pre-measurement was 39.16 with a standard deviation of 11.60, while the arithmetic mean for the post-measurement was 67.4 with a standard deviation of 6.68. We note that the calculated T value is greater than the tabulated T with a significance level of 0.05, which means that there are statistically significant differences with regard to the stability diving test in favor of the post-test.

Table No. 12: Shows the development rate for the pre- and post-test for the stability diving test.

speed test			
pre-test	post-test	The amount of change between averages	Development % rate
39.16	67.4	28.24	%41.89

Table 12 shows the amount of development between the arithmetic averages of the "Diving with Stability" test for the pre- and post-tests

For the group, the development rate reached 41.89%, and this amount indicates the effectiveness of the proposed training in improving underwater resistance, as the difference between the two calculation media for the two tests (pre- and post- (was 28.24, and this means that there is development in the post- "diving with stability" test for the group. Which shows the differences between the values of arithmetic averages.

4- Discussing hypotheses:

4-1- Discussing the first hypothesis:

Regarding the first research hypothesis, which states:

The proposed training program contributes to developing the resistance trait of fin swimmers under 12 years of age.

Through what was presented from the course of the study and its analysis in Table No. (08) (for the Bolt test (for the sample, the results appeared after completing the proposed training program, as there appeared statistically significant differences between the pre- and post-tests, and this confirms the effectiveness of the training program in improving the resistance to carbon dioxide (CO₂) among trained swimmers.

Accordingly, the researcher attributes this development to the proposed training curriculum, which confirms the opinions of experts, regardless of the different sources of their scientific culture. -The training program leads to the development of the resistance to carbon dioxide bending) (CO₂, provided that this curriculum is completed on a scientific basis

Organized, we find that the training program proposed in this curriculum has greatly helped in developing the resistance to carbon dioxide

We also find that the exercises improved underwater resistance in fin swimming, which led to an improvement in the test result.

In addition to the fact that the training has improved endurance and leg strength in propulsion and improved breathing while swimming, this training leads to delayed early arrival on the abdomen. This is what researcher Dolabi and others have proven. The stage of needing air, which leads to increased self-concealment, and this works to control carbon dioxide in the chest

4-2- Discussing the second hypothesis:

Regarding the second research hypothesis, which states: The proposed training program helps save effort for fin swimmers under 12 years of age.

The results in Table (09) raised the existence of statistically significant differences in diving with stability in developing the quality of perseverance in swimming with fins underwater. The researcher attributes this to the nature of training exercises and physical work to develop the respiratory

system and save effort in swimming with diving. In addition, it helped in improving the technique of swimming on the abdomen during side breathing and swimming without fatigue. This proves the validity of our hypothesis through the researcher's application of the proposed training program regarding effort saving and improving the mechanical movement of the swimmer's body during freestyle swimming. This is proven by the previous study of the environmental laboratory Sports work and motor results of the University of Toulon by autres et/C.ulmer F.JOULIA entitled The effect of special diving training

For chemical variables and muscle activities of the body. In 2003

Discuss the third hypothesis:

Regarding the third hypothesis, which says: The proposed training program helps develop the speed trait of fin swimmers under 12 years of age.

. There are statistically significant differences between the pre- and post-tests in improving the speed level of underwater fin swimmers under 12 years of age.

The results in Table (10) indicated that there were significant differences in the speed variable for a distance of 25 m, and the researcher attributes this to the nature of Exercise, muscle work, and developing the respiratory system to combat the body's resistance to carbon dioxide (CO₂) and its effect on speed in one way or another.

The exercises increased the body's resistance to carbon dioxide in terms of the respiratory system, which gave the swimmer more self-confidence, as the heart rate decreased relative to what it was, making him a fast swimmer. On the other hand, strength also developed in the lower muscles, which increased the strength of the fin underwater.

Using a carbon dioxide resistance training program helps you gain the ability to swim underwater with confidence and increase your swimming speed. It also had a positive effect on the swimmer's speed in abdominal

swimming, and this was confirmed by a study in a club affiliated with the French Federation for Underwater Studies and Sports in 2020

5-General conclusion of the study:

In light of the results of the study, the researcher concluded the following:

- 1 Training on the body's resistance to carbon dioxide leads to the development of underwater resistance.
- 2 The development of carbon dioxide resistance contributes to effort savings during underwater fin swimming and freestyle swimming.
- 3 Training to develop the body's resistance to carbon dioxide has shown effectiveness in swimmers in improving results for swimming with fins underwater in terms of speed and the longest possible distance traveled underwater.
- 4 There are statistically significant differences in the variable of speed, resistance to carbon dioxide, and effort economy for the swimmer during diving.
- 5 The researcher's program can be used to develop the speed of swimming on the surface of the water in the four swimming pools by developing epoxy technology. Hypoxie.

6- Future hypotheses:

- 1 Use carbon dioxide resistance training for swimmers to improve digital results.
- 2 Spreading awareness among swimming coaches of the importance of this type of training because of its positive impact on the physical and physiological aspect
- 3 Preventive measures must be taken in order to train to develop carbon dioxide resistance due to the side effects it produces during Training such as dizziness, high blood pressure, nausea, and diaphragm contraction.
- 4 Do not use the suggested training daily, as recovery is necessary for development.
- 5 Develop the program and integrate it into swimming programs to develop the swimmer's breathing technique.

- Conclusion:

Sports training in all sports in general and swimming in particular has taken a qualitative step through modern research and studies in all physical, physiological, planning, skill, psychological aspects....

Its aim was to discover more effective and faster methods in this sport. Success in performing the game's skills depends on extending the efficiency of the swimmer's physical and skill qualities, as physical and physiological qualities are considered an essential and important component of water sports in general and fin diving swimming in particular, given that it is a new sport in our country and of greater importance in physical and physiological diseases, according to the opinions of scientists and researchers in this field. Believing in the scientific method and its role in developing science through studies and with the aim of developing training curricula, our research came to study the impact of a proposed training program to resist

Body carbon dioxide in fin swimming athletes under 21 years of age. By identifying these physical and physiological characteristics and knowing whether this proposed training program has a positive impact by discussing the results and comparing them with the hypotheses presented.

Based on our findings of proof of partial hypotheses, we have accepted the validity of the general hypothesis that the proposed training program to develop the body's resistance to carbon dioxide effectively affects some physical and physiological abilities in fin swimmers under 12 years of age.

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