Predicting the Endurance and Accuracy of the Skill Performance in Terms of Some Functional Indicators of the Circulatory System and the Heart Muscle of Young Football Players

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Abstract-- One of the special and important abilities of the football player is the enduring of performance that enables the players to maintain ideal and skilled performance under the physical and psychological pressure resulting from matches burden with the progress of time, which contributes to the ability to perform accuracy in the shots on post, which is the final outcome to win the games. From here the researchers employed a designed and computerized test in order to measure the accuracy in shooting on post under the pressure of performance tolerance. Also the researcher have tackled a number of functional indicators, including hypertension, cardiac output, volume of blood flow, peripheral resistance, and rate of ejected blood of heart muscle to determine which of the indicators are more influential in performance tolerance by finding the equation of prediction. After obtaining the correlation coefficient for a number of indicators under study with performance accuracy and the value of (B) regression for tests and measurements tackled by the research and its significance in predicting the accuracy of scoring.

Index Term-- endurance- accuracy- skill performance - functional indicators- circulatory system- heart muscle.

1. INTRODUCTION

1.1 Introduce the importance of research:

All that of progress we see is due to the movement of scientific research, which looks at all the factors that contribute to upgrade the level and accomplish the achievement and performance of the players and football, which is characterized by rapid performance and at the same time characterized by high and violent load during competitions through keep running and transition between the two situations of attack and defense, in addition to movement with or without the ball, which requires a high level of performance in a way that requires maintaining the exemplary performance that ensures accuracy, which is the main objective of the dynamic duty and the responses associated with the different situations facing the football players and all require passing or scoring accuracy, and this requires from players a high level of functional competence of vital organs, especially the heart muscle and the circulatory system.

"Since the main cause of the increase in cardiac output is due to the burden of physical exercise and is accompanied by the safety of blood vessels and nervous and hormonal activity, a study has been conducted in which the doubling of heart output was observed" d(Lujan, DiCarlo,. 2013).

The harmony with performance also requires to use the working muscles only without the participation of other muscles, which from other hand require from the circulatory system and the heart muscle to be fed with blood, food and oxygen, and then the athlete's body can respond consistently to the intensity and volume of performance by delivering blood through the number of heartbeats and blood volume flowed in one beat and the volume of blood reached to one square meter of the body. Hence the importance of research and the need for it to modify " a designed test to withstand the performance of skills and its accuracy" of young football players to give the extent of the impact of performance tolerance on the level of accuracy(Hasan, 2018). Also " one of the reasons for the changes associated with the change in the volume of flowed blood from the heart in a single beat and the cardiac output is the severity of the stimulants and its proximity and the size of its continuation in addition to the activation occurring in the upper nerve centers of the vascular and cardiac area with chemical changes which are in response to physical exercise "(Chapman, Elliott, 1988).

1.2 Research problem:

Through the follow-up to most of football teams in the Iraqi league and even the Iraqi teams for youth or advanced, we note decrease in level of performance over time during the matches as well as the accuracy of the performance that discriminates the reduced performance of most players, which is accompanied by the loss of ball possession and the transition of attack-to-defense situation is linked to a number of factors such as low fitness, lack

of attention and better concentration, as well as low endurance and performance tolerance.

Hence the problem of research lies and the need for it, but the low level of accuracy is related to several factors including distance, time and speed of performance as well as performance tolerance, since with the low level of energy and its sources in working muscles in skilled performance in addition to the effect of using the tool and all that mentioned have an effect on the tolerance and accuracy of performance. Through that the researchers chose the problem of their research in order to give solutions and reasons for the low level in the tolerance of skilled performance and its accuracy in football by finding the correlation matrix between the studied variables in the research and finding the equation of prediction that shows which of these variables affect the tolerance and accuracy of the skilled performance, in order to emphasize on developing and elevating it by modifying a designed test to withstand performance and its accuracy in addition to determine the test degree by equation as an indicator of performance tolerance and accuracy.

1-3 Research Objectives:
The research aims to:
1- Identify the relationships between the tolerance and accuracy of the performance and some functional indicators of the circulatory system and the heart muscle of the young football players.
2- Reaching the prediction equation to measure the tolerance and accuracy of skilled performance by indicating some functional indicators of the circulatory system and the heart muscle of the young football players.

