International Journal of Sports Science and Arts

# The effect of hypoxic training on the development of special endurance compounds and some vital reactions of athletes

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## Introduction

The need for athletes to possess physical and movement capabilities has led to the interest of coaches and researchers in developing those capabilities, and the need to reach high levels in various fields of sport has called for the use of scientific method and technological progress to improve the style of sports training in various games, and this in turn reflects the level of progress of countries and peoples.

Functional adaptation is one of the main duties of the sports training process and one of the most important indicators by which it is possible to measure the level of influence of the training process and its development to reach the highest level of achievement, and so that identifying the physiological effects of sports training indicates the trainer's understanding of how the various body systems respond and adapt to the training load, Which is one of the most important applied rules for physiological science in the sports field. Through this information, training programs can be developed and planned to establish and codify the components of the appropriate training load and develop it and improve training methods in away that achieves the ideal achievement and does not lead to stress. (19:10)

The trainer must be familiar with the foundations of the sciences

associated with the training process and not rely on experience only in completing the training process, but always strive to complete these aspects through his continuous study concurrent with the training process.(4:17)

Hypoxic training appeared in the beginning when the Olympic Games were set to be held in Mexico, which rises 2300 meters above sea level, as the trend began positively to try to know the exact extent of the possibility and impact of sports and sports numbers when the athlete is exposed to competition in the heights, and questions began after that about its impacton Achievements, and how long will it take for adaptation to occur. (5: 290)

Hypoxic training is the performance of exercises while the tissues and cells of the body are exposed to hypoxia (by suppressing the breath, controlling breathing, or reducing the number of times of breathing during the performance) and for the inevitability of playing competitions in places above the sea level, in which the player is exposed to a lack of oxygen, which calls for To the importance of an adaptation of the body's organs andsystems to performance during hypoxia "(6: 301)

Hypoxic training has been used with success in swimming and Athletics. The positive effects of studies have been shown to improve the maximum oxygen consumption, economize blood circulation within the muscle, and increase the storage of glycogen in the muscles with an increase in the enzymes that help produce ATP aerobically and anaerobically ”(310: 9)

Football sport, as a multi-center sporting activity, needs some special physical characteristics that achieve excellence in athletic and skillful performance, just like all sports, as every sporting activity has special physical dimensions that distinguish it from other sports activities.

This is consistent with what Mufti Ibrahim indicated, that each of the playing centers has certain characteristics and specifications that must be available in the player who occupies this position, and the priorities of the specifications for each center differ according to the nature of the performance priorities for defensive and offensive duties in different placeson the stadium. (19: 287-296)

Bahaa Al-Din Salama (2000 AD), Arnason and others confirm that the nature of performance in football during the match is characterized by the instability of the methods of performance in terms of the frequency and variety of moves, and it is always linked to the changing playing positions, as well as all the playing positions that he performs. The player is linked to the changing playing situations he meets during the competition, and the implementation of the planning duties requires various movements and a mixture of maximum speed and less than the maximum, running and walking as required by the playing conditions, as well as situations that are characterized by quick performances, running for small distances, rotations and changing directions according to positions, jumping, kicking and extracting the ball All the above must be taken care of so that football becomes faster, more interesting and attractive. (9: 270, 271), (39: 278)

Muhammad Reda Al-Waqqad (2003) points out that special physical abilities in soccer are a fundamental factor in raising the level of skillful performance, as physical abilities aim to define certain characteristics that play a prominent role in the player's mastery of basic skills, and socceras one of the group physical activities is a technical sport which contains a large number of skills that require a great deal of potential and physical abilities in order to perform in a good manner and artistic performance. (25:31)

Essam Abdel-Khaleq (2005 AD) also states that special endurance means the ability of an athlete to perform as efficiently as possible during physical and skill work that is completely similar to the physical and motor act performed by the athlete in the specialized competition, no matter how long the performance period is.The circulatory and respiratory systems are considered among the most important body systems that have an impact on the level of functional competence of soccer players, whether in actual performance or in the time of rest between the two halves, so the coach must be fully aware of the processes of development of anaerobic energy and how to increase the efficiency of the respiratory circulatory system, which affects positively on the level of the skillful performance of football players. Therefore, delaying the onset of fatigue in an athlete depends mainly on the efficiency of the circulatory and respiratory systems, as muscle groups cannot continue to contract unless they are supplied with energy and oxygen, The more there

is a continuous providing and supply of energy and oxygen to neurons through the circulatory and respiratory systems, the more muscle groups can continue to function. ” (15: 144)

Accordingly, training with lack of oxygen is considered one of the modern training methods that work to raise the level of athletic performance, given that training with lack of oxygen leads to an increase in oxygen debt while reducing the number of times of respiration, which leads to hypoxia even at the level of the cell, but to a certain extent ensures the adequate supply of cells With oxygen in tissues.

Through the previous presentation, we find that hypoxic exercises are of particular importance, as they lead to some functional changes that would raise the athlete’s performance level, This calls for the necessity to study this method of training in the field of soccer sports in order to raise the level of the player's functional and physical competence. Adrian Casillas(2008) explains that training programs depend in their design for developing special endurance on many methods, means and training methods, according to the desired goal Examples include hypoxic training, This is evident in the match where the sport of soccer consists of two halves, the duration of the stroke (45 minutes) and the rest period between them (15 minutes). Thus, the predominant energy system according to the performance time on which the player relies is the aerobic, but the performances within the stadium depend on the anaerobic system upon execution and this In a course, the player is exposed to harsh competitive conditions that require special endurance compounds, and this shows us the urgent need to apply hypoxic training in soccer.

Through the above, and after the researcher reviewed many scientific references and studies that dealt with research and study on hypoxic training, as well as the researcher's interview with a group of soccer coaches and some experts in the field of sports training in terms of conducting dialogues with them and through the researcher's experience as a coach and a physical trainer, Note that most of the studies that have been conducted have examined the effect of hypoxic training within the limits of the researcher's knowledge without being exposed to knowing their effect on the special endurance compounds and the vital reaction of athletes at different levels of their training.

Hence, the problem of this research crystallized, represented in the absence of such specialized studies, which help the person in charge of the training process to know the effect on the special endurance compounds and the vital reaction of the body.

