EUROPEAN ACADEMIC RESEARCH
Vol. II, Issue 10/ January 2015

Impact Factor: 3.1 (UIF)
DRJI Value: 5.9 (B+)

ISSN 2286-4822
www.euacademic.org

Measuring and evaluating the electrical effectiveness of heart muscle and some physiological variables to determine the predictive ability for heart function

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Abstract:

Sporting events like (javelin, discus and shot put) vary in nature through speed and strength, and this difference has different effects on heart muscle. Each of these events has yields on adaptation of heart muscle, which reflect on heart function. Heart function varies depending on the type of sporting event used through this research, the researcher wants to determine the heart function through some equations to predict electrical efficiency and some functional variables in order that dealing with athletes will be more scientific and more effective.

Because of the researchers were not interested with such aspects so I supervising the relation between the function of heart while sports that depending on strength and speed in the anaerobic sports .while procedures I adjust two equations predictive for heart function which depend on two variables length and wave time (t).

Key words: electrical effectiveness, heart muscle, predictive ability, heart function

1- Introduction:

Evolution in the techniques of medical and sports devices remains one of the important factors in determining and

measuring the nature of responses in their public and private sectors among athletes. Therefore, every physical effort or sporting event imposes some effects on the various organs of human body. Sporting events characterized by high speed and maximum power in such a short time like (javelin, discus and shot put) will inevitably impose some responses and functional adaptations different from those events characterized by speed endurance and endurance for a long time.

While the researcher was following up many of the studies he noted that there wear a few scientific researches dealing with the prediction of heart function because there was a great need of the means measurement in this matter and the large number of derivations of the equations to reach the content of this prediction, as well as the lack of scientific knowledge to predict heart function in the variables presenting a great influence among the athletes in these events in order to determine the best scientific result. That is why the researcher wants to study into this field to reach a scientific fact by finding predictive equations through some variables.

This research aims is study field of the level of harmony and positive adaptation of heart muscle through some of the variables having a direct impact on heart function , measuring and evaluating them among the members of the research sample, and finding some equations to predict heart function through some of the variables used.

2 - Research procedures:

The choice of approach usually depends on accurate and objective solutions through which we can find a resolution to the problem, so the researcher adopted a descriptive approach with a survey manner which is suitable with the nature of the research. Research community (20) players included sporting events players characterized by high speed and maximum power in such a short time like (javelin, discus and shot put) in

the clubs of Thi-Qar province. A good choice for the research sample is one of the important steps in the research, so that the researcher can avoid mistakes, and give derived data required accuracy. The selected sample "is the part that represents the community of origin, which the researcher deals with". [1].

The community of origin (20 players) have been intentionally selected as a sample of the research who form a percentage of (100%). The homogeneity of the sample has been done by the researcher as shown in table (1):

Table (1) Arithmetic means, standard deviations, coefficient of mediator and sprain and Kolmogorov-Smirnov test to ensure good distribution of the sample under Gauss curve

Statistic / Variables	Measure	Mean	S.D	Median	Skewnes	Kolmogorov-Smirnov Test
Cw	m/z	7652.6	192.7	7694	0.64	0.09
T	Mm	0.04	0. 7	0.20	0.68-	0.12
Qrs	Mm	0.64	0. 3	0.50	1.41	0.08
P	Mm	0.01	0.2	0.2	1.50-	0.10
Cc	Mm	0.92	0.61	0.94	0.09	0.09
t-P	Mm	0.48	0.04	0.50	1.51-	0.07
VDT	Mm	0.14	0.01	0.15	3.0-	0.09
VST	Mm	0.09	0.1	0.0 10	2.41	0.30
SBp	Z / mL	120.2	6.44	120	0.0 9	0.06
DBp	Z / mL	80.2	3.18	80.8	0.56-	0.97
MABp	Z / mL	81	3.40	82.1	0.97-	0.10
Pp	Z / mL	40	1.54	40.2	0.38-	1.05
Sv	Cm3	75	2.12	76	1.41-	1.76
HR	M	53.62	4.59	52.3	0.86	1.98

The values of homogeneity in all the research variables in Table (1) are about (± 3), thus the research sample may be properly distributed in all the research variables.