1.4 Research hypothesis:
The researcher assumes the following:
1- There are some associations between the tolerance and accuracy of the performance and some functional indicators of the circulatory system and the heart muscle for young football players.
2- The prediction equation can be reached to measure the tolerance and accuracy of the skilled performance by indicating some functional indicators of the circulatory system and the heart muscle of young football players.

1-5 Fields of research:
1-5-1 Human field: (12) Youth Football Players / Al-Minaa Sports Club.

1.5.2 Time: 01/02/2018 State 01/06/2018
1-5-3 Place: Physiology Laboratory / College Physical Education and Sports Science / Al-Basrah University and Iraqi Laboratory / Al-Basrah / Ashar.

2. THEORETICAL STUDIES
2.1 Cardiac muscle and physical exertion:
The heart is an active muscular pump that works throughout human life, the heart consists of four separate cavities and four valves and takes over the continuation of blood circulation throughout the body (Fadhil, 2011) and the heart acts as a double pump and the valves are one-way for the flow of blood and allow the blood to pass in one direction and do not it to return back again, and there are two directions through which blood is pumped through where the blood is gathering from all parts of the body to the heart which is the systemic circulation, and then the blood collects from the lungs to the heart which is the pulmonary circulation (Salama, 2009).

During physical exertion, the central nervous system and the autonomic nervous system are provoked, where the sympathetic nerves play an important role in affecting the Atrioventricular nodes and the contraction of the heart muscle, and the muscle contraction, that occurs in voluntary muscle groups involved in the process, works on generating and increasing the speed of blood return inside the blood vessels, these factors determine the activity of the heart muscle contraction, also increased return of blood to the heart leads to an increase in the volume of diastolic blood, which causes an increase in the volume of heart beat as a result of increased systolic pressure which helps the strength and speed of blood outflow through the aortic and arteries, and all these responses vary from person to another according to the degree of their training. (Salama, 2009)

3. METHODS AND TECHNIQUES
The approach is the path that leads to the target or invisible link that tights the research from beginning to the end in order to reach certain results (Radwan, 1980). The researchers used the descriptive approach which is appropriate to solve the problem of their research.
3.1 research sample
The research sample included (12) young players from al-Minaa football Club. The researchers also performed homogenization in height, weight, age and heart rate as it is shown in Table (I).

Table I
Illustrates homogenization in height, weight, age and heart rate of the sample

Statistics / Variables	Measure unit	Arithmetic mean	Standard deviation	Variation coefficient	Mediator	Skewness coefficient
Weight	Kg	67.33	1.632	2.43%	58.5	-0.312
Height	Cm	172.03	3.763	2.18%	173.5	-1.331
Age	Year	17.58	0.664	3.77%	17.5	0.361
Training age	Year	1.46	0.103	7.05%	1.5	1.165

The table shows that the variation coefficient are less than 30 % and this indicates the homogeneity of the sample.

3.2 Devices and tools used in the research:

1.1- A stethoscope to measure the heart rate, 2- Arterial Sphygmomanometer (blood pressure) (Mercurial), 3- Computer hp, 4- (6)Compact discs (CD), 5- (4) stopwatches, 6-whistle, 7 – measuring tape, 8 - footballs – device- (Physiow flow) to measure the indicators of heart muscle and circulatory system.

3.3 Measurements and tests used in the research:

3.3.1 Measuring the physiological indicators: (Radhwan, 1980)

1- Number of Heart rate
2- Arterial Blood Pressure
3- Diastolic Blood Pressure
4- Mean Arterial Blood Pressure
5- Systemic Vascular Resistance
6- Systolic Volume (ml)
7- Ejection Fraction (%)
8- Cardiac Index (l/min. /m^2)
9- Cardiac Output (l/min)
10- Estimating the end diastolic volume (ml)

Descriptions of the device to measure the performance endurance and accuracy:

1- 4 pads (50cm x 50cm) and 10 cm of thickness. Each pad is fixed by a steal frame to be installed on the wall at one of the corners of the goal drawn on the wall.
2- The device contains 4 square sensors on a piece of hard plastic in each pad and it is connected by a cable containing 3 poles of 1 m long to the designed electronic map.
3- The device contains an electronic map mounted in a box (20 x 15 cm)
4- A special program for the manufactured device for data processing.
5- When shooting and touching any part of the pad, It will be a successful shot.

