Physiological analysis of the stages of stability and reaching the steady state according to some functional and physical variables for young soccer players

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Abstract

The study aimed to identify the physiological characteristics of the stage of instability and constancy in different body parts in terms of some functional and physical variables for youth soccer players. Those registered within the Sports Talent Care Department lists in Al-Diwaniyah for 2020-2021, whose number is (15). After excluding the goalkeepers, the final number of the sample members reached (12) players. The most important result of the study is that there is a discrepancy in the physiological variables in the two phases (persistence and reaching stability) for youth soccer players.

Introduction

The importance of the research can be expressed in knowing the extent of the effect of the level of the physical and functional characteristics studied on the speed of reaching the stability stage of the physiological variables that have a direct impact on the level of performance in order to reduce the lost effort and energy or to save the energy expended by analysing those variables physiologically during the stage of reaching the steady state of the body parts Through the instantaneous and accumulated effort; the research problem lies in answering the following questions: Do the physiological characteristics vary according to the different parts of the body involved in the performance? Will the period of reaching the

steady state be shorter, longer, or equal if the body participates in the performance, or only the two legs participate? Meaning, will the period of reaching the steady state at the beginning of the (simultaneous) physical effort be shorter, longer, or similar to the period of reaching the steady state during the (accumulated) physical effort. The research aims to identify the physiological characteristics of the stage of instability and constancy in different body parts in terms of some functional and physical variables for youth soccer players.

practical part

The researcher used the descriptive approach using the method of correlations, as it is the appropriate approach to solve the research problem on the youth soccer players registered in the lists of the Sports Talent Care Department in Al-Diwaniyah for the year 2020-2021, whose number is (15). After excluding the goalkeepers, the final sample members reached (12). The physical and functional tests were carried out using the rotation method, and the homogeneity of the variables affecting the study was confirmed.

Measurements and tests used in the research:

Measuring physiological variables using the (k5) device:

The following variables were measured during the Bruce test on the treadmill and the Strand test on the Mornac exercise bike. These variables included the following:

1- Heart rate HR.

2- VO2MAX oxygen consumption.

3- Respiratory coefficient RQ.

4- VE/vo2 equivalent ventilation.

5- Ventilation equivalent to carbon dioxide VE/VCO2.

Determine the tests used in the research:

First: functional variables:

It was measured using the K5 device during the physical effort on the treadmill and the Mornac exercise bike, as shown below:

1- The Bruce test measuring the maximum oxygen consumption:

Measurement of the maximum oxygen consumption (21): A test was conducted to measure VO2max using a test that includes seven stages of effort; the time of each stage is 3 minutes, meaning that the total test time is 21 minutes, and with a zero inclination angle, the device's speed changes at the end of each stage, as shown in the test details in Figure (5). (Hazaa Muhammad Al-Hazaa: 2009, 484).

Exploratory experience:

The researcher conducted the exploratory experiment for two days, from Tuesday 12/14/2021 until Thursday 12/16/2021, on (6) players from the research sample, where the researcher conducted physical tests on Tuesday on three players from the research sample in a playground. The football quintet of the Department of Sports Talent Nurturing in Al-Diwaniyah, then functional tests were conducted on three players in the Physiology Laboratory in the College of Physical Education and Sports Sciences at Al-Qadisiyah University to identify:

1- Determine the mechanism for applying physical and functional tests.

2- Determining the tools and equipment used and the sports facilities that can be used in the study through a comprehensive survey.

3- Identify the extent to which the study can be implemented.

4- Determine the difficulties the researcher and assistants may encounter while implementing the measurements and tests.

5- Ensure the validity of the tools and devices used in the research.

6- Identifying the test's appropriateness with the research sample's capabilities.

The scientific basis for the tests:

The physical tests used by the researcher are tests taken from scientific sources and previous studies, as they are tests used by the researcher, and he found scientific foundations for them, which are standardised tests.

First: honesty.

The researcher relied on virtual validity, which is part of the validity of the content, and after the tests were presented to experts and specialists in order to confirm that the test measures the phenomenon that was set for actually measuring it at a rate of (100%) for the tests used in the research.

Second: constancy.

The researcher adopted the test and re-test method for the tests used by applying them to the survey sample, by applying the first test on Tuesday (12/14/2021) and after (7) days, the test was re-tested on Tuesday (12/21/2021). Statistical data processing.

Third: Objectivity.

The researcher relied on verifying them by recording the test results by two referees from the assistant work team simultaneously, and the calculated correlation coefficient results showed a high correlation in the tests.