3- Measurements used:

First - Measuring functional indicators: -

a- Systolic Blood Pressure (SBP):

This variable is measured by an electronic blood pressure monitor (Rossmax). The cuff of the electronic blood pressure monitor has been tied to the left, to measure the level of systolic blood pressure shown on the screen. Note that the normal value of this variable (SBP) is 120 MmHg.

b - Diastolic Blood Pressure (DBP)

This variable is measured by the same mechanism for measuring systolic blood pressure, thus the screen of the device displays both the systolic pressure and diastolic pressure. The normal value of this variable (DBP) is 80 MmHg.

c - Mean Arterial Blood Pressure (MABP):

It is calculated as follows:

MABP = DBP + 1/3 PP.

d- Pulse Pressure (PP):

It is calculated as follows:

PP = SBP – DBP……]2[

In humans, the average value of the strike volume (SV) is about 75 cm3. The volume of the left ventricle in diastole (LVDV) and systole(LVSV) has been measured by an ultrasound device (ECHO), then the stroke volume (SV) was calculated as follows: ……]3[

SV = LVDV – LVSV.

e- heart function (CW):

It is calculated as follows:

CW = SV * MABP. …..]4[

Second: Measuring the electrical effectiveness of heart muscle

(Electro Card Graph):

The electrical effectiveness of heart muscle has been measured by an ultrasound device (ECHO). We calculated the period of

waves and periods of ECG during rest period and after lying down for five minutes. Timers are calculated for the waves and periods directly through the graph paper of the device, particularly from the second pole.

Thus, many measurements have been taken:

a- Heart Rate Measure:

Heart rate (HR) has been calculated for each member of the sample using a device (ECG), which represents a record of the sequence of electrical events and signal transmission before and during each cardiac cycle. Four electrical leads from the ultrasound device (ECG) have been fixed in specific places in the arms and the legs. Then we switch on the device. Ten consecutive strokes have been taken from the graph paper of the device. Finally the mean for ten cardiac cycles from the second lead have been calculated as follows:

HR = 60/M(RR)…]5[

b- Cardiac Cycle:

It is the time that takes all the accidents associated with every heartbeat. The normal average of the time of human cardiac cycle is (0.833/sec.). Then, cardiac cycle has been calculated as follows:

CC = 60/HR

For example, the heart rate (HR) for a member of the sample is (62) b/m. Thus, the average of his cardiac cycle is (0.967/sec.) seconds.

c - Repolarization Wave Time: (t-P)

It is the period of stability of the polarization of heart muscle. It is determined by the end of wave (t) and the beginning of wave (P) of the next cardiac cycle. The length of this period gives the impression that there is a decline in heart rate (HR). So, this period lengthened and shortened according to the number of

heartbeats. The normal average of this period is about (0.30/sec).

d- Ventricular systolic Time (VST):

In general, ventricular systolic time is calculated according to QRS wave time which represents the ventricular systolic time. On the other hand, the wave QRS represents the demise period of the polarization of the ventricles. The direction of systole occurs in all parts of the ventricles.

The natural average ventricular systolic time (VST) at about (0.09/sec.). This wave starts from the beginning of wave (Q) until the end of wave (S).

e- Ventricular Diastolic Time (VDT):

In general, calculated according to the time of the wave (T), which represents ventricular diastolic time. This is a very important period which reflects the activity of the heart during diastole. It also constitutes a large proportion of the time of cardiac cycle. The natural average of this period is about (0.16/sec).....]6[

4 - Analysis of results:

Table (2) Shows the tendency values of the indicators of the electrical effectiveness and (T) Test to predict heart function according to the wave time (t)

Coefficients [a]						
Variables	B	Mean	S.D	d.f N-1	T Test	Sig 0.05
Wave Time (t)	8158.17	0.17	0.01	19	2.34	0.03

a= 3494.12

Table (2) shows the results of the statistical treatment of the value of inclination (b) to wave time (t). The value of inclination (b) were significant through the test (T). Calculated reached (2.34) at a level of significance (0.05) and with a degree of freedom (19). The results show that the value of a constant

inclination (a) is (3494.12). Thus, we can trust that wave time (t) to determine the equation of heart function. Thus analysis of variance of declination will occur among heart function, length and wave time (t) to detect the significant declination between the two variables.