The idea of the device is extracted from one of the scientific researches, but the pads and the way to mount them on the wall were developed in a way that meets the test goal in football (Hasan, 2018).

3.3.2 Skillful Test

Performance Endurance and its Accuracy Test:

Purpose: Measure the level of young footballers' skillful performance endurance and its accuracy

Used Tools: a wall that has the same measurements of a real football goal post. 4 pads of 10cm thick is placed on the wall at each corner. The pad is a square-shaped (50cm x 50cm) and connected to a computer with a program to receive any hit in any pad. At the end of the test, the designed program registers the number of successful and unsuccessful shots and the total number. Technique: the footballer stands 18 yards away. When he sees the start sign, he starts shooting the 4 pads for 4 minutes. Registration: the number of successful shots is registered by the device modified by the two researchers. The tester also register the total number of shots; an indicator for skillful performance endurance and accuracy can be obtained through using the following formula: Calculation of Test Score: Test score prepared by the researcher is calculated using a formula developed by a specialist by involving all parties affecting the test result of skillful performance endurance and accuracy. The high score value is an evidence for the increase in the performance endurance and accuracy and vice versa. The formula has been presented to a group of experts specialized in tests, measure, statistics and mathematics[*] to verify the formula as an indicator to measure the skillful performance endurance and accuracy.

The indicator of skillful performance endurance and accuracy =

$$\frac{\text{number of total shots} - \text{number of unsuccessful shots}}{\text{Performance time}}$$

3.4 Main Experiment:

The two researchers have made an experiment on 04/04/2018, where the tests to measure the skillful performance endurance and accuracy in football were conducted. After the end and in a stand position , the functional indicators of heart muscle and circulatory system were measured by using the Physio Flow.

2-5 Statistical Means(Al-Tikritea, 1999) : Use of SPSS

The researcher has used the statistical means through using the SPSS Program to process and reveal the research results because the statistics is a science of collecting, classifying , presenting and interpreting numerical data, induction and decision-making(Radhwan, 1989).

1- Arithmetic Mean
2- Standard Deviation
3- Standard Error
4- Variation Coefficient
5- Percentage
6- T Test for Independent Samples
7- Coefficient of Simple Correlation (Pearson)
8- One-way analysis of variance
9- Forecast Formula

4. RESULTS

4.1 presenting the results of arithmetic means, standard deviations for performance endurance and accuracy and some functional indicators of heart muscle and circulatory system:

Table II
shows standard deviations and means for tests and measurements dealt by the researcher

Tests and measurements	Arithmetic Mean	Standard Deviation
Skillful performance endurance and its accuracy	1.32	0.043
Heart Rate (B/m)	180.83	1.722
Stroke Volume (ml)	98.77	2.041
Cardiac Output (l/m)	15.645	0.291
Cardiac Index (l/m/m^2)	5.521	0.172
Ejection Fraction (%)	68.76	0.797
Systolic Blood Pressure (mm Hg)	161.33	1.032
Diastolic Blood Pressure (mm Hg)	80.12	77.35
Mean Arterial Blood Pressure	93.65	6.32
Systemic Vascular Resistance	0.849	0.033

4.2 Presenting the results of correlations between the skillful performance endurance and its accuracy and some functional indicators of circulatory system and heart muscle for young boxers.

Table III
Presenting the results of variance analysis test (F) between the skillful performance endurance and its accuracy and the functional indicators of circulatory system and heart muscle.

Variables	HR	SV	CO	CI	%EF	SBP	DBP	MABP	SVR	Performance endurance and its accuracy
HR	1	**0.83	**097	**0.97	**0.68	**0.98	**0.63	**0.90	**0.98-	0.36
SV		1	**0.93	**0.93	**0.90	**0.86	0.211	**0.60	**0.87-	0.04-
CO			1	**0.99	**0.80	**0.97	*0.49	**0.82	*0.97-	0.21
CI				1	**0.80	**0.96	*0.47	**0.80	*0.97-	0.24
%EF					1	**0.72	0.101	0.46	*0.68-	0.26-
SBP						1	*0.60	**0.89	*0.97-	0.28
DBP							1	**0.89	*0.54-	*0.52
MABP								1	**0.84-	0.45
SVR									1	0.35-
Performance endurance and its accuracy										1

Table IV
shows the variance analysis test (F), Coefficient of determination and multiple correlation.

