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The effect of special exercises using different training methods and their effect on VO₂MAX and the completion of the 50m freestyle

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Abstract. One of the objectives of the research is to know the effect of using special exercises with different training methods inside the swimming pool as a means of increasing the water resistance to confront the swimmer's creep forward and its effect on the maximum oxygen consumption and its effect on the time of the 50 m freestyle race. In order to achieve the research goal, the researcher chose (10) swimmers ages (14- 16) years and randomly, and was divided into: Two groups, the first was an experimental group (5) swimmers as an experimental group, and the second was (5) swimmers as a control group. Both groups implemented the sections of the special training program by their trainer in all its details, except that the experimental group used different methods in training as a resistance tool within the vocabulary of the daily training unit. The researcher began testing before and after the research period, which lasted for 12 weeks, with three training units per week. The results achieved were analyzed statistically for the two groups. It was found that the 50-meter freestyle swimming time improved for both groups, but the group that practiced the exercises using different methods became the best. In addition to improving the maximum oxygen consumption, the researcher recommends using special exercises with training methods in the daily training of swimmers because of their impact on achieving the level of achievement in the 50-meter freestyle swimming.

Keywords. special exercises, training methods, VO₂MAX

Introducing the research:

Introduction:

The science of sports training is one of the sciences that has a major impact in building the basic foundation for raising sports levels, the results of which have appeared in the level of physical, skill and tactical performance we observe As a consequence of utilizing sports training theories and concepts that have contributed to the development of the training process in its various aspects of training loads and training methods. Help to train different physical abilities and raise physical effort requirements during training or competitions. Choosing the appropriate exercise and training methods is one of the factors that is given great importance in modern sports training. The applied uses of some of these methods, individually or in combination, in training processes have been evident in helping coaches reduce effort and costs and shorten time to reach the desired goals in the training process. The use of training methods is linked to physical

exercises, the content of which must be consistent with what the swimmer needs. Part of the requirements of the exercise is The process of developing special physical and functional abilities. In order to serve the swimmer Maharai to adapt to the high physical effort, here it is necessary to point out the foundations of choosing and using auxiliary means and tools: Regularity in the training process and lack of interruption has an effective impact in developing the level of efficiency of the swimmer's various functional systems. For this reason, the researcher wanted to inform those working in this field of the physical and physiological effects of using special exercises using different training methods on the maximum oxygen consumption indicator. On this basis, the importance of the research became clear in discovering the functional indicators of the respiratory system. The result of practicing training with special exercises using different training methods for the event of (50) m freestyle swimming and evaluating the condition for it. Therefore, modifications can be made in the training programs and methods, since the tests that are conducted for them represent one of the main means of providing a high level to the swimmer.

Research Problem:

Swimming is unique from other sporting events by the high intensity of the effort expended as a result of practicing it in the water environment and the high physical efficiency that this environment requires to confront a group of resistances while the body slides forward. Therefore, special exercises must be developed using different training methods to reduce the effort and costs and shorten the time to reach the desired goals in training process. Through the presence of the researcher during the training, the researcher noticed a discrepancy in the level of swimmers' performance in the 50-meter freestyle swimming event. The researcher believes that the problem in this is due to the lack of use of special exercises with appropriate training methods for the type and specificity of the event and knowledge of its effect on the breathing process (maximum oxygen consumption). It is an important indicator of the condition of swimmers in raising the swimmer's ability and keeping pace with the level of chronological development occurring in Olympic swimming events.

Research objective:

- Identify the effect of training using special exercises with training methods at the level of VO₂MAX, the maximum oxygen consumption.
- Identifying the effect of special exercises and training methods on the level of achievement in 50-meter freestyle swimming.

1-4 Research hypothesis:

- 1- There are statistically significant differences in raising the level of VO₂MAX in the post-tests, in favor of the experimental group.
- 2- There is a positive effect of using special exercises as training methods on the level of achievement in the 50-meter freestyle swimming..

