

A Comparative Study in Some Functional Responses and Blood Oxygen Saturation among Futsal and Handball Players

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Abstract: Physiology is one of the supporting sciences for the sports training science, which depends on it mainly, as it studies all the details of the player's physiology responses, and the reactions of body to the training process in terms of external and internal training loads, the authors used the descriptive approach as it is appropriate for the objectives of the research, the aim of this research is to know and compare functional responses and oxygen saturation with blood among futsal and handball players, the research sample was represented by futsal players and handball players in the Faculty of Physical Education and Sports Sciences At Diyala University for the academic year 2023-2024, As for the research problem, it was to identify the reactions associated with performance, as many studies are working to show the good face of the effect of sports practice, while the other side of it is neglected, and what is meant is the negative effect associated with sports practice, which often occurs when the percentage of blood saturation with oxygen decreases after the performance of physical efforts, the authors concluded from the current study a greater effect on the indicators of heart rate (H.R) and diastolic blood pressure rate (Dias.BI.Pr) after (5) minutes From the completion of the effort (recovery) in the handball team than in futsal. There was no effect on the blood oxygen saturation (SPO2) and systolic blood pressure (Sys.BI.PT) after (5) minutes of the completion of the effort (recovery) between the handball and futsal teams. The authors recommend intensifying low-intensity interval load training in developing the heart's adaptation to physical exertion by increasing the load on the heart and thus bringing about the adaptation process to ensure a return to normal as soon as possible.

Keywords: functional responses, blood oxygen saturation, futsal, handball.

1- Definition of research:

1-1. Introduction:

Physiology is one of the sciences that are related to the science of sports training, which helped translate the mutual relationship between what is happening in the body and the external load placed on the trainee's shoulders, and that knowing how sports training leads to structural and functional changes in the human body and how to change the course of functions and body structures under the influence of training for one time or continue training many times. will achieve responsiveness and then adapt or imprint on training. The performance of physical effort for a relatively long period according to the studied training programs gives reactions and responses involving improved consumption and heart rate heart beat and other indicators, as well as an improvement in the ability and volume of hemoglobin with oxygen due to the renewal of red cells, and that these standards and others are related to the work of the circulatory and breathing apparatus as these devices respond in different proportions to physical exercises then

can be followed up and monitored the emergence of these responses with the help of modern technical devices, including an oxymeter and a measuring device. Digital blood pressure. The team games are one of the games that are widely popular in all countries of the world in terms of follow-up because of the excitement and excitement of competing in order to reach superiority and thus achieve the desired goals, which is to reach the championship, and that the games of futsal and handball are games that are performed under almost similar conditions in terms of field sizes and even in the approximation of the actual time of performance, which is located within one energy system, which is the use of an oxygen energy system. As a result of the use of stress and high training loads in the training of sports teams, the use of the term hypoxic or work in conditions of lack of oxygen and its role in the decrease in the ability to perform in athletes and the importance of research lies in studying this topic and identifying the role of practicing these two different activities in terms of the intensity of performance that they work with in affecting the percentage of blood saturation with oxygen and some other physiological indicators.

1-2. Research problem:

The respiratory circulatory system is one of the most important functional organs through which the level is evaluated because of its importance in preparing the Faculty of Physical Education to withstand the effort and respond to it, and specialists have recently used various training methods and methods in terms of change and upgrading in the training stresses as well as in the innovation of everything that is new and useful in games that depend on the results of the continued performance, And that this development was also accompanied by the development in the functional aspects of the athlete as a collection of pressure on the functional organs of the current and chronic and that what interests us in this study is in the reactions associated with the performance as many studies are working to show the good face of the impact of sports practice while being neglected the other face of it and intended the negative impact associated with sports practice, which often occurs when the percentage of blood saturation with oxygen after the performance of physical efforts and this is what The researcher pushed in an attempt to answer the following question: Is there a difference in the percentage of blood saturation with oxygen and some other physiological variables as a result of the difference in physical effort, performance and game.