R	R Square	Adjusted R Square	Change statistics			
			F Change	DF1	DF2	Sig. F Change
0.916	0.840	0.697	5.893	8	9	0.008

Table IV shows the results of statistical processing to state the multiple correlation which is 0.916. it also shows that the value of Coefficient of determination is 0.840, the value of variance analysis is 5.893 and Sig value is 0.008. And at a temperature of (8 , 9), it is clear that there is a statistically significant difference between tests and measurements used in the research and the skillful performance endurance and its accuracy.

4.3 Presenting and discussing the results of B value for tests and measurements studied by the researcher and their significance to forecast the shooting accuracy

Table V
shows the (B) value, calculated (T) Value, (sig) and measurements by which we can forecast the shooting accuracy.

Tests and measurements	B	Std. Error	Beta	T	Sig
	8.468	2.684		3.155	0.012
HR	-0.051	0.024	-24.748	-2.169	0.058
SV	-0.061	0.025	-10.682	-2.403	0.040
CO	0.346	0.180	20.642	1.922	0.087
CI	0.232	0.086	4.892	2.683	0.025
% EF	-0.010	0.016	-0.430	-0.650	0.532
SBP	0.05	0.06	0.804	0.811	0.438
DBP	0.014	0.08	1.087	1.767	0.111
SVR	-1.657	0.819	-8.034	-2.024	0.074

The value of constant (A) = 8.468

The table 5 shows that (B) value for HR is 8.468 and (T) value is 3.155. (B) value for SV is 0.061 and (T) value is -10.682. (B) value for CO is 0.346 and (T) value is 2.683. (B) value for CI is 0.232 and (T) value is 2.683.

And regression (B) value which is the amount of blood flowing with each pulse is (-0.010) and its regression on the skill performance endurance and its accuracy through (T) value is (-0.650), regression (B) value of systolic blood pressure is (0.05) and its regression on the skill performance endurance and its accuracy through (T) value is (0.811), regression (B) value of diastolic blood pressure is (0.014) and its regression on the skill performance endurance and its accuracy through (T) value is (1.767) and regression (B) value of systemic vascular resistance is (-1.657) and its regression on the skill performance endurance and its accuracy through (T) value is (-2.024).

Therefore, we can trust the following variables (that have been mentioned in the prediction formula) in the final composition of the prediction formula: shooting accuracy= constant A + arithmetic mean of heartbeats X regression + arithmetic mean of the amount of blood flowing with each heartbeat X regression + arithmetic mean of cardiac output X regression + arithmetic mean of heart function X regression + arithmetic mean of the amount of blood flowing X regression + arithmetic mean of systolic blood pressure X regression + arithmetic mean of diastolic blood pressure X regression + arithmetic mean of systemic vascular resistance X regression.

Example: skill performance endurance and its accuracy = (8.468) + (82.63 X -0.061) + (3.205 X 0.232)

Skill performance endurance and its accuracy= 8.468 + (-14.297)

Skill performance endurance and its accuracy= 4.171

5. DISCUSSION

5.1 Discussing correlation matrix results

Table () shows the correlation matrix for all variables that have been tackled in this research which show that functional indicators (SVR – MABP – SBP – CI – CO – HR2) have created a significant correlation among them and have not created one with skill performance endurance and its accuracy, meanwhile the indicator (EF %) has created a significant correlation with all variables except for (MABP – DBP) and skill performance endurance and its accuracy.

Functional indicator (DBP) has created significant correlations with all variables including skill performance endurance and its accuracy.

The researcher promotes that circulatory system variables are associated with each other during its function which requires a healthy heart that beats properly based on the effort made also the amount of blood flowing must be consistent with the effort as it increases whenever the effort is increased in a manner that insures enough blood is transferred to the muscle fibers conducting the skill performance; each one of above mentioned has an impact on the cardiac output and function therefore, all these variables are connected with the level of systolic and diastolic blood pressure since the increment of blood flowing is matched by an increment in the systolic blood pressure and dilation in blood vessels to reduce the diastolic blood pressure, force applied on the walls of the blood vessels and obstruction of blood flowing in the vessels which leads to minimize the systemic vascular resistance. This is what happened during skill performance endurance and its accuracy. (DBP) is the only indicator that created a negative correlation with the skill performance test, researchers think that (DBP) reduction indicates a reduction in resistance and obstruction of blood flowing and an increment in blood flowing to the muscles participating in the physical activity; this how correlation is created.