1.5. Research field:

1.5.1. Human field: A sample of swimmers from the Babylon (Al-Musayyab) Olympic Swimming Club, ages (14-16 years).

1.5.2. Time field: from (2/3/2022) to 2/6/2022).

1.5.3. Spatial field: Water City indoor swimming pool (Marina (50m)) Babylon.

2. Methodologies for research and field operations:

2.1. Research Methodology:

The method is the method followed by the researcher in studying the problem to discover the truth . Therefore, the researcher used the experimental method to suit the nature of the problem.

2.2. Community and sample Research:

The research sample was chosen in an intentional and representative manner, and it consisted of (10) swimmers, out of the research community, which numbered (15) swimmers. (5) swimmers were excluded due to their lack of commitment to attending the training units on a regular basis, and they were divided into two control and experimental groups, each group including (5) Swimmers. Homogeneity was conducted for the research sample in measurements of height, weight, and age. Table (1) shows homogeneity among the sample members.

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

Variables	Mean	Std. Deviation	Coefficient of difference	Result
Length/Cm	173	1.257	0.765	Homogeneous
Age	15.06	0.183	1.41	Homogeneous
Weight	64.6	0.94	1.62	Homogeneous

2-3: Research devices and tools:

1. Electronic stop watches.
2. Team work
3. Various training methods (paws, ropes, fins).
4. Swimming pool (50m)

2-4: Field research procedures:

2-4-1: Pretests

The researcher conducted the pre-tests on Thursday, corresponding to (2/3/2022) between ten o'clock and one o'clock in the afternoon, and all variables related to the research were recorded in a special record prepared for this purpose. After (8) weeks had passed, which is the training period, the post-test was conducted for two sample groups. The research took place on Monday, 2/5/2022, and the times achieved were recorded and the same procedures were implemented when conducting the pre-tests.

2-4-2 Field tests:

- Measuring the value of maximum oxygen consumption (VO₂ max):

The maximum oxygen consumption was measured indirectly using the Kariman equation, which depends primarily on the adequacy of physical performance at the heart rate (170 beats/minute), as shown below:

$$VO_2 \text{ max} = 2.2 \times \text{PWC } 170 + 1070$$

Note that the maximum consumption of absolute oxygen is estimated and calculated in (liters/minute) and this functional indicator is related to supplying the cells with oxygen.

- Efficiency test (50 m) freestyle:

Objective of the test: Measure the time of (50) freestyle swimming.

Tools used: closed marina swimming pool (50 m), stopwatches, whistle, registration forms.

Description of the test performance: After a warm-up period and an appropriate rest period, the swimmer stands at the platform in the area designated for him, and upon hearing the word “take” from the launcher, he takes the starting position, and after hearing the launcher’s whistle, he jumps from the platform into the water and covers a distance (50 meters) in a maximum freestyle swimming method speed after completing the race distance, the average time achieved by the swimmer out of the three hours is recorded and recorded in the register of the form prepared for this purpose. In order to achieve the best of the swimmer, the researcher involved two swimmers in the race in order to compete and achieve the best of the swimmer.

2-4-3 Experimental tools used

- Experimental approach

By informing the researcher of the latest research, training, and methods used with special exercises in these methods, he, in conjunction with the swimming coach, developed resistance and assistance training methods from pulling ropes and swimming paws within the main section, while making some changes so that the training curriculum is compatible with the capabilities of the swimmers and the training stage they are in in it The curriculum was prepared to develop the strength characterized by speed and maximum strength in swimmers, taking into account the changes that accompany the use of exercises so that they do not affect the method of performance. During training, the researcher focused on the acceleration phase and the speed maintenance phase, with 3 training units per week, two units for the resistance method and one alone. For assistance on days (Sunday - Tuesday - Thursday), The following week, there were two units for assistance and one for resistance. The researcher, through agreement with the trainer, focused on training during the curriculum for the purpose of serving a 50-meter freestyle race, using paws and pulling ropes for the research group, while the control group continued on the experimental method without special exercises by means. The curriculum included exercises that work to develop the maximum muscular strength of swimmers through the use of assistive methods (paws and pulling ropes) through the amount of force produced by the working muscles (d. paws and tow ropes), Which works to increase the speed of neuromuscular excitement between the working muscles and the brain, where the speed of excitement works to increase the speed of repetition of strikes and to reach good speed by maintaining performance and emphasizing maintaining correct performance during training. All the exercises were carried out in the same pool, in the same class, and by the same coach.