**Research objective:**

**The research aims to identify "the effect of hypoxic training on developing special endurance compounds and some vital reaction reactions for athletes**" through the following:

- The effect of hypoxic training on the development of special endurance compounds for soccer players.
- The effect of hypoxic training on the vital feedback of soccer players.

**Research Hypotheses:**

- There are statistically significant differences between the mean of the pre-measurement scores and the average of the post-measurement scores in the endurance components of soccer players in favor of the post-measurement.
- There are statistically significant differences between the mean of the pre-measurement scores and the average of the post-measurement scores in the vital feedback of soccer players in favor of the post- measurement.

**Search terms: Hypoxic exercises:**

"It is training to suppress breathing by reducing the number of times of breathing, which results in a decrease in the amount of oxygen needed for the body's cells, which leads to an increase in the body's ability to adaptto the oxygen debt." (17: 311)

**Special endurance compounds:**

They are the different forms of special endurance that appear in the different kinematic performances of a soccer player, with or without the ball, including bearing performance - bearing capacity - acceleration - bearing speed.

**Research methods and procedures:**

**Research Methodology:**

The experimental method was used with the experimental design ofone group using pre and post measurement.

**Research Community and Sample:**

The research community includes football players in the clubs in the Qalubiya region, whose number ranges from (240) players who are

registered in the records of the Egyptian Football Association for the year (2019/2020 AD). (25) players and (5) players were used in the survey, and that is from the total sample range of (30) players.

**Homogeneity of the sample:**

The researcher has approved that there is homogeneity for the members of the research sample in the variables that may affect the independent variable, as indicated by previous studies and theoreticalreadings, which are as follows:

Table (1)

Homogeneity of the research sample in the variables of age, weight, height, and training age N=30

| Ser. | Variable | Average | Mediator | standard deviation | Coefficient of torsion |
|---|---|---|---|---|---|
| **1** | **Age** | **15.40** | **15.00** | **1.453** | **0.825** |
| **2** | **Length** | **164.50** | **160.50** | **9.547** | **1.109** |
| **3** | **Weight** | **62.03** | **62.50** | **6.094** | **0.231** |
| **4** | **Training age** | **3.87** | **3.00** | **2.345** | **1.113** |

It is evident from Table (1) that the values of the torsion coefficients inthe variables of homogeneity (age - height - weight - training age) ranged between (-0.231: 1.113), which are values less than ± 3, indicating the homogeneity of the members of the research sample in the selected variables. It lies below the equinox curve.

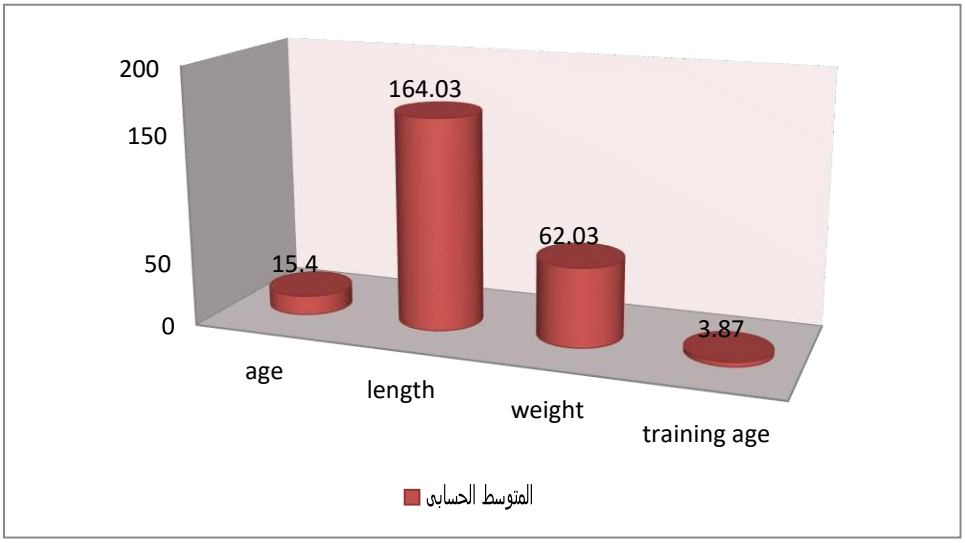



Table (2)

Homogeneity of the research sample in special tolerance compoundsN=30

| Ser. | The test used | Unit of measuring | Average | Mediator | standard deviation | Coefficient of torsion |
|---|---|---|---|---|---|---|
| 1 | **Speed endurance** | **Time** | **7.013** | **7.000** | **0.679** | **0.030** |
| **2** | **Strength Endurance** | **Number** | **179.564** | **180.000** | **1.622** | **0.041** |
| **3** | **Performance** | **Number** | **12.082** | **12.000** | **0.805** | **0.337** |
| | **Endurance** | | | | | |
| **4** | **Aerobic Endurance** | **Meter** | **2079.600** | **2098.500** | **59.325** | **-0.141** |

It is evident from Table (2) that the value of the torsion coefficient is limitedto (± 3) for the special endurance compounds, where the value of the torsion coefficient is limited to (-0.623: 0.385), which is less than ± 3, which indicates the homogeneity of the members of the research sample in the special endurance compounds. It lies below the equinox curve.

