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# *The Effect of Aerobic Exercises to Develop Pulmonary Capacity Efficiency and Skill Performance for 100m Running*

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## *ABSTRACT*

The research aims to investigate the extent to which aerobic exercise affects the development of lung capacity of 100m runners for students of the Faculty of Physical Education and Sport Sciences, Mesopotamia University, which in turn improves the efficiency of lung capacity in 100-meter runners, as it increases the volume of air that the lungs can absorb and their ability to use oxygen more efficiently by increasing lung capacity, such as jogging, making the lungs work harder to increase oxygen consumption, which leads to the expansion of the lungs and an increase The volume of air that you can absorb, and this is known as increasing lung capacity, and the research problem is that some coaches for the young category have been interested in aerobic exercises for players, and the researcher used the experimental method of nature to suit the problem, and using the statistical bag to process the data, and the study concluded that aerobic exercises improve the use of oxygen and help the body use oxygen more efficiently, which means that the lungs get more oxygen from each breath and get rid of carbon dioxide more efficiently and strengthen the respiratory muscles. Aerobic exercises strengthen the muscles that help in the breathing process, such as the diaphragm muscles and the muscles between the ribs, which enables the athlete to breathe deeper and more efficiently, improving endurance, increasing lung capacity, and improving oxygen use, leading to an improvement in the athlete's endurance ability and increased performance in running races.

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Biocapacity expresses oxygen capacity, and can be expressed by the size of the lungs, the strength of the breathing muscles, and the elasticity of the lungs and rib cage. It is the maximum capacity of air, and the biological capacity is defined as the amount of air that a person can expel to the outside by taking a deep inhale after taking a deep inhale, and its rate ranges between 4000 to 4800 cm3 air for men and 10% less for women.The biocapacity is related to the size and structure of the individual (height and weight) and is inversely proportional to the age of the person, and the rate of vital capacity is high in swimmers and divers and decreases in the elderly and in those who suffer from respiratory diseases such as asthma, polio, the presence of fluid in the lung envelope, air inside the chest, and fibrosis of the lungs... etc.The vital capacity is affected by the position of the body, so it increases in the case of standing due to the small volume of blood that enters the lungs, it is also affected by the strength of the breathing muscles, especially the extension of the lungs and the chest cavity, and decreases while sitting. Exhalation and the process of expelling air from the lungs, even if it is strong, through which the lungs cannot be completely emptied of air, but approximately (1-1.5 liters) of air is called residual air, and this amount varies according to age, as its percentage decreases in young people, which leads to a significant increase in the amount of air expelled, while this percentage increases with age, which leads to a decrease in the amount of air expelled. The amount of biocapacity in athletes is higher than that of non-athletes, as it reaches (5-6 liters) to (7 liters) in advanced athletes who have large lungs, however, the athlete uses 66-75% of the vital capacity during maximum effort, the large biocapacity can absorb large amounts of air, and the volume of breathing per minute for advanced athletes may reach more than ( 150 Liters) and may sometimes reach (189.5 liters/minute) approximately under special requirements and conditions.The volume of breathing air is determined by the amount of pulmonary capacity, as the lack of breathing resistance increases the strength of the breathing muscles, and then it is reflected on the increase in the vital capacity of the lungs, which increases the volume of breathing air, as there is a direct relationship between the vital capacity and the maximum breathed air, and there are factors that affect the vital capacity:

Body position. The strength of the breathing muscles and the extension of the lungs and the chest cavity, where it is 4.6 liters in young males and 3 liters in females, and it is related to the length of the body and structure by 4-30% of the normal size, and it can reach 6-7 liters, and the lung volumes and capacities in females are 20-25% less than in males and increase in athletes.

The importance of the research comes from the possibility of providing energy through aerobic breathing necessary to produce energy and muscular mechanical work and continue it for as long as possible through the ability of the respiratory system to direct oxygen to the working muscles to consume oxygen during the physical work that the player performs for a possible period of time.