2-5: Statistical methods:

Researcher used

1. Arithmetic mean $(\bar{x}) = \frac{\sum Mg}{n}$
2. Standard deviation $(p) =$
3. T-test: for corresponding samples .
- 4- T-test: for independent samples

3: Presentation, analysis and discussion of the results:

3-1: Show results:

The researcher presented the results obtained during the implementation of the research and processed them statistically. The results were arranged in the form of explanatory tables for all the research variables and for both the control and experimental groups in the pre- and post-measurements, in order to analyze the reality of the differences between the two groups and to show The effect of the exercises specific to the training methods that were applied to the experimental group and on the variable of maximum oxygen consumption is under investigation, and through tables and discussions.

Table (2) shows the arithmetic mean, the standard deviation, and the calculated and tabulated T-value for the pre- and post-tests for both the experimental and control groups to measure the maximum oxygen consumption (VO₂ max)

Group	Per-Test		Post-Test		Calculated T value	Tabular value	Sig type
	Mean	Std. Deviation	Mean	Std. Deviation			
Experimental	39.22	1.44	48.41	0.66	15.21	2.305	Sig
Control	39.72	1.49	40.05	1.53	3.49	2.305	Sig

Table (2) shows the research results of the pre- and post-test to measure (VO₂max). The results showed a significant difference showing the two tests, as the calculated (t) value for the experimental and control groups reached (15.21) and (3.49), respectively, which are greater than the tabulated (T) value of (2.305) under a degree of freedom (8) and a significance level (0.05). Which indicates that there has been development of the aforementioned variable in the post-test for both groups, noting that there is a significant difference in favor of the experimental group, which indicates that there is an effect of the exercises for the training questions used by the members of the research sample on this variable. The researcher explained that the reason for the significance of the differences for the experimental and control groups is the increase in the efficiency of the circulatory and respiratory systems and the adequacy of the oxygen transfer processes to the working tissues as a result of regular swimming training, “since regularity in swimming training adapts the body in some functional adaptations, which are represented by increasing the efficiency of the two systems.” Cyclic and respiratory, the adaptations resulting from training swimmers for short distances lead to an increase in the maximum consumption of Oxygen (VO₂max).

For the purpose of comparison, the significance of the differences between the arithmetic means and between the results of the experimental group and the control group in the post-test is shown in Table (3).

It shows the comparison between the arithmetic means, standard deviations, and the calculated and tabulated values for the control and experimental group in the post-test to measure the maximum oxygen consumption (VO_{2max}).

Group	Post-Test		Calculated T value	Tabular value	Sig Level	Sig type
	Mean	Std. Deviation				
Experimental	48.41	0.66	14.95	2.111	0.05	Sig
Control	40.05	1.53				

Below the degree of freedom (8) and the level of significance (0.05)

Table (3) shows the post-test results for the two groups. The arithmetic mean for the experimental group was (48.41) ml/kg/d with a standard deviation of (0.66). As for the control group, the arithmetic mean was (40.05) with a standard deviation of (1.53) after extracting the calculated (t) value of (14.95), while the tabular value reached (2.111), under a degree of freedom (8) The significance level is (0.05) and when the calculated value is greater than the tabulated value, this indicates that there is a significant difference between the two groups and for the benefit of the experimental group, which the researcher attributed to the effect of the exercises specific to the training methods used by the experimental group, in addition to the experimental group's regularity in swimming training. This led to the adaptation of the working muscles and an increase in their ability to perform and their adaptation to extracting the largest amount of oxygen with the increase Its sufficiency during metabolism, "Swimming is one of the best sports activities that affects the efficiency of oxygen transfer within the body's cells, and thus raises the maximum level of oxygen consumption."(Muhammad Ali Al-Qat, 2004,p. 90). The maximum oxygen consumption "means the ability to provide energy to the (working) muscles during training and sports competitions that last more than a minute and a half and depend in performing their functions on oxygen consumption as a standard for measuring physical fitness. If this rate increases, it is evidence that the person or athlete is fit" (Abu Al-Ala Ahmed Abdel Fattah, 1998). On the other hand, the development in the training load in size or intensity using different training methods and exercises specific to the type of activity, that is, specialty, led to an increase in the physiological capabilities of the research sample, "as there is a correlation between the improvement of the maximum oxygen consumption and the development of the training load" ,There is a correlation between the maximum consumption of oxygen and the intensity of training, and whenever the athlete is able to compensate for the deficiency in oxygen, this leads to an improvement in the level of ability in training. "Also, the maximum oxygen consumption reaches its maximum limits at the heart rate (180 -190) N/D".(Kazem Jaber Amir, 1999, p.172). Studies have also proven and agreed that the maximum oxygen consumption index ($Vo_2 max$) is one of the most important physiological indicators for athletes to evaluate the functional work of the heart, circulatory, and respiratory systems, because it reflects, with complete specificity, the maximum functional efficiency of the two systems. Circulatory and respiratory.