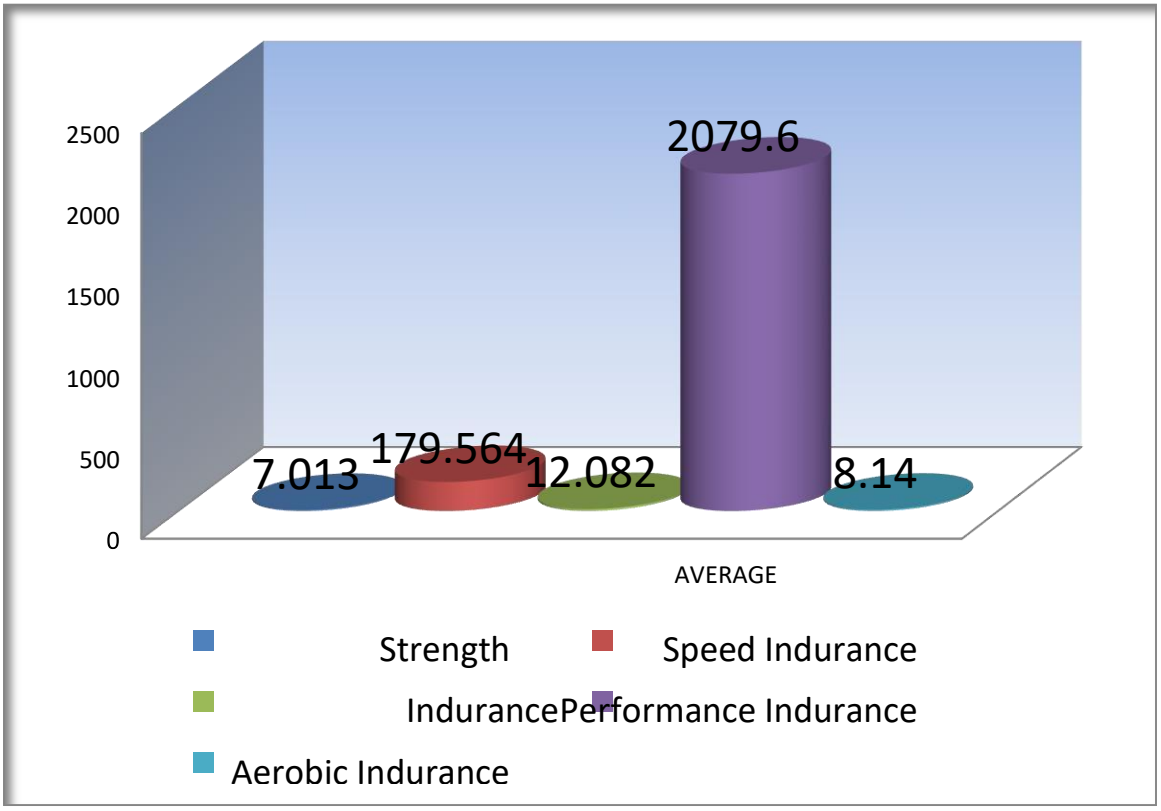


**Table (3)**
**The homogeneity of the research sample in some variables of thecirculatory system**
**N = 30**

| Ser. | Variables | Unit of measuring | Average | standard deviation | Mediator | Coefficientof torsion |
|---|---|---|---|---|---|---|
| 1 | Rest pulse | p/m | 71.753 | 0.864 | 72.000 | 0229 |
| 2 | Diastolicblood Pressure | Milliliters / Hg | 78.642 | 0.923 | 79.000 | -0306 |
| 3 | Systolicblood Pressure | Milliliters / Hg | 119.139 | 0.709 | 119.000 | -0.122 |
| 4 | Power Indicator | Degree | 138.907 | 0.707 | 139.000 | 0.509 |
| 5 | Lactic Percentage | Mmo1e/1 | 7.092 | 0.705 | 7.000 | -0.027 |
| 6 | Cardiac Impulse | Milliliter / liter | 7.762 | 0.706 | 8.000 | 0.256 |

It is evident from Table (3) that the value of the torsion coefficient is limitedto (± 3) for the physiological variables, where the value of the torsion coefficient is limited between (-0.423: 0.509), which is values less than ± 3, indicating the homogeneity of the members of the research sample in the selected variables and that they fall under Equinox curve.