1-3. Research Objectives:

The research aims to identify:

1. Functional response in the percentage of blood saturation with oxygen and some functional indicators of the circulatory and respiratory systems of the futsal players of Faculty of Physical Education and Sports Sciences at Diyala University.
2. Functional response in the percentage of blood saturation with oxygen and some functional indicators of the circulatory and respiratory systems of the handball players of Faculty of Physical Education and Sports Sciences at Diyala University.
3. Comparison in the functional response in the percentage of blood saturation with oxygen and some functional indicators of the circulatory and respiratory systems among futsal and handball players of faculty of Physical Education and Sports Sciences at Diyala University during rest and after (5) minutes from the completion of the effort (recovery).

1-4. Hypothesis of research:

There are statistically significant differences in the functional response of futsal and handball players of Faculty of Physical Education and Sports Sciences at Diyala University after 5 minutes of the completion of the effort.

1-5. Research fields:

1.5.1 Human Field: Handball and Football Players of faculty of Physical Education and Sports Sciences at University of Diyala.

1-5-2 Time field: period from 20/9/2023 to 15/12/2024.

1.5.3 Place field: Indoor sports hall at the Faculty of Physical and Sports Sciences at Diyala University.

2- Methodology and Procedures:

2-1. Methodology:

The method adopted in the research is one of the important things through which the facts can be known, and accurate results can be reached, the descriptive approach is one of the most used scientific research methods in the sports field, so the choice of the approach depends mainly on the nature of the problem to be solved, as the researcher will use the descriptive approach in a survey manner because of its suitability to the nature of the study subject of the research.

2-2. Research sample:

The method of selecting the research sample is a necessity of scientific research and the selection is always linked to its representation of the original community from which it was taken, and the possibility of generalizing its results to the group from which it was taken on the basis that it achieves the purposes of the study carried out by the researcher, so the selection of the research sample was deliberately from the students who represent the teams of the College of Physical Education and Sports Sciences - Diyala University futsal and handball males for the academic year 2023 - 2024 They were chosen in a deliberate way to obtain outstanding performance, which falls within the specified performance times of the air power system (oxygen), and their number reached (20) players representing the entire community of origin.

2-3. Tests used in the research:

2.3.1 Heart rate measurement: The value of this variable is obtained from the device used type (beurer) digital German origin dedicated to measuring blood pressure and heart rate.

2.3.2 Blood pressure measurement: The blood pressure of the research sample was measured by the brachial artery using a blood pressure monitor type (beurer) as follows:

- Measurement of blood pressure at rest before exertion.
- Measuring blood pressure after the completion of the effort and the measurement process is as follows:
- Start by wrapping the ligament (cuff) and placing it correctly above the elbow joint by about (2.5) cm, followed by blowing the ligament by pressing the start button (On) that the pressure of the ligament leads to cutting the blood circulation in that artery because the air pressure inside the ligament is greater than the blood pressure inside the artery, then the device automatically stops and allows the air to exit slowly until the blood is allowed to pass in the artery Completely brachial, then the device stops automatically and then numeric values appear on the screen representing systolic pressure (SYS) (B) and diastolic blood pressure (diap and heart rate) (Pulse) rate, the final result is recorded by writing systolic pressure - diastolic pressure.

2-3-3 Measuring the percentage of oxygen saturation in the blood Spo2:

The measurement was through a small portable device prepared for this purpose is placed in the finger (index finger) of the left hand used to measure the percentage of blood saturation (hemoglobin) with oxygen and contains a special program to give results directly and after placing it in the hand after one second, and its results are high in accuracy and objectivity and is one of the devices used to measure physical effort and assess the health status of athletes.

2-4. Exploratory experiment:

The experiment is to inform the researcher of the ability and validity of what helps them in the experiment of tools, work team and tests, which is an important process recommended by specialists in scientific research, it is "an experiment or test that is a prelude to a larger experiment and test", defined as "a preliminary experimental study carried out by the researcher on a small sample before doing his research in order to test research methods and tools". Therefore, the researcher conducted the exploratory experiment on 12-10-2023 on a sample of (4) students other than the research sample, and the experiment aimed to identify the following:

- Diagnosis of the negatives and obstacles facing the researcher and overcome them during the application of the main experiment.
- Know the effectiveness and validity of the tools used in the research.
- Recognize the time it takes for each test.
- Knowing the suitability of the test for the sample members.
- Introducing the assistant team to the nature of the tests and experiment, the use of measurement tools and the mechanisms of work of the devices used.