## 2. Research Problem:

The respiratory system in the field of sports is important in an "economical" investment in time and effort to achieve the best results, through the fact that it is related to the total components of the body, the body and the function, and there are several methods of training in aerobic exercises, as each method

differs from the other in how it is applied, but it agrees in increasing the consumption of oxygen during the sports training process, so it wants to produce the energy of the athlete's neuromuscular work and by reviewing the researches and studies that deal withThe internal functional systems, especially the respiratory system of the athletes, which are related to the applied aspect of this subject and its relationship with the mechanical aspect of the 100m event, which prompted the researcher to go through this problem and identify the extent of the players' consumption of oxygen during the performance of the 100m running event, where the researcher noted that there is no great interest in the sports field of the field of health and knowing the effect of practicing physical activities in general and aerobic activities in particular, and the attention is only focused on medication and taking medical drugs, which prompted the researcher to do With this study, and to identify the extent of the effect of practicing physical sports and aerobic exercises suitable for players through exercises and their effect on the physiological and physical aspect, and that aerobic exercises are one of the important means in raising the body, maintaining the integrity of the body, and repairing defects and deformities that frame the body.

3. **Research Objectives:**
   1- Preparation of aerobic exercises for 100m runners from Mesopotamia Sports Club
   2- Identify the effect of exercise on research variables.
   3- Identifying the differences between the research variables .

4. **Research Hypotheses:**
   1- There are statistically significant differences between the pre- and post-measurements of pulmonary capacity of 100m runners.
   2- There are statistically significant differences between the pre- and post-Quins tests (3 minutes) of aerobic and functional body capacity.
   3- There is a statistically significant difference between the pre- and post-measurements of the PWC170 test .
   4- There is a difference between the two measurements (before and after) for the extraction of maximum oxygen (vo2 max)
   5- There are statistically significant differences between the pre-race and post-100m selections for the 100m run.

5. **Research Areas:**
   1- Human Field: A group of Mesopotamian sports players.
   2- Spatial Field: Playgrounds and halls of the Faculty of Physical Education and Sport Sciences – University of Mesopotamia and the medical laboratories of the university.
   3- Time Range: For the period from 1/2/2025 to 7/6/2025
6. **Study Terms:**
   1- **Pulmonary capacity :** It is the ability of the body to consume the greatest amount of oxygen during a given unit of time and thus produce kinetic energy that enables the individual to continue physical performance for a long time while delaying the onset of fatigue .

2- **Aerobic exercises** : These exercises lead to improving the efficiency of energy production systems in the presence of oxygen as well as improving respiratory endurance .
3- **Oxygen Capacity** : It is the ability to produce maximum energy or work in the phosphogenic system, ranging between 1-10 seconds, and includes sports activities that lead to maximum speed and strength in the shortest time.

**2-1 Research Population and Sample:**

The researcher used the experimental method to suit the nature of the problem, as the experimental method is one of the most accurate types of methods and is more effective and appropriate in communicating accurate and reliable results as it deals with the effective phenomena and their causes.

**2-2 Research Population and Sample:**

The research population includes a group of players of Mesopotamia Sports Club, where they represent the total research community, and the research sample was taken from the original community, which is (6) players, and they represent the research sample.

**2.3 Equivalence procedure for the research group**

**Table (1) shows the parity of the research sample members**

| Torsion coeffic | Broker | on | Going to | Variables |
|---|---|---|---|---|
| 1,377 | 67,5 | 1,96 | 68,4 | Weight |
| 2,366 | 171 | 3,55 | 173,8 | Length |
| 0,092 | 24,02 | 1,30 | 24,06 | Chronological a |
| 1,821 | 3,86 | 0,56 | 4,2 | Training Age |

It is clear from the above table (1) that the research sample according to the estimates indicated in the above table is limited to (-+3), which indicates the moderation of the research sample (equivalence).

**3-3 Devices and tools used in the research:**

1- Arab and foreign references and researches.
2- Observation and experimentation
3- Wooden Step Test Box (40cm)
4- Electronic Calculator
5- Spirometer.
6- Terraces, Weight and Height Measuring Device, 50m Length Metal Measuring Tape, Phosphorus Function Markers, Registration Form, Electronic Clocks, Phosphorous Adhesive Tape, Electronic Calculator.