(Radwan, 1980) states: "the development of circulatory system capacity has an impact on the functional basis by which physical characteristics are built and participate in enhancing basic skills".

Salma (2009) states: during physical activity, left ventricle is filled with blood which means there is an increment in blood going to the heart (venous return) because of the increase of systolic blood pressure which helps in increasing the stretch of ventricle walls". This fact is confirmed byAmmar (2006) as when a physical effort is exerted, it leads to the gradual decrement of vascular resistance depending on the intensity of the physical activity and surrounding circumstances (temperature, height above sea level).

5.2 Discussing regression value and prediction formula

The researches attribute the reason behind the existence of a predictive relation between (SV) and (CI) to the nature of performance in the 9 minutes identified test, this period of time in boxing rounds is enough for blood saturated with oxygen and nutrient elements to flow, get rid of metabolic products that surround the fibers of active muscles and maintain basic component of the interior surrounding which requires the consistency between the volume of pumped blood with the physical effort in addition to the cardiac function (CI) which associates with the cardiac output that depends on (heartbeat rate and amount of pumped blood per beat); this accords with the blood reaching a square meter of the body i.e. continuity of performance and maintaining precision depends on the blood reaching active body parts which depends on heart muscle, amount of pumped blood, heartbeat rate and cardiac output that meets the cardiac function. "heartbeat rate is one of the important indicators of circulatory system efficiency by which we can know the extent of achieved goals in the training process and players' functional and physical levels" (Al-Kubaisi, 1993).

The amount of pumped blood is significantly related to the to the physical activity since the first increases whenever the physical activity increases till it reaches its fixed limits within the athlete's ability (Ammar, 2006) .

Guyton & Hall (1997) state that the cardiac output is limited to the local blood flow of tissues which means that the heart increases the productivity based on the need of the tissues but needs the aid in the form of neural signals that makes it pump proper amounts of blood whenever needed. This is confirmed by (Al-Gelani, 2005) when he stated that blood flowing to certain tissues is consistent with the metabolic process occurring in them and during the activity, heart productivity increases. Also blood distribution differs according to environmental circumstances, fatigue and type of effort nevertheless, most of heart productivity goes to active muscles. This is supported by Guyton & Hall (2006) when they stated that during a physical effort, muscles need for more blood flowing increases and part of this increment results from local vascular dilation of muscles vessels due to muscular cells metabolism which leads to an extra increment in concurrent arterial pressure with that effort by approximately (30% - 40%) which increases blood flow by two extra doubles. Ammar & Aqeel (2008) confirm that in case of physical effort, blood pressure rises in the circulatory system and heart muscle therefore physical effort is accompanied by an increment in cardiac output and flow speed that is accompanied by dilation in blood vessels which lead to reduction in vascular resistance.

6. CONCLUSIONS AND SUGGESTIONS

6.1 Conclusions: most important conclusions reached by the researcher are as follows:

1. Prediction formula of skill performance endurance and its accuracy depends on (amount of pumped blood per pulse in addition to the blood reaching a square meter of the body represented by cardiac function).
2. There are correlations among all functional indicators under study which indicates the importance of these indicators and the validity behind choosing them.
3. There are correlations between diastolic blood pressure and the skill performance endurance and its accuracy test.
4. Occurrence of correlations is proof of the ability to predict the endurance of skill performance and its accuracy through indicators and their significance.
5. There is harmony among the functions of the circulatory system, measurements and functions of heart muscle and blood vessel.
6. Statistical characterization of research sample functional variables is in a good level which conforms to the research sample.
7. Endurance of skill performance and its accuracy is affected by many factors with varying degrees but they are distinguished of those which were accepted in the prediction formula.

6.2 Suggestions

1. Adopt the prediction formula for skill performance endurance and its accuracy which has been reached by the researcher.

2. Indicators of pumped blood volume and cardiac function that have been tackled in this research and gained a high degree of validity to be a part in the prediction formula must be trusted to be a part of achieving the skill performance endurance and accuracy test.
3. Trainers must stress on formulating and preparing training for variables that participated in the prediction formula and giving them enough space in the training curriculum to improve shooting accuracy under the pressure of enduring skill performance.
4. Conduct researches on other indicators that have an impact on scoring accuracy in football.

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