2-5. Main experiment:

The researchers conducted the first main research experiment on 19-10-2023 as follows:

1. Obtaining all the values of the vascular system (cardio respiratory system) before performing the effort at rest by measuring systolic and diastolic blood pressure, heart rate and blood oxygen saturation.
2. Implementation of the training unit, which included the necessary warm-up and then the establishment of a full futsal match.
3. Implementation of the training unit, which included the necessary warm-up and then the establishment of a full handball match.
4. Obtaining all values of the vascular system (cardio respiratory system) five minutes before performing the effort and five minutes after the effort by measuring systolic and diastolic blood pressure, heart rate and blood oxygen saturation.

2-6. Statistical Processes:

The statistical program (SPSS) was used to obtain the results of statistical treatments, as it was extracted:

1. mean.
2. Mediator.
3. Standard deviation.
4. Torsion coefficient.
5. Test (T) for associated samples.

3- Results and discussion:

3-1 Results: In order to achieve the objectives of the research and its hypothesis in knowing the effect of playing football and handball on the immediate physiological response of the circulatory and respiratory systems, the researchers presented the results of the tests in illustrative tables that facilitate the observation of differences and compare the results with the research hypotheses, as well as the researcher discussed the results reached and knowledge of the differences and their statistical significance for each functional measurement. The research included the following measurements: heart rate, systolic blood pressure, diastolic blood

pressure, and measuring blood oxygen saturation and Table (1) shows all these variables in the handball team.

Table (1) shows the comparison in means, and standard deviations between variables before and after (5) minutes from the end of the effort for handball players

Variables	Measure units	Pre		Post		(t) test	Error rate	Sig.
		M.	St.d	M.	St.d			
H.R	Bpm.	72.70	4.24	91.70	6.42	6.097	0.000	Sig.
SPO2	%	98.50	0.52	98.30	0.67	0.557	0.591	Insig.
SUS.BI.PR	mmHg	120.00	0.47	120.00	0.66	0.429	0.678	Insig.
DIAS.BI.PR	mmHg	70.50	0.52	80.80	1.03	-1.655	0.132	Insig.

In the variable heart rate (HR) during rest for the handball team, the mean was (72.70) and the standard deviation was (4.24), but after (5) minutes from the end of the effort, the mean reached (91.70) and its standard deviation was (6.42), while the calculated value of (T) was (6.097), which is greater than the error rate of (0.000), which gave a significant significance. In the variable of blood oxygen saturation ratio (SPO2) during rest for the handball team, the mean was (98.50) and the standard deviation was (0.52), but after (5) minutes from the end of the effort, the mean was (98.30) and its standard deviation was (0.67), while the calculated value of (T) was (0.557), which is smaller than the error rate of (0.591), which gave a non-significant significance, in the systolic blood pressure variable (SYS). During the rest of the handball team, the mean was (120.00) and the standard deviation was (0.47), but after (5) minutes from the end of the effort, the mean reached (120.00) and its standard deviation was (0.66), while the calculated value of (T) was (0.429), which is smaller than the error rate of (0.678), which gave a non-significant indication in the diastolic blood pressure variable (Dias. B.P.) during the rest of the handball team, the mean was (70.50) and the standard deviation was (0.52) and after (5) minutes of The end of the effort reached the mean (80.80) and its standard deviation was (1.03), while the calculated value of (T) was (1.655), which is smaller than the error rate of (0.132), which gave a non-significant significance.

Table (2) shows the means and standard deviations between the research variables before and after the completion of the effort by (5) minutes for football players

Variables	Measure units	Pre		Post		(t) test	Error rate	Sig.
		M.	St.d	M.	St.d			
H.R	Bpm.	72.60	5.44	102.00	9.77	-9.323	0.000	Sig.
SPO2	%	98.10	0.99	98.40	0.51	-0.937	0.373	Insig.
SUS.BI.PR	mmHg	120.40	0.96	110.30	1.25	2.372	0.042	sig.
DIAS.BI.PR	mmHg	70.90	0.31	70.20	0.78	3.207	0.011	sig.