**3-4 Tests used in the research:**

1- Pulmonary capacity
2- Queens test for (3 minutes) for aerobic capacity.
3- Extraction Maximum Oxygen Consumption (VO2 Max)
4- Test flexion and extension of the arms from the inclined prone position (Shanaw) in ten seconds
5- Jumping Running Time Test (30 meters)

6- Test run (20 meters) from the start of the aircraft
7- Test run 100 meters from a seated position to measure achievement.

1- **Pulmonary Capacity Test:** A dry, hydroelectric or electrical acerometer is used to measure the vital capacity of the lungs.

- Measurement method: The tester stands holding the breathometer in his hand, then makes an inhale and introductory exhale 1-2 times quickly, then takes to his chest the largest amount of air he can take from the inhaled air and performs the exhalation regularly and continuously until the extent that he has expelled the largest possible amount of exhaled air through the mouth, where he blocks the nose with a clip that performs this experiment three times and records the best reading, and to calculate the relative vital capacity, he divides the absolute vital capacity by the weight of the body.

**2- Measurement of the Quincy Step Test for (3 minutes) for functional aerobic capacity:**

- Purpose of the test: The test provides a way to assess the level of cardiorespiratory fitness and respiratory endurance.
- Description: The tester starts with the steps up and down the platform at a rate of 24 steps per minute, which lasts for 3 minutes, then the tester stops immediately after the completion of the performance to calculate the heart rate for 15 to 5-20 seconds after stopping, then multiplies the number *4 in order to know the number of beats per minute.
- Scoring: Maximum oxygen can be calculated and evaluated

111.33-0.42 (ml/ kg/ min) )Pulse per minute (= Male VO2max)

Female VO2max (ml/kg/min) = 66.81 -0.1847 × )Pulse per minute (Al-Jumaili, 2021)

**3- PWC170 Functional Efficiency Test Measurement:**

Functional efficiency is one of the most important special and important tests because it reflects the functional capacity of the heart and blood circulation, and the following equation is used.

Pwc170= n1+(n1-n2)*170-ps1%ps2-ps1

Relative functional efficiency (relative to the weight of the player) is calculated as absolute functional efficiency / weight of the player

PWC 170\WT. = PWC Relative 170

Absolute Functional Efficiency = PWC 170

Player Weight WT= (Jaber, 1997)

**4- Test flexion and extension of the arms from the inclined prone position (Shanaw) in ten seconds**

(Qais Naji, Bastowisi Ahmed, 1987, p.374)

- The objective of the test: to measure the rapid strength of the muscles in the arms.
- Test Description: The runner takes an inclined prostate position on the floor with the opening between the arms about chest-width apart, after which he bends and extends the arms completely, focusing on not bending the torso by raising or lowering the hip or bending the knees, and records the number of times the arms are bent and extended in ten seconds.

- Registration : The number of attempts completed by the runner is recorded within ten seconds.

**5- Testing the running time by jumping for a distance of (30 meters)** (Ibrahim Al-Basri, 1983, p. 151)

The objective of the test: to measure the rapid strength of the muscles of the legs.

Test Description: The runner stands on a specific line and then begins to perform successive jumps between the right and left legs and on the combs, focusing on the extension of the hind leg and the bend of the front of the knee, and the movement of the arms is coordinated and alternating with the two legs.

Registration : The timing of the performance time from the beginning to the moment of crossing the finish line of the prescribed distance of (30) meters by means of a manual electronic clock.

**6- Running test (20 meters) from the beginning of the plane (Qais Naji, Bastoisi Ahmed, 1987, p.363)**

Test objective: Measure the maximum speed.

Description of the test: A distance of (30) m is determined on the running field and a distance of (10) m is marked from the starting line at which the runner is standing and uses it as an accelerator during the run, and when the whistle is heard, he runs from the high start and when he reaches the prescribed starting line, the referee gives a signal to run (20) meters to the two timers standing at the end of the specified distance.