Table (4) shows the arithmetic means, standard deviations, and the calculated and tabulated T-value in the pre- and post-tests for the experimental and control groups for the 50 m freestyle swimming test.

Group	Per-Test		Post-Test		Calculated T value	Tabular value	Sig Level	Sig type
	Mean	Std. Deviation	Mean	Std. Deviation				
Experimental	34.6	1.85	32	1.23	3.01	2.31	0.05	Sig
Control	34.5	1.74	33.1	0.88	3.27	2.31		Sig

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

Analysis of Table (4) reveals statistically significant differences between the pre- and post-test results for the two research groups concerning the 50-meter freestyle swimming time variable, as indicated by the calculated (t) value for the two experimental groups. The controls are 3.01 and 3.27, respectively, exceeding the tabular value of 2.31 at a degree of freedom of 4 and a significance level of 0.05. The results indicate development of the aforementioned variable in the post-test for both groups, with a significant difference favouring the experimental group. This suggests a positive effect of the training methods employed by the research sample on this variable.

Table (5) illustrates the arithmetic means, standard deviations, and computed and tabulated T-values for the experimental and control groups in the post-test of the 50-meter freestyle swimming test.

Group	Post-Test		Calculated T value	Tabular value	Sig Level	Sig type
	Mean	Std. Deviation				
Experimental	32	1.23	3.4	2.10	0.05	Sig
Control	33.1	0.88				

Under a degree of freedom (8) and a significance level (0.05)

Table 5 presents the statistical outcomes for the experimental and control groups regarding the 50-meter freestyle swimming time variable. The experimental group attained an arithmetic mean of 32, accompanied by a standard deviation of 1.23, whereas the control group recorded an arithmetic mean of 33.1, with a standard deviation not specified. The value obtained was 0.88, while the calculated t value was 3.4, exceeding the tabular t value of 2.10. With a degree of freedom of 8 and a significance level of 0.05, the results indicate a significant difference between the two groups, favouring the experimental group. The researcher attributes this difference to the specific exercises employed in the training methods of the experimental group, in contrast to the varied training methods (such as fins for the legs and paddles for the arms), which contributed to the enhancement of strength and speed in both the legs and arms, as well as the use of rope for sensory development. As quickly as I have the swimmer, in addition to using the breath-holding exercise, which helped the swimmer cover the 50-meter freestyle

distance in a shorter time, organizing the training load during the training curriculum using various means led to developing the speed of the swimmer's performance and raising the level of achievement among the experimental group. This is what (Sareh Abdul Karim Al-Fadhli, 2010, p. 73) indicates that the exercises in which the training methods for developing ability are used must be characterized by the similarity of the movement and its speed as it is in competition, and this is what was implemented by the research group during the ability development exercises to work the arms and legs within the vocabulary. The prepared training curriculum, which created a different training effect and adaptation that led to an improvement in their performance time. This is because exercises specific to the training methods used (ropes, paws, rafts, weights) had an impact on the adaptation that occurred to the muscles of the arms and legs due to increased frequency, which consequently led to an improvement in their performance time (Brauha, L., 1991). Experimental group The researcher believes that the training methods have increased the efficiency of the muscular strength of the arms and legs, and thus the ability of the muscles to produce a higher speed to cover a longer distance has increased for each. Whereas power is the product of speed and muscular strength. Here we find a close connection between the efficiency of the functional systems and achievement, especially the maximum level, as Qasim Hassan Hussein pointed out that regular sports training clearly affects the functional efficiency of the heart and circulatory system, and with the improvement of the functional condition, through which the athlete is able to perform greater work while saving energy expended. (Buhre, T., 1982) , Also, the maximum amount of oxygen used increases as a result of regular training, and this increase occurs as a response to the muscles exerting effort and accustoming them to extracting a larger amount of oxygen, which qualifies the muscle with increasing its efficiency and reducing the acidity resulting from metabolism to a minimum)) (Costill, D.L, Maglisco E.W, Richardson A.B, 1992).