Table (3) Show (ANOVA) Test to the stability of prediction of the value of heart function through wave time (t)

ANOVA [b]					
Variables	**Sum of squares**	**d.f**	**Mean Square**	**F**	**Sig**
Regression	**380698.9**	**1**	**380698.944**	**5.94**	**0.03**
Residual	**1247793.45**	**18**	**69321.858**		
Total	**1628492.3**	**19**			

Table (3) shows the results of the statistical treatment for determining significance of decline one variable wave time (t) through heart function . There are variances for significant through the calculated (ANOVA) Test with a level of significance (0.05). This may confirm how we can predict heart function depends on wave time (t). Thus, we can formulate the final form of the equation of prediction as follows: -

*** Linear Regression**

0.17 + 8158.17 = 8752.17 . 3494.12 * CW=

Table (4) Show the values of the inclination of the indicators of the of electrical efficiency and (T) Test to the prediction of heart function according to wave length (t)

Coefficients [a]						
Variables	**B**	**Mean**	**S.D**	**d. f**	**T Test**	**S. g**
				N-1		**0.05**
wave length (t)	**5128.53**	**0.03**	**0.07**	**19**	**2.58**	**0.01**

a = 9987.75

Table (4) shows the results of the statistical treatment of the value of inclination (b) to the length of the wave (t) . We noticed that the value of inclination (b) were significant through the test (T). Calculated (T) reached (2.58) with a level of error (0.05) and a degree of freedom (19). The results show that the value of a constant inclination (a) was (9987.75).

Therefore, we can trust the ability of wave (t) to determine the equation of prediction of heart function. The analysis of variance of decline will be done between heart function and the length of the wave (t) to detect a significance of decline between the two variables.

Table (5) Show (ANOVA) Test to the stability of prediction of the value of heart function through wave length (t)

ANOVA [b]					
Variables	**Sum of squares**	**d.f**	**Mean Square**	**F**	**Sig**
Regression	**441737.71**	**1**	**441737.71**	**6.70**	**0.01**
Residual	**118674.67**	**18**	**1186754.67**		
Total	**1628492.39**	**19**	**1628492.39**		

Table (5) shows the results of the statistical treatment to show significance of decline one variable length of the wave (t) through Heart of function. Therefore variances for significant are through (ANOVA) at level of error (0.05) and a degree of freedom (19). This confirms that the possibility of prediction of heart function depends on the length of the wave (t). Thus, we can formulate the final form of the equation of prediction as follows: -

***Linear Regression**

Cw = 9987.75 *0.3+ 5128.53 = 8124.866

Through tables (3, 4, and 5) have been achieved to predict heart function depending on the time and the length of the wave (t), through the statistical means and tables above shown the

importance of time and the length of the wave (t), which represents time of diastole of the ventricles in determining and predicting heart function.

The researcher realizes the importance of the periods and the waves of heart muscle in determining the efficiency of heart muscle because of the increase in the period of diastole leads to replenishment of ventricles with a larger amount of blood laden with oxygen and nutriment. This increase of period of systole leads to increase blood flow period from the ventricle. Thus, there is an increase of the amount of blood flowed during one heartbeat which leads to a decline in heart rate according to the wave (t) and depending on a regular training. A certain study showed that .The period the most affected is the period (T-P) a period in which blood laden with oxygen and nutriments are delivering to the fibers of heart muscle through the coronary capillaries. So any increase in time of distance is the result of some cumulative responses to heart muscle and will have a positive impact on the work of the circulatory device and ease of functional burdens on work Respiratory. Sport plays which depend in the performance in dynamic competencies related with functional devices. Every physical activity is closely depended on internal devices. So we think that the athlete strives to make his internal devices reach a higher adaptation which reflects positively on his fitness in general. That he will properly accommodate the training modules and continue training very actively in order to access to the required level of achievement.

The researcher believes that the performance of any physical work and continuous effort of training for athletes leads to an adaptation of functional devices and an increase in their efficiency, as heart muscle and realize the importance of the electrical effectiveness of heart muscle.

5 - Conclusions:

The researcher found through this study, which included many functional variables and the electrical effectiveness of heart muscle, that it is possible to predict heart function for every member of the sample according to time and the length of the wave (t). Predicting should be in these two variables, which lead to increase the adaptability of heart muscle within these sporting events characterized by speed. Through these two variables we have realized two equations to predict the positive heart function, so it is possible to adopt most of the exercises that develop of time and the length of the wave (t).

The researcher recommends conducting similar studies including some other variables to achieve the positive heart function.

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