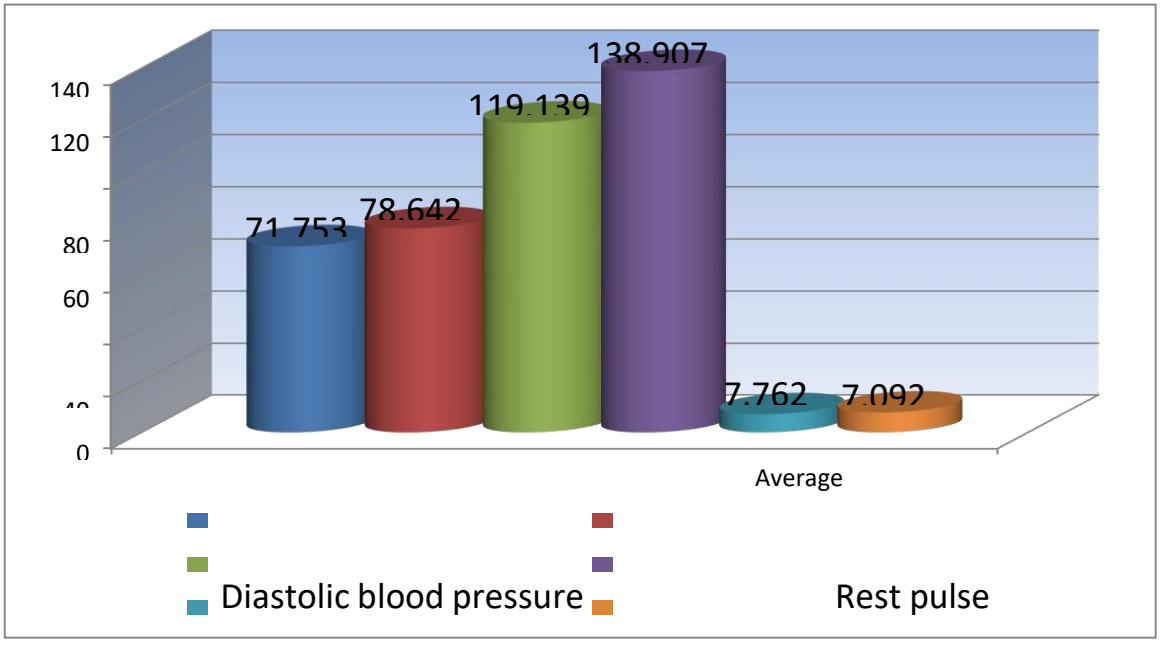


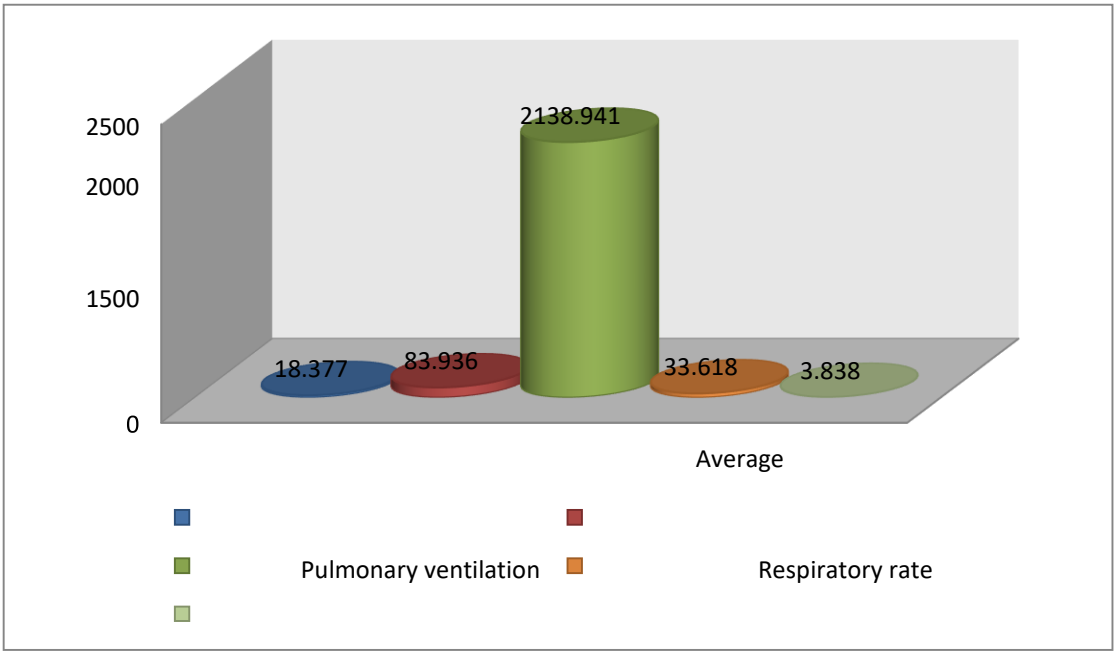
Table 4

Homogeneity of the research sample in some variables of the respiratory system

N = 30

| Ser. | Variables | Unit of measuring | Average | standard deviation | Mediator | Coefficient of torsion |
|---|---|---|---|---|---|---|
| **1** | **Respiratory Rate** | **Repetition** | **18.377** | 0.764 | **18.00** | **-0.405** |
| **2** | **Pulmonary ventilation** | **L/M** | **83.936** | 1.104 | **84.000** | **0.052** |
| **3** | **The volume of consumed oxygen** | **ML / Min** | **2138.941** | 34.085 | **2156.000** | **-0340** |
| **4** | **Maximumoxygen consumption** | **ML/KG/Min.** | **33.618** | 1.096 | **33.000** | **0.881** |
| **5** | **Vital capacity** | **Liter** | **3.838** | **3.727** | 4.000 | **0.116** |

It is evident from Table (4) that the value of the torsion coefficient is confined to a value of (± 3) for the variables of the respiratory system, where the value of the torsion coefficient is confined between (-0.547: 0.881), which is values less than ± 3, which indicates the homogeneity of the individuals of the research sample in the selected variables and that it isIt lies below the equinox curve.




**Means and tools for data collection:**

The researcher used the tools, devices and tests that are commensuratewith the nature and objectives of the research and the mechanisms of action within the practical application of the research experiment.

**First: the tools and devices used in the research**

- A training ground.
- Medium trampoline
- Divided box
- Barriers, cones, medical balls, collars, rubber ropes and agility ladder.
- Swiss balls, tape measure and adhesive labels.
- Balls and sandbags.
- Stopwatch and whistle.
- graduated ruler.
- Keel for balance.
- Speed Parachute.

**3/3/2/7/2 devices used in the research:**

- Ristameter device.
- Video camera (SONY).
- Medical balance.
- P4 computer.
- HP1200 Laser Printer.
- A scanner.

- Masks for low oxygen exercise.
- Metamax 3B device to measure some variables of the circulatory and respiratory system, equipped with a computer

**Second: The tests and measurements used in the research:Physical exams attachment (10):**

**Table (5)**
**Tests that measure special endurance compounds**

| Ser. | Physical variables | Tests | Measure u. |
|---|---|---|---|
| | | | |
| 1 | Aerobic endurance | Cooper Test 12 minutes | Meter |
| 2 | Strength endurance | Hanz Test | Repetition |
| 3 | Speed endurance | 5 x 30 meter test with 30 seconds rest | Second |
| 4 | Transition speed | The running test - 50m from the approaching 15m | Second |
| 5 | Performance endurance | Head and foot hitting test for 1 minute | Repetition |

**Physiological tests, attachment (10):**
**Table (6)**
**Tests that measure physiological (heart) variables**

| Ser. | physiological variables | Tests | Measure u. |
|---|---|---|---|
| 1 | Systolic blood pressure | Using the Sphygmomanometer | Milliliters / Hg |

| | | | |
|---|---|---|---|
| 2 | Diastolic pressure | Using the Sphygmomanometer | Milliliters / Hg |
| 3 | Cardiac energy index | (Systolic + diastolic pressure) x heart rate / 100 | Degree |
| 4 | Cardiac thrust | Metamax 3B device | Milliliters / minut. |
| 5 | Lactic | Taking a blood sample after exertion | Mmole/l |

**Respiratory Variables:**

Tests that measure the physiological variables of the respiratory system through the Metamax 3B equipped with a computer.

**Exploratory study:**

The researcher conducted a number of (2) exploratory studies, the first study aimed at verifying the validity of the tools and devices used, trainingassistants, and the second study aimed at legalizing special training loads, determining the dynamics of pregnancy during the program weeks, and determining the times of hypoxic training within the training dose.

**Application procedures 1/5/3 pre- measurements**

Pre-measurements were made on the individuals of the basic study sampleof the special tolerances and vital reactions from 6/9/2020 AD to 8/9/2020AD.

**Basic Research Experience:**

After the exploratory study and its findings, the researcher conducted thebasic study as follows:

The individuals of the basic sample were subjected to a unified program inall its suggested contents, which the researcher had previously applied to

the players of the Benha Sports Club, for a period of 8 weeks from9/10/2020 AD to 11/12/2020 AD.