Table No. (1)

It shows the reliability and objectivity coefficients enjoyed by the candidate tests.

tests	stability	Objective
Performance tolerance	0,92	0,94
Speed tolerance	0.91	0,94
Withstand force characteristic of speed	0.95	0,94

The ability to repeat at high speeds	0,88	0,90

The main experience:

After the exploratory experiment was conducted and the requirements for the experiment were finally prepared, the researcher conducted the main experiment for (16) days, the period from (22/1/2022) to (7/1/2022) on the research sample, where the main experiment was conducted on several. The stages are as follows:

The first stage:

The researcher conducted the Strand test on the physical effort bike (Monarch) on Monday (23/1/2022) on the research sample at nine o'clock in the morning in the physiology laboratory in the College of Physical Education and Sports Sciences - University of Al-Qadisiyah, where the player began to perform the appropriate warm-up for a period of (3) Minutes according to the test instructions, then the test is applied as mentioned in its details and stages aforementioned in this chapter. At the end of the test, the K5 device that sends data using Bluetooth technology to the calculator was stopped to be stored in several formats, including Excel and graphic forms of the studied variables. Then the same procedure was done with the players.

The second phase:

The researcher conducted a speed endurance test on Wednesday corresponding to (27/1/2022) on the research sample at three o'clock in the evening at the five-year stadium in the Department of Sports Talent Care in Diwaniyah of the Ministry of Youth and Sports, as the details of the test were that the tester puts the right foot on the line The Beginning When he hears the start signal, he starts hopscotching six hopscotch in a row with one leg, trying to cover the longest distance.

Then the tester walks back to the starting line to put the left foot behind the starting line, and when he hears the start signal, he starts hopscotching with the left leg for six consecutive hurdles.

Third level:

The researcher conducted a speed endurance test on Sunday corresponding to (29/1/2022) on the research sample at three o'clock in the evening at the five-year stadium in the Department of Sports Talent Nurturing, where the laboratory performs the shuttle run test 30 seconds: 35 seconds rest * 6 times

The fourth stage:

The researcher conducted the Burc test on Tuesday (31/1/2022) in the physiology laboratory in the College of Physical Education and Sports Sciences - University of Al-Qadisiyah, where the Burc test was conducted to measure VO2max, which includes seven phases of effort, the time of each phase is 3 minutes, meaning that the total test time is (21 minutes) and at an angle of zero inclination, the speed of the device changes at the end of each stage, according to the test above instructions, as the test lasted for six days, with two players per day.

Level five:

The researcher conducted a performance endurance test on Thursday (3/2/2022) at the football stadium in the College of Physical Education - Al-Qadisiyah University at 3:00 pm, where this test is performed in the form of 7 stations, as described in detail above.

What is meant by the stability stage is the stage in which the functional variables reach the stage of stability without increasing or decreasing. The most prominent of those variables relied upon is the variable (heart rate HR) during each stage of the test, whether Bruce or Strand, the stage of stability is preceded by a stage of Instability, then stability, and accordingly, those functional variables were monitored.

As the functional variables were recorded for the two stages (before stability and the stationary stage), whether using parts of the whole body in (Bruce's test) or part of it in (Strand's test).

Statistical means:

The researcher used the Spss statistical program.

Results

View and analyse the results of the differences between the two phases (persistence and reaching stability) in the two tests (physical effort bike and treadmill) in terms of the physiological variables under study.

Using the bicycle test, table (2) shows the arithmetic mean and standard deviation between the two stages (steadiness and reaching stability).

Variables	Phase	Number	Arithmetic mean	Standard deviation	t	Degree of freedom	Signifi e
HR	stability stage	12	173.5000	1.08711	20.896	11.000	0.000
	The stage of reaching stability	12	138.0000	5.93908			
RQ	stability stage	12	0.6058	0.04078	-1.820	11.000	0.096
	The stage of reaching stability	12	0.6225	0.03745			

VE/VO2	stability stage	12	57.9083	2.97946	-1.420	11.000	0.183
	The stage of reaching stability	12	62.5833	13.24262			
VE/VCO2	stability stage	12	95.7417	4.43364	-0.840	11.000	0.419
	The stage of reaching stability	12	100.1417	16.56466			
VO2MAX	stability stage	12	22.3533	1.88572	28.622	11.000	0.000
	The stage of reaching stability	12	8.1992	1.64066			

Discussion

Tables (2) show that there are differences in the variables under study within the two phases (persistence and reaching stability), as well as differences that appeared between the two tests (bicycle and treadmill) according to the variables under study and the researcher attributes this to the fact that the heart rate rises during the effort physical activity and depends on the intensity of the effort. When the muscle mass is small, the heart rate cannot reach its maximum compared to the physical effort with an activity that occupies the most significant muscle mass, such as the muscles of the thighs or the body as a whole. p. 378),

and this is known in the case of physical effort in the stability stage, and this is what was shown by the differences between the stability stage and reaching stability, so that the average human heart rate reaches from (70-80) beats per minute, and he indicated (Syed, 2003, p. 22) and the pulse rate of athletes is lower than that, reaching (60-50) and this is due to the natural structural adaptations that occur in the heart muscle, as studies indicate that the continuation of physical exertion for extended periods leads to widening of the chambers of the heart, specifically the left ventricle, which leads to Increasing the ventricular capacity and thus increasing the volume of cardiac impulse, including cardiac output, so the continuation of riding a stationary bike is consistent with Gormaly's bicycle et al. (Gormaly & et al, 2008,40), as Gormley clarified that the continuity of physical effort for long periods leads to an increase in the volume of impulse and a decrease in the pulse rate during Comforts.