Scoring : The time is recorded to the nearest 0.01 seconds and each runner is given two attempts and the best of them is scored .

**7- Test of running 100 meters from a sitting position to measure achievement.**

Exam objective: Measure achievement.

Test Description: The runner sits at the beginning of the 100-meter run on the athletics track and when he hears the call to start, he runs as fast as possible until he crosses the finish line.

Registration: The time to the nearest 0.01 achieved by the runner is recorded by an electronic clock from the start to the end of the running distance.

## 3-5 Exploratory Experiment :

The exploratory experiment was conducted on Saturday 11/3/2025 on (5) players from outside the research sample, and the aim of conducting this experiment was to find out the following:

1. Identify the obstacles that may accompany taking the tests for the purpose of overcoming them.
2. Know the time required to perform the tests.
3. The validity of the devices and tools used in the research.
4. The efficiency and understanding of the testing of the assistant team.

## 3-6 Pre-Tests :

The pre-tests of the research sample were conducted on Tuesday 15/3/2025 with the same procedures as the exploratory experiment in terms of time, place, and tools used on the stadium of the Faculty of Physical Education and Sport Sciences – Mesopotamia University.

**3-7 Main Experiment**: The implementation of the main experiment of the research sample started on Saturday 22/3/2025

**3-8 Aerobic Exercise Program:**

The aerobic exercise training program was applied for (12) weeks and two training units per week (Sunday and Wednesday), where the program lasted three months and the number of training units reached (24) units, and the training unit time ranges from (60) minutes, including warming up and soothing, and the researcher used the interval training method in giving the training load, as the training unit included exercises for prolonging oxygen, aerobic exercises from standing, flooring, wall exercises, relaxation, stretching, as well as exercises of the arms, torso, legs, and abdominal exercises. The back is repeated (3) to (4) times, and the rest period was from (45-90) seconds between one set of exercises and another.

**3-9 Post-Tests :**

The researcher conducted the post-tests of the research sample on Wednesday 2/4/2025 immediately after the completion of the application of the training curriculum and in the same style as the pre-tests so that they are the same in terms of time, playground, and tools used.

**3-10 Statistical Methods:**

The researcher used the Statistical Package for Data Processing (SPSS )

## 4. Presenting, analyzing and discussing the results:

**1Presentation, analysis and discussion of the results of the pulmonary capacity and skill performance tests for the research sample**

Table (2)

**It shows the arithmetic mean, standard deviation, mean differences, deviation of the error of estimating the difference observation, the calculated value of (v), the level of significance and significance in the tests of lung capacity and skill performance of the 100 m run for the pre- and post-tests**

| Level Significance | Morale level | (v) Calculated | ASF | P | Dimensional | | Tribal | | Variables |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | on | Going to | on | Going to | |
| Moral | 0,000 | - | - | 2.93 | 0.71 | 3936 | 0.6 | 3243 | Pulmonary capacity test |
| Moral | 0.000 | - | - | 27.24 | 133.19 | 1560.93 | 121.22 | 1350.25 | Pwc170 |
| Moral | 0.000 | - | - | 4.45 | 2.7 | 159 | 2.58 | 125 | Koonys Test |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Moral | 0.000 | - | - | 3.31 | 254.33 | 4312.23 | 279.65 | 2614.11 | Vo2Max Test |
| Moral | 0,000 | 8,94 | 0,54 | 4,83 | 1,21 | 13,16 | 0,81 | 8,33 | 10 S Test/Repeat |
| Moral | 0,001 | 4,87 | 0,08 | 0,39 | 0,069 | 5,23 | 0,085 | 5,62 | 30m Jump Running Time Test |
| Moral | 0,001 | 4,8 | 0,05 | 0,24 | 0.051 | 2,75 | 0,067 | 2,99 | 20m test of flying mode |
| Moral | 0,000 | 6,85 | 0,07 | 0,48 | 1,063 | 11,67 | 1,079 | 12,15 | Achievement Test |

The tabular score is at a degree of freedom (5) and below the error level of ≤ (0.05).