**Steps to design the training program:**

**The researcher took the following into account when designing theprogram:**

- Determine the goal of the program and the goals of each stage during its implementation.
- The program is suitable for the age group.
- Take into account individual differences and individual playerresponses.
- Determine the most important training duties and arrange theirprecedence and gradation.
- Organizing the training process and diversifying the exercises.
- Flexibility of the training program.
- The degree of endurance is proportional to training in terms of(straits, size and intensity).
- Gradual increase in load, appropriate progress and taking into account the wave shape of the training loads.
- Take into account the security and safety factor.
- Taking into account the method of application of hypoxic exercisesaccording to scientific foundations.
- Taking into account the period during which the hypoxic training is applied (preparation period - competition period - transition).
- Taking into account any physiological fatigue during execution or when symptoms of fatigue appear, and as a result, the intensity ofthe exercise is reduced or the player stops exercising.

**Steps to legalize the training program**

**The researcher has identified the most important variables of the training program, represented in:**

- The period for applying the training program.
- Determine the type of training phase.

- The time period (number of weeks) appropriate to implement theprogram.
- Determine the number of repetitions of the training unit per week.
- Determine the number of training periods during the daily trainingunit.
- Determine the time of the training unit.
- Determine the loads used in the program.
- Determine the formation of the training load during the trainingunits.
- Determine the hypoxic training method.

Based on the analysis of training programs that are specialized in the hypoxic exercises referred to by scientific references and previous studies, including the study of "rusko" (1999) (34), study of Hellemans, J (1991) (32) "et al, Gundersen" (2001) (31), “Vogt et al” (2001) (33) “,Intisar al-Shahat Ahmad” (2004) (7), study of “Muhammad Zakaria Gazr” (2005) (26) “,Muhammad Hasan Muhammad” (2005) ( 24) 56, “ Amrallah Ahmad Al-Busati” (2016) (6), Aya Muhammad Atiyah (2017) (8).
This resulted in the following:

- The volume of hypoxic training ranges from 25-50 minutes of the total volume of the training unit time, which ranges in duration ofapproximately one hour.
- It is not allowed to be used for a long time to avoid fainting or nausea, which are two possible phenomena that stop the moment offeeling a headache, which may last for 30 minutes.

**The foundations that the researcher observed when applying theexperiment: Characteristics of the load directed at the development of specialendurance compounds through hypoxic training:**

- The program was applied 5 times a week at a time ranging from 40: 109 minutes for 8 weeks during the preparation period, and accordingly the number of training units became 40 training units, and the hypoxic training during the weeks was heavily graded from 75%: 90% of the maximum for a player.

- A standardized warm-up was carried out in the training units on the research group (experimental) with an air load of 30%: 50% intensity, whichincluded exercises that contribute to raising the body temperature and preparing the muscles for work and stimulating the blood circulation (such as various running and jumping) and then various stretching exercises
- Then the main part was implemented, which included general preparation exercises for the research group, whose content targeted most parts of the body.
- The experimental variable (hypoxic training) was applied in the special preparation and skills part of the training dose by 30% of their total.
- The standardized calming part was implemented in the training units, which contains exercises that contribute to the restoration of healing, such as weighting and stretching.

**The post- measurements**

The post measurements were made on the basic study sample of special endurance compounds and vital reactions from 11/13/2020 to 11/15/2020.

**Statistical processors**

After collecting data and recording the various measures of the variables that were used in this research, appropriate statistical treatments were carried out to achieve the goals and ensure the validity of the assumptionsusing statistical laws. The data was processed using the following statisticalmethods:

SMA.

Mediator. Standard deviation.

Coefficient of torsion. The T-test for differences

Percentage improvement%.View and discuss results

Table (7)

Differences between the pre and post measurements in the special endurance vehicles

N = 25

| Ser. | Variables | Pre- measure | | Past- measure | | Difference between 2 averages | Value of T. | Improvement percentage |
|---|---|---|---|---|---|---|---|---|
| | | S | ± C. T | S | ± C. T | | | |
| 1 | Velocity Endurance | 7.016 | 0.688 | 5.736 | 0.525 | 1.280 | 7.396 | -18.24% |
| 2 | Strength endurance | 179.468 | 1.631 | 185.960 | 2.263 | - 6.496 | -11.636 | 3.62% |
| 3 | Performance endurance | 12.058 | 0.814 | 17.680 | 1.108 | -5.622 | -20.450 | 46.62% |
| 4 | Aerobic endurance | 2079.640 | 62.643 | 2394.800 | 57.371 | -315.160 | -18.551 | -30.91% |
| 5 | Transition velocity | 8.-48 | 0.880 | 5.560 | 0.583 | 2.488 | 11.785 | -30.91 |

The tabular t value is at 0.05 level of significance and 24 = 1.71 degree of freedom.

Table (7) shows that there are statistically significant differences between the pre and post measurement of the experimental group in the special endurance compounds, as the value of (t) was calculated between (-20.450:11.785) and its calculated value was greater than the tabular at a significantlevel of (0.05), which indicates There are differences between the two measures of special endurance compounds