The bottom line is that, through the functional indicators, it became clear to us that the swimmer who has good functional indicators has good achievement results through the moral correlations of the functional indicators and the completion of the 50-meter freestyle swim, which indicates the swimmer's good preparation.

Conclusions and recommendations:

Conclusions:

- 1. Training using special exercises and training methods is appropriate to increase water resistance, which works to raise muscle capacity and thus raise the efficiency of the heart and circulatory system (maximum oxygen consumption).
- 2. The results showed the importance of using exercises and training methods in raising the level of achievement in the 50-meter freestyle swimming.

Recommendations:

- 1- Paying attention to using special exercises in various training methods in freestyle swimming training due to the positive effect of the methods in developing functional ability and the level of achievement.
- 2- Functional and physical tests must be conducted to evaluate training curricula and improve swimmers' achievement.

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Appendix

Training units: Models of training loads for the methods used

The first week of the curriculum, at a rate of three training units per week

Sunday		
Curriculum Content And Objective	Organization	Training Method
Warm up	200m freestyle + 100m + 4×25m 15 s)	Heart rate 120-150 f/min
Endurance swimming	4 x 100m (25m right + 25m left) arm pull + 50m swimming	Interval – 2 minutes (work + rest) 75% intensity*
Lactate production exercises	4 x 50 + 50m between each repetition, light swimming	Repeat 90 seconds (work + rest), intensity up to 90%
Bearing swimming is a topical basis	2 x 100m, two legs only, fins	2.5 minute interval (work + rest) 75% intensity
Overload exercises	(4 x 50 m) using experimental auxiliary tow ropes	Maximum intensity 90 seconds (rest + work) Maximum intensity
Recovery	400m gentle downhill swimming	Continuous swimming time: 6 minutes, light intensity
Size	1400 m	
Tuesday		
Curriculum Content And Objective	Organization	Training Method
Warm up	200m (100m medley + 100m freestyle)	Continuous swimming time: 120 seconds, pulse up to 150
Endurance swimming	4 x 50m (25m right + 25m left) pull-ups with arms and paws	Interval – 40 seconds (work + rest), 75% intensity
Capacity development exercises	2 (8 x 25m) using resistance ropes	Maximum intensity 60 seconds (work + rest) Maximum intensity
Bearing swimming is a topical basis	4 x 100m, two legs only, fins	2.5 minutes (work + rest), 75% intensity
Anaerobic threshold training	4 x 100m	90 seconds of repetition (work + rest) submaximal intensity
Recovery	4 x 50m increments (increasing the time to cover the distance each repetition)	4 minutes, light intensity
Size	1600m	

Thursday		
Curriculum Content And Objective	Organization	Training Method
Warm up	200m (50m freestyle + 50m butterfly + 50m backstroke + 50m breaststroke x...)	Continuous swimming time: 12 minutes, pulse up to 150
Endurance swimming	6 x 100m (25m) arm pull + 75m full paw swim	Interval – 2 minutes (work + rest) 75% intensity
Lactate production exercises	3 (8 x 25 m) swimming specialty	90 seconds (work + rest) + 3 dBm, intensity 90%
Bearing swimming is a topical basis	4 x 100m, two legs only, fins	2.5 minutes (work + rest), 75% intensity
Overload exercises	(6 x 50m) using resistance ropes	Maximum intensity 90 seconds (rest + work) Maximum intensity
Recovery	200 m gentle downhill swimming	Continuous swimming time 4 min
Size	1800m	