We can see from the above table () that there are statistically significant differences between the pre- and post-measurements and in favor of the dimensional measurement in the maximum oxygen consumption, which is a significant function, and this is consistent with the study of (Hussein Abaza, 2000) and Hossam Al-Sayed, 2000, and the researcher attributes this difference to the training program used by the research sample, as the training contributes to improving pulmonary ventilation and increasing the level of oxygen consumption, which in turn leads to a reduction in the content of lactic acid in the blood during physical exertion in players. The researcher attributes the remarkable progress in both the physical efficiency of the Queens test and the maximum oxygen consumption leads to a rise in physical fitness, as Muhammad Hassan Allawi (1994) refers to the association of various physical traits with the process of upgrading and improving the work of the various internal organs of the individual's body, which emphasizes and ensures motor activity, and agrees with the study of Youssef Dhahab (1984) and Owais Al-Jebali (1985), It is pointed out that the standardized training program affects the level of functional status positively, as well as leads to a fundamental improvement in the individual's ability to exert more effort, improve the processes of transporting and delivering oxygen to the working muscles, and delay the onset of fatigue, as well as in the (PWC170) test that significantly improves the work of the heart and blood circulation as a result of adaptation during the practice of physical training, as the value of physical efficiency may be high or low depending on the sports training, as it increases with regular training and decreases in The case of disconnection from it (Al-Shammari, 2009).

Also, there is a significant difference in the running tests (100 m) between the pre- and post-tests and in favor of the post-test, and the researcher attributes that the development of achievement in the post-test was due to the improvement of the fast strength and speed of the research sample, the results of which appeared clear in the tests of running by jumping and jumping, and the speed that was referred to as a result of the use of exercises according to a correct scientific method, which contributed to improving the physical level of the research sample, which was reflected in the

increase in the output of the strength of the working muscles and the repetition of the instantaneous push in each step during running. Increasing the force imposed on the ground by the legs and continuing the maximum performance for the longest possible period of time, as the nature of the exercises is to raise the level of neuromuscular compatibility in the muscles participating in the performance, which in turn works to increase the motor speed of the working muscle groups and the exchange of central and eccentric contractions in the shortest possible time so that they become compatible during the muscular contractions in the motor work, which leads to raising the level of physical players. Most of the early stages of short distances depend entirely on the development of rapid strength, speed and neuromuscular compatibility to recruit the largest possible number of active motor units, which means a development in the ability of the working muscles to make such movements, and this was evident in the results of the achievement, and this is confirmed by (Mohamed Tawfiq). The motor speed increases through muscle strength and the development of rapid strength is due to the adaptations in the fast-contracting muscle fibers associated with muscular adaptation, represented by the large size of the muscle cross-section, resulting in the effect of training (Mohamed Tawfiq Othman, 1998, p.42).

## 5- Conclusions and Recommendations:

### 1- Conclusions :

1- The exercises prepared by the researcher and applied to the members of the research sample contributed to the development of all the research variables.
2- Aerobic exercise contributed to the development of skill performance through the consistency between the length and frequency of running steps.
3- . The exercises used within the training curriculum have contributed to the development of achievement.
4- The training program using aerobic exercise has led to a significant improvement in both the Vital Capacity, Queens Test, PWC170 and Maximum Oxygen Consumption.

### 2- Recommendations:

1- Adopting the vocabulary of the training curriculum and circulating it to the trainers of this event in sports clubs.
2- Emphasizing aerobic training according to Emaar's category, taking into account the training loads and intensity level.
3- Attention by trainers to respiratory function, especially in aerobic exercises
4- Using other training programs to know their impact on research variables.
5- Emphasizing flexibility and relaxation training, especially for the lower extremities, in exercises during each training unit .
6- Conducting similar studies for other categories and other activities using the aerobic training method.

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- **Consultation:**

It is best to consult with your trainer or doctor before starting any aerobic exercise program, especially if there are any health problems.