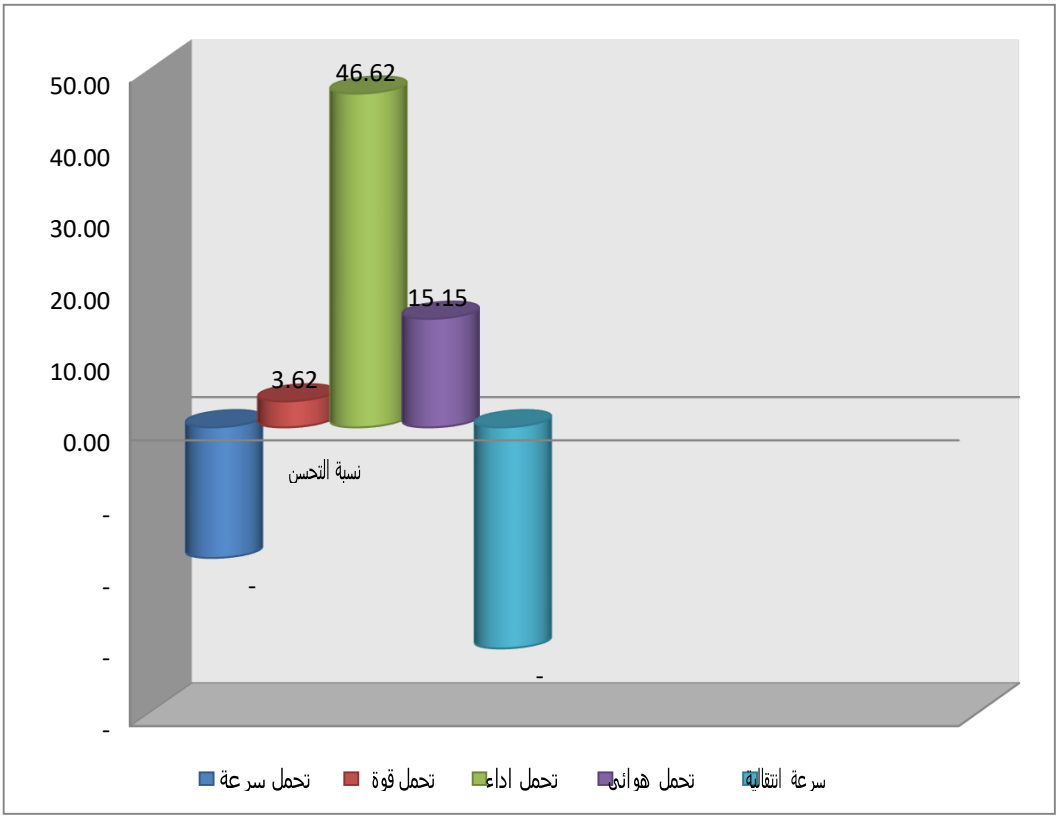



Table (8)

The differences between the pre and post measurements of the experimental group in the measurements of the Circulatory system

N = 25

| Ser. | Variables | Pre- measure | | Past- measure | | Difference between 2 averages | Value of T. | Improvement percentage |
|---|---|---|---|---|---|---|---|---|
| | | S | ± C. T | S | ± C. T | | | |
| 1 | Rest pulse | **71.744** | **0.885** | **69.800** | **0.764** | **1.944** | 8.313 | **%-2.71** |
| 2 | Diastolic blood pressure | **78.531** | **0.914** | **75.400** | **0.816** | **3.131** | 12.773 | **%-3.99** |
| 3 | Systolic blood pressure | **119.173** | **0.718** | **114.800** | **0.764** | **4.373** | 20.865 | **%-3.67** |
| 4 | Power indicator | **138.888** | **0.776** | **132.120** | **1.092** | **1.580** | 25.256 | **%-4.87** |
| 5 | Lactic percentage | **7.060** | **0.708** | **5.480** | **0.510** | **-0.686** | 9.055 | **%-22.38** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6 | Cardiac thrust | **7.834** | **0.720** | **8.520** | **0.963** | **-0686** | -2.852 | **%8.76** |

The tabular t value is at 0.05 level of significance and 24 = 1.71 degree of freedom

Table (8) shows that there are statistically significant differences between the pre and post measurement of the experimental group in the vital reactions, as the value of (t) was calculated between (-2.852: 25.256) and its calculated value was more tabular than at the level of significance (0.05)

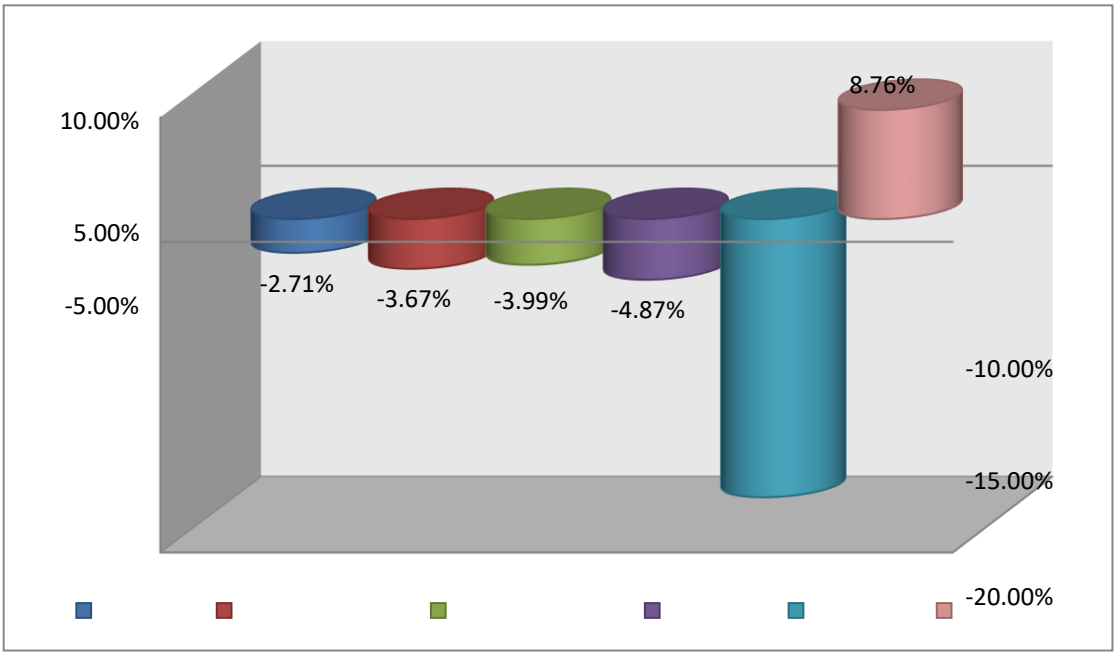



Table (9)

Differences between pre and post measurement of experimental group in respiratory measurements