In the variable heart rate (HR) during rest for the football team, mean was (72.60) and the standard deviation was (5.44), but after (5) minutes from the end of the effort, the mean reached (102) and its standard deviation was (9.77), while the calculated value of (T) was -0.9323, which is greater than the error rate of (0.000) which gave a significant significance. In the variable of blood oxygen saturation ratio (SPO2) during the rest of the football team, the mean was (98.10) and the standard deviation was (0.99), but after (5) minutes from the end of the effort, the mean reached (98.40) and its standard deviation was (0.51), while the calculated value of (T) was (93700), which is greater than the error rate of (1373), which gave a significant significance. In the variable of systolic blood pressure (SYS.BI.Pr) during the rest of the football team, the mean was (120.40) and the standard deviation was (0.96), but after (5) minutes from the end of the effort, the mean reached (110.30) and its standard deviation was (1.25), while the calculated value of (T) was (2.372), which is greater than the error rate of (0.042), which gave a significant significance. In the diastolic blood pressure variable . Dias. B) During the rest of the football team, the mean reached (70.90) and the standard deviation (0.31), but after (5) minutes from the

end of the effort, the mean reached (70.80) and its standard deviation was (0.78), while the calculated value of (T) was (3.207), which is greater than the error rate of (0.011), which gave a significant significance.

Table (3) shows means, standard deviations, difference, rest time deviations, (t) value, error rate, and significance of variables

Variables	Measure units	Football		Handball		(t) test	Error rate	Sig.
		M.	St.d	M.	St.d			
H.R	Bpm.	72.70	4.24	91.70	6.42	0.250	0.805	Insig.
SPO2	%	98.50	0.52	98.30	0.67	0.538	0.567	Insig.
SUS.BI.PR	mmHg	12.00	0.47	12.00	0.66	0.452	0.656	Insig.
DIAS.BI.PR	mmHg	70.50	0.52	80.80	1.03	0.535	0.600	Insig.

In the variable of heart rate (HR) at rest for the football team, the mean was (72.70), the standard deviation was (4.24), the mean during the rest of the football was (72.100) and its standard deviation was (6.27), while the calculated value of (T) was (0.250), which is smaller than the error rate of (0.805), which gave a non-significant indication. In the variable of blood oxygen saturation ratio (SPO2) during rest for the football team, the mean was (98.500) and the standard deviation was (0.94), and the mean during the rest of handball was (98.300) and its standard deviation was (0.94), while the calculated value of (T) was (0.538), which is smaller than the error rate of (0.567), which gave a non-significant indication in the systolic blood pressure variable (SYS.BI.Pr) during rest for the handball team, the mean was (120.00) and the standard deviation was (0.47) and the mean during Rest for football (120.20) and its standard deviation (1.31), while the calculated value of (T) was (0.45), which is smaller than the error rate of (0.65), which gave a non-significant significance. In the diastolic blood pressure variable . Dias. B) During the rest of the handball team, the mean was (70.50) and the standard deviation was (0.52), and the mean of the heart rate (HR) during the rest of the football ball was (70.70) and its standard deviation was (1.05), while the calculated value of (T) was (0535), which is smaller than the error rate of (0.600), which gave a non-significant connotation.

Table (4) shows the mean, standard deviations, difference, deviation difference, (t) value, error rate and significance of variables at recovery

Variables	Measure units	Handball		Football		(t) test	Error rate	Sig.
		M.	St.d	M.	St.d			
H.R	Bpm.	92.50	6.81	102.00	9.77	2.251	0.021	sig.
SPO2	%	97.20	2.52	98.40	0.51	1.470	0.159	Insig.
SUS.BI.PR	mmHg	110.70	1.41	111.30	1.25	0.669	0.512	Insig.
DIAS.BI.PR	mmHg	70.90	0.31	70.20	0.78	2.605	0.018	sig.