This was confirmed by (Abu et al., 1994) that the heart rate varies between the positions of the players in football depending on the difference in their tasks and duties and the rate of play (Abu El-Ela, 1994, p. 168) and also confirms that there is a direct relationship between the heart rate and the physical effort, If the heart rate increases according to the increase in physical effort, and this increase quickly disappears with the disappearance of the effect of physical effort. The period for the return of the heart rate to its normal position immediately after the end of the physical effort determines the efficiency of the heart and blood circulation as a result of organised training according to scientific foundations (Mohamed et al., 1984, p. 33).

The heart rate changes during and immediately after physical exertion are one of the fundamental indicators of the ability of the heart and circulatory system—blood pressure physical exertion (Ahmed Naji, 1988, p. 19).

Also, the volume of pulmonary ventilation is related to the rate of increase in oxidative processes that are directly proportional to each other (Sayed El-Din, 2000, p. 111).

Reaching the stationary phase requires stress in the respiratory muscle, thus stimulating chemical receptors during the effort (Rowland, 2005, p. 145).

Moreover, about (RQ), when the effort continues to reach the steady state, in which the consumption of oxygen is greater than the production of carbon dioxide in the beginning, that is, the coefficient of respiration is less than (1), but when the physical effort increases, the production of carbon dioxide will be greater than the oxygen This indicates an important point, which is that (RQ) is only an indicator of the movement of oxygen against carbon dioxide during the physical effort in the stability phase. This matter is entirely different from what it is at rest or during the aerobic physical step in which the (RQ) indicates the nutrients responsible for energy production and the percentage of their contribution. As for the increase in effort, the (RQ) is responsible for changing the percentage of oxygen in exchange for the rate of carbon dioxide production. During the action, it is noted that (RQ) is less than (1) as an integer, and the values begin to approach (1) gradually. According to the speed and duration of the physical work, as well as the aerobic potential that the player possesses until it reaches (1), this is confirmed by (Rose, 2007) that the production of carbon dioxide is at the beginning of the physical effort less oxygen consumption, which makes the respiratory coefficient (RQ) Less than one. Still, when increasing the physical effort and approaching the threshold of lactic acidification, the difference shrinks a lot, and carbon dioxide becomes higher than oxygen consumption (Rose, 2007, p. 281).

Also, at the stability stage, the ventilation increases linearly with the consumed oxygen and carbon dioxide until it reaches a rate of (20-25) litres of air for every litre of oxygen consumed. Under these conditions, the ventilation increases with an increase in volume, so for young basketball players, the breathing process takes a role during the effort. Moreover, more important, there is a state of complete saturation of the blood as a result of the compatibility in the ventilation because the partial pressure of oxygen and carbon dioxide is

close in value, and the time of transmission of the blood flow through the arterial vessels is slow in a way that allows a complete change of gas, the rate of cardiac ventilation of the oxygen consumed, determines the ventilation equivalent It appears as VE/VO2 in young adults. Under challenging exercises, the ventilation takes a noticeable increase. It increases heterogeneously with an increase in oxygen consumption. As a result, the ventilation equivalent is more significant than in continuous exercises until it reaches (35-40) litres of air per litre of oxygen consumed (Hashem Al-Kilani, 2000, p. 282).

Maximum oxygen consumption (VO2MAX) is closely linked to the circulatory, respiratory, and muscular systems. The circulatory and respiratory systems take oxygen and transport it to the working muscles in the most significant possible amount. Then comes the role of the muscular system to consume the amount of oxygen reaching it, as sports training has a role Important in developing the efficiency of the devices above, which will therefore increase the efficiency of the maximum oxygen consumption because sports training works to improve the capacity of the respiratory system by increasing the speed of delivery of oxygen to the muscles, in addition to progress that increases the volume of breathing air per minute during effort, which means an increase in oxygen consumption as The process of pulmonary ventilation is grown to get rid of carbon dioxide more than it is for obtaining oxygen, at least under the influence of the maximum physical load. It is a hindering factor for the top oxygen limit, as it is noted that the trained person uses less pulmonary ventilation than the untrained person when performing the same physical load and at the same level of carbon dioxide production; that is, economic physiological terms characterise his performance, and the maximum limit of pulmonary ventilation can reach high amounts (Haider Blush, 2009, p. 61).

The increase in the volume of oxygen consumption reflects the rate of steady demand for oxygen by the working muscles, and this is what resulted in the significant differences for

VO2MAX because the maximum oxygen consumption is according to the stationary phase, as with the increase, changes occur in other variables. Each of these variables contributes in addition to bringing about a development in The maximum oxygen consumption to counter the accumulation of lactic acid by pushing the most significant amount of blood during the effort until the start of the training, the pulse increases directly, and this is related to the increase in the intensity of the training and is inferred by the power of the movement about the consumption of oxygen. The higher the heart rate, the higher the rate of oxygen consumption and the higher the heart rate. With increasing training intensity (Bahaa et al., 2000, p. 52).

Conclusions:

1- There is a discrepancy in the physiological variables in the two phases (persistence and reaching stability) for youth soccer players.

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