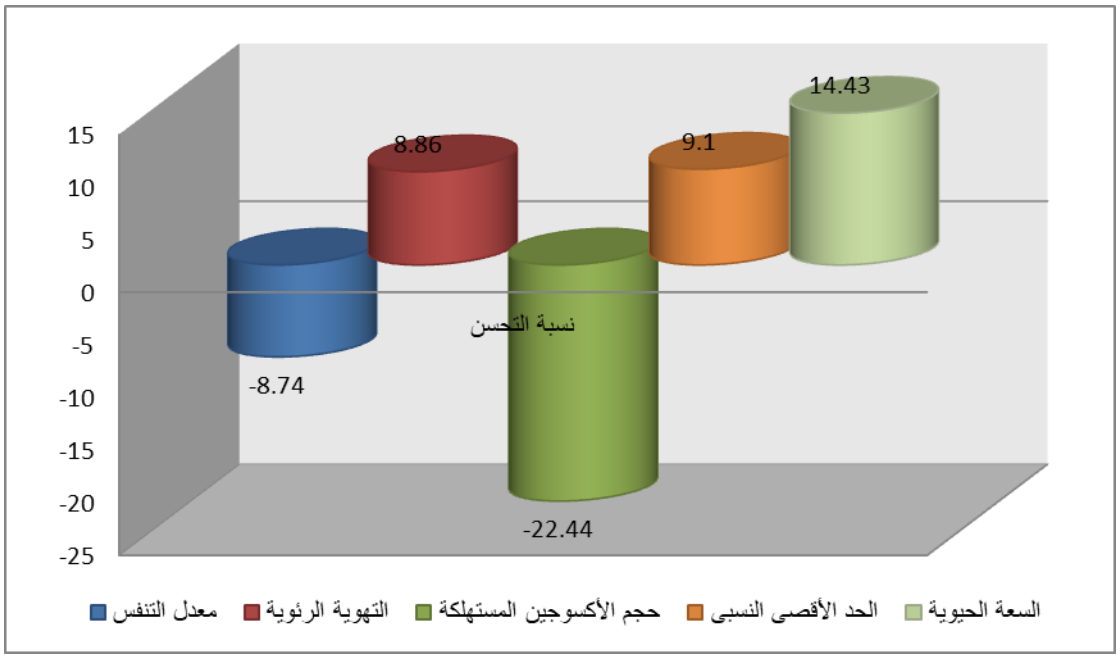
N = 25

| Ser. | Variables | Pre- measure | | Past- measure | | Difference between 2 averages | Value of T. | Improvement percentage |
|---|---|---|---|---|---|---|---|---|
| | | S | ± C. T | S | ± C. T | | | |
| 1 | Respiratory rate | **18.452** | **0.765** | **16.840** | **0.987** | **1.612** | **6.455** | -8.74 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 | Pulmonary ventilation | **83.923** | **1.179** | **91.360** | **1.075** | **-7.437** | **-23.307** | 8.86 |
| 3 | The volume of oxygen consumed | **2138.941** | **34.203** | **1658.941** | **63.619** | **480.000** | **33.227** | -22.44 |
| 4 | The maximum oxygen consumption | **33.546** | **1.090** | **36.600** | **0.500** | **-3.054** | **-12.733** | 9.10 |
| 5 | Vital capacity | **3.845** | **0.723** | **4.400** | **0.577** | **-0.555** | **-2.998** | 14.43 |

The tabular t value is at 0.05 level of significance and 24 = 1.71 degree of freedom.

Table (9) shows that there are statistically significant differences between the pre and post measurement of the experimental group in the measurements of the respiratory system, as the value of (t) was calculated between (--2.99: 33.227) and its calculated value was more tabular than at a significant level (0.05) than It indicates that there are differences between the two measurements in all respiratory measurements under study.



**Discussion and interpretation of results:**

It is clear from Table (7) and Figure (7) regarding the differences between the pre and post measurements in the special endurance compounds that there are statistically significant differences between the pre and post measurement of the research sample in the special endurance compound, where the calculated value (T) is limited to (-20.450: 11.785) and its calculated value was greater than the tabular at a significant level (0.05), indicating that there are differences between the two measurements in the special endurance compounds, The percentages of improvement between
the pre and post measurements in special endurance compound ranged between (3.62% -30.91%) in favor of the post measurement.

The researcher attributes the improvement in the results to the effect of using hypoxic training as well as the standardized training and the similar training contained in the nature of the performances that he applied to theindividuals of the research sample.

Special exercises are of great importance in improving performance, and training must be consistent with the kinetic path of the skill to be trainedwith, and the working muscles participate in the movement.

Special exercises are of great importance in improving performance, and training must be consistent with the kinetic path of the skill to be trainedwith, and the working muscles participate in the movement.

Alsayed Abdel-Maqsoud (1994) (4) confirms that that its exercises are a dynamic match between their path and the technique, and they also leadto the development of the dynamic qualities of technique, and special exercises take many forms according to the nature of the sporting activity being practiced.

These findings are consistent with the results of Mufti Ibrahim Hammad (1999) (27) Muhammad al-Sayyid al-Junaidi (2005) (21), Wael Awad (2007)
(29), Ahmad Abd al-Mawla (2008) (1), Adel Al-Fadhi (2009) (13), Islam
Massad (2011) (2), Sameh Ibrahim Bakri (2015) (10) that the highly

standardized training program and structured training lead to improvementin physical characteristics.

The researcher also attributed the improvement in the special endurance compounds at a significant level (0.05) to the hypoxic exercises used in the training program, and this was confirmed by the results of the Scientific and clinical oxygen deficiency (2002) (41) that the use of training with lack of oxygen on athletes leads to an improvement in the elements of Public and private physical fitness..

The results of the study of Essam El-Sayed (2003) (16) and Muhammad Zakaria Jazar (2005) (26) also indicate that there is an effect of hypoxic training on the physical variables with respect to the two post- measurements of the experimental and control groups in favor of the post-measurement of the experimental group as these two studies confirm that the use of These exercises contribute to raising the level of general and private fitness of the players.

The results of this study are in agreement with the study of Entesar Al- Shahat Ahmed (2004 AD) (7) regarding the existence of an effect of hypoxictraining on the physical aspect with respect to the two post measurements of the experimental and control groups in favor of the post measurement of the experimental group in the variables (general endurance, speed endurance, agility, velocity, muscle strength).

Also, the study of Ashraf Al-Sayed Suleiman (1995) (3) confirmed that hypoxic training during training leads to difficulty breathing, which resultsin the body adapting to this intensity on the internal body systems, this, inturn, leads to an improvement in the physical aspect, and that the use of low-oxygen exercises on the physical variables with respect to the post- measurement of the experimental group led to a clear improvement in both (endurance, velocity endurance, strength characteristic of speed).

Adel Omar (1999) (12) asserts that the rate of improvement in physical characteristics increases through anaerobic exercises, aerobic exercises and

the development of appropriate tools, as it is a reflection of the effect of the training load on vital organs as a result of the external load of the anaerobic exercises that the player performs in order to develop the functional and physical condition.

Adel Omar (1999) (12) asserts that the rate of improvement in physical characteristics increases through anaerobic exercises, aerobic exercises and the development of appropriate tools, as it is a reflection of the effect of the training load on vital organs as a result of the external load of the anaerobic exercises that the player performs in order to develop the functional and physical condition.