In the heart rate variable (H.R) after (5) minutes of completion of the effort (recovery) for the handball team, the mean was (92.50) and the standard deviation was (6.81), and the mean of the football team was (102.00) and its standard deviation was (9.77), while the calculated value of (T) was (2.521), which is greater than the error rate of (0.021), which gave a significant significance. In the variable of blood oxygen saturation ratio (SPO2) after (5) minutes of completion of the effort (recovery) of the handball team, the mean was (97.20) and the standard deviation (2.52) and the mean of the football team was (98.40) and its standard deviation was (0.51), while the calculated value of (T) was (1.470), which is smaller than the error rate of (0.159), which gave a non-significant significance. In the systolic blood pressure variable (SYS.BI.Pr) after (5) minutes of completion of the effort (recovery) of the handball team, the mean was (110.70) and the standard deviation (1.41) and the mean of the football team was (110.30) and its standard deviation was (1.25), while the calculated value of (T) was (0.669), which is greater than the error rate of (0.512), which gave a significant significance. In the diastolic blood pressure variable. Dias. B) After (5) minutes of completion of the effort

(recovery) of the handball team, the mean of it reached (70.90) and the standard deviation (0.31), and the mean of the football team reached (70.90) and its standard deviation (0.78), while the calculated value of (T) was ((2.605), which is one of the largest error rate of (0.018), which gave a significant significance.

3-2. Discussion:

3.2.1 Discussion of the results of the pre- and post-tests: Table (1) shows the comparison in the research indicators between the results of the pre-test and the test after the end of the effort by (5) minutes for the handball team, the results did not show a significant significance in most of the research indicators and that the team has returned to normal almost in most indicators except for the heart rate index (H.R) and the researcher attributes the reason for the delayed return of heart rate as a normal condition depends on the level of Fitness of the players, as the return of the rate to normal may need a longer time, although this time does not indicate any weakness in the level of fitness.

Table (2) shows the comparison in the research indicators between the results of the pre-test and the test after the end of the effort by (5) minutes for the football team, the results have shown a significant significance in most of the research indicators except for the index of oxygen saturation in the blood (SPO₂) and the researcher attributes the reason for this to the team's failure to return to the normal situation almost in most indicators, which is a deficiency in the level of physical fitness in a way that exceeds what has been observed in the handball team as well as the observation of the presence of Individual differences between the team players in the return of functional indicators, but what was observed from the absence of a significant difference in the blood oxygen saturation index (SPO₂), this indicator needs to be more intense and sized to note the difference between the pre- and post-tests.

3.2.2 Discussion of the results of the pre-tests between the two teams: Table (3) shows the results of the comparison in the research indicators for the pre-test between the handball team and the football team, which showed that there were no significant differences in all the research indicators.

3.2.3 Discussion of the results of the post-tests between the two teams: Table (4) shows the comparison between the results of the post-tests in the research indicators between the two teams, which showed a significant difference in the heart rate index (H.R) between the handball and football teams and in favor of the handball team and the researcher attributes that this indicator also appeared clear from the previous tables through the speed of return to the normal state to a greater degree than was observed in the football team, which showed a delay in the speed of Returning to normalcy These signs indicate to us that the game of handball needs more physical fitness as a result of the continuous free game than the football team because of the latter's enjoyment of long handling, which reduces the chances of movement. As for what appeared from the existence of a significant difference in the rate of systolic pressure (Dias.BI.Pr), this indicator does not mean anything in terms of positive or medical aspects, as the reason may be the existence of individual differences between the players of the handball team or that there are other causes such as influenza or other diseases. This supports what Maher Abdel Latif pointed out that "there are many factors that affect blood pressure during physical exertion, including: the qualities, characteristics and abilities of the examinee such as (chronological age, size and strength of the muscles working in performance, level of physical fitness, some habits such as smoking, nature and pattern of physical exertion, and others.

4- Conclusions and recommendations:

4.1 Conclusions: Through the presentation and discussion of the results, the researchers reached the following conclusions:

1. A greater effect on the indicators of heart rate (H.R) and diastolic blood pressure (Dias.BI.Pr) after (5) minutes of completion of the effort (recovery) in the handball team than in futsal.

2. No effect on the indicators of blood oxygen saturation (SPO₂) and systolic blood pressure (Sys.BI.PT) after (5) minutes of the completion of the effort (recovery) between the handball and futsal teams.

4-2 Recommendations: The researchers recommend the following:

1. Intensification of low-intensity interval load training in developing the heart's adaptation to physical exertion by increasing the load on the heart and thus bringing about the adaptation process to ensure a return to normal as soon as possible.
2. Conducting similar studies to show the effect of response on functional indicators in games that depend on energy from the lactic acid system. 3- Conducting similar studies to identify the response in other functional and biochemical indicators.

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