Islam Mosaad, quoting Patrick Beth (2011) (2), confirms that the sport of soccer depends to a large extent on the anaerobic system in order to keeppace with the great development in the movement of soccer players, through the results that were reached and the agreement of many scientists and studies, the effect of hypoxic training on the special endurance compounds that the results showed is clear, which led to improvement, Thus, the first hypothesis is validated.

**Interpretation of the results of the second hypothesis:**

Table (8) and Figure (8) regarding the differences between the pre and post measurements of the experimental group in the measurements of the Circulatory system indicate that there are statistically significant differences between the pre and post measurement of the research sample in the vital reactions , where the calculated value of (t) was limited to (-2.852: 25.256) and its calculated value was greater than its tabular value at a significant level of (0.05), which indicates the existence of differences between the two measures in the vital reactions, The percentages of improvement between the pre and post measurements in vital reactions ranged between(-22.38% -8.7%) in favor of the post-measurement.

It is also clear from Table (9) and Figure (9) for the differences between the pre and post measurement of the experimental group in respiratory measurements. There are statistically significant differences between the pre

and post measurement of the experimental group in the measurementsof the respiratory system, as the calculated value of (t) was limited to (- 2.99: 33.227) and the tabular value calculated was greater than at a significant level (0.05), which indicates the existence of differences between the two measurements. In all respiratory measurements under investigation, the percentages of improvement between the pre and post measurements in vital reactions ranged between (-22.44 14.43) in favor of the post measurement.

This is what was confirmed by both Muhammad Hassan Allawi and Abu Al-Ela Abdel Fattah (2000) (24) that sports training reduces the heart rate at rest.
The study of both Naglaa Fathy (1996) (28) and Muhammad Zakaria (2005) (26) confirms the study of the role of exercise in reducing the heart rate atrest, improving cardiac impulse, and improving the work of the circulatory and respiratory systems.
The study of Muhammad Amin, Abu Al-Makarem Ubaid (1994) (22), Muhammad Hassan Allawi and Abu Al-Ela Abdel Fattah (2000) (24) also indicates that sports training leads to physiological changes, and the most important of these physiological changes are the circulatory system, respiratory system and the ability to Increase oxygen consumption.
The results of this study are consistent with each:
Gunderesen,.s,Chapman.Rf,Levine,B.D,(2001)(31 ) Rusko,H.K,at al(1999)( 34 ) Mohamed,M.(1995)( 36 ) , Katayama k., &eatel ( 2001 ) ( 38 ), Mc Millan, K Helgerud, j ., at.al (2005)(40 ) Arnason .a.s.b sicurdsson . at.al (2004)( 39 ), All these previous studies confirm that breathing control exercises increase the maximum percentage of oxygen consumption as wellas improve the heart rate, cardiac impulse and stroke volume, increase the efficiency of the circulatory and respiratory system, and improve the aerobic and anaerobic capacity.
This is confirmed by the study of Intisar Al-Shahat Ahmed (2004) (7) in its results between the two pre- measurements of the experimental and control groups in some physiological variables in favor of the post measurement of the

experimental group. She indicated that the use of hypoxic exercises leads to improvement in some physiological variables such as (blood pressure, resting pulse, improvement in cardiac thrust and stroke volume, and an improvement in the maximum oxygen consumption.

The study of John Heil (1999) (35) confirms that the use of hypoxic exercises has an effective effect on improving heart work, increasing the amount of blood flowing, improving stroke volume, reducing the pulse rate at rest, improving it with some effort, and that the use of athletes for theseexercises improves the level of Their achievement.

Also, the oxygen-lowering exercises have an effect on the efficiency of the respiratory system, and this effect appears in the improvement of lung function and improvement in pulmonary volume and capacity, and this is what was explained by the study of Ashraf Al-Sayed Soliman (1995 AD) (3) as breathing control exercises lead to an improvement in the (reduction) variables Maximum oxygen consumption, pulse rate) and thus increase the efficiency of the respiratory system as a result of changes in the level of efficiency of blood supply and thus improve the efficiency of the body to meet the oxygen debt.

The study of Najla Fathy (1996 AD) (28) also indicates that the use of hypoxic training method results in an increase in body cells and tissues toextract more oxygen and increase pulmonary reflux.

As stated by Ali Fahmi Al-Beik, Imad Al-Din Abbas (2003 AD) (18) that training with hypoxia leads to an increase in the efficiency of ATP production both aerobically and anaerobically in addition to improving themaximum oxygen consumption.

The results of the current study are also in agreement with the study of Aya Muhammad Atiyah Khattab (2017 CE) (8), MohMED Amin , Ramadan Aboelmakarim (1994) (22) that the use of oxygen-lowering exercises on the physiological variables in relation to the post measurement of the experimental group led to improvements in both (resting pulse, systolic and diastolic blood pressure, energy index, blood cells). Red, hematocrit, lactic

percentage, vital capacity, cardiac thrust, stroke volume, maximum pulse, pulmonary ventilation, oxygen pulse, relative maximum oxygen consumption, pulmonary ventilation coefficient, and volume oxygen consumed).

**Findings:**

Within the limits of the research method, the tools used, the sample to which the research was applied, and the results obtained from the study,we can conclude the following:

1. The results of the standardized training program for hypoxic exercises applied to the sample in question resulted in a significant improvement inthe special endurance compounds (velocity endurance, strength endurance, performance endurance, aerobic endurance and transition speed).
2. The results of the standardized training program for hypoxic exercises applied to the sample in question resulted in a significant improvement in the vital reactions (circulatory system) under study (resting pulse, diastolicblood pressure, systolic blood pressure, lactic ratio).
3. The results of the standardized training program for hypoxic exercises applied to the sample in question resulted in a significant improvement in the vital reactions (circulatory system) under investigation (resting pulse, blood pressure (respiratory system) under investigation (pulmonary ventilation, volume of oxygen consumed,, maximum oxygen consumption).Vital capacity)

**Recommendations:**

In light of the procedures that have been carried out in this study and within the limits of the selected research sample, and based on the findingsof this study, we can recommend the following:

1- The need to pay attention to hypoxic exercises because of their effective results on physical aspects and vital reactions.

2- Conducting more research related to hypoxic training on other samplesof athletes.

3 - The need to inform those in charge of the training process on the proposed training program to benefit from it in terms of preparing players.