IJIRR

International Journal of Information Research and Review
Vol. 04, Issue, 12, pp.4889-4898, December, 2017

REVIEW ARTICLE

THE EFFECT OF EXERCISE ON THE CARDIO-VASCULAR SYSTEM OF SHORT DISTANCE ATHLETES

***[1]Adikali Kaba Sesay and [2]Javed Soomro Ali**

[1]Lecturer: Milton Margai College of Education and Technology (MMCET)
[2]Lecturer: University of Sindh, Jamashoro-Pakistan

ARTICLE INFO

Article History:

Received 19th September, 2017
Received in revised form
22nd October, 2017
Accepted 04th November, 2017
Published online 30th December, 2017

Keywords:

Stroke volume,
Cardiac output,
Cardiovascular,
Heart rate, Athletes.

ABSTRACT

The study focuses on examining the effect of exercise on the cardiovascular system. A sample size of twenty athletes and non-athletes were chosen of which we have five regular or seasoned athletes who were male, five regular or seasoned athletes who were female, five non regular athletes male and five non regular female athletes. These non-regular or untrained athletes and trained athletes were put together to have ten week session of training so as to see the effect that exercise will have on their cardiac output. After this exercise, the data generated were analyzed using simple descriptive statistics technique and physiological calculation of the stroke volume and the Heart rate to arrive at the cardiac output. It was realized that the cardiac output of both groups varied as some had a reduced heart rate while others had an increase in heart rate that leads to the various results on the cardiac output.

INTRODUCTION

Physical activity is recognized as a risk factor for coronary artery disease. The circulatory system responds to an increase need for blood by adjusting the width of the blood vessels, primarily the arterioles and venues. The dependence of vessel resistance of the radius of the tube is described by Poiseulles law. It could be seen that blood flow depends very sensitively on the width of the blood vessels, so that changing the radius slightly has a large impact on the flow of blood.Cardiac output applies to the amount of blood pumped by the heart, which in return depends on the heart rate and he stroke volume. An increase in the maximum cardiac output is the most considerable change in cardiovascular function which is as a result of training. Even though the heart rate decreases moderately with this type of training there will still be increase in cardiac output due to the improved stroke volume. Cardiac output will continue to increase till the point where a plateau is reached.During aerobic training blood flows to the muscles in considerable amount in relation to other tissue. This consequence happens due to vasoconstriction of the sympathetic system. Working muscles are considerably larger in relation and need all the blood and oxygen that they can get.

Corresponding author: **Adikali Kaba Sesay**
Lecturer: Milton Margai College of Education and Technology.

In response to this, the parasympathetic system will constrict since it is not working as hard and does need as much blood. In other words, an increase in muscle blood flow is related to the increase in cardiac output, as well as, the redistribution of blood to muscles from non active areas that can temporarily compromise their blood flow, and the increase in cross-sectional area of the large and small arteries and veins.These are only some or the occurrences that happen to the cardiovascular system as we do aerobic training. Exercise training increases cardiovascular functional capacity and decreases myocardial oxygen demand at any level of physical activity in apparently healthy persons as well as in most subjects with cardiovascular disease. Regular activity is required to maintain these training effects. The potential risk of physical activity can be reduced by medical evaluation, risk stratification, supervision and evaluation.Exercise can help control lipid abnormalities, diabetes and obesity. In addition, aerobic exercise adds an independent blood pressure-lowering effect in certain hypertensive groups with about 8-10 mm Hg in both systolic and diastolic blood pressure measurements. There is a direct relation between physical inactivity and cardiovascular mortality and physical inactivity is an independent risk factor for the development of coronary artery disease. The greatest potential for reduced mortality is in the sedentary who because moderately active. The most beneficial effect of physical activity on cardiovascular disease mortality can be trained through moderate intensity activity (40%-60%)

of maximal oxygen training programs or leisure time physical activities. A fit heart muscle can handle extra demands placed on it. Through regular exercise, the heart muscles get stronger, contacts more forcefully and therefore pumps more blood with each beat. The heart is just like any other muscle it must be exercised regularly to stay fit. The fit heart has open; clear arteries free of atherosclerosis is a condition that contributed to a heart attack, stroke, hypertension, angina pectoris, and peripheral vascular disease.Deposits on the walls of arteries of arteries restrict blood flow and oxygen supply to the tissues. Atherosclerosis of the coronary arteries, the vessels that supply the heart muscles with oxygen, is particularly harmful. If these arteries become narrowed, the blood supply to the heart muscles is diminished, and angina pectoris may occur. Atherosclerosis increases the risk of heart attack because a fibrous clot is more likely to obstruct a narrowed artery than a healthy open one.

Statement of the Problem

The heart is rendered inefficient by one or more circumstances ranging from high heart rate, high blood pressure, and excessive stimulation. All of these conditions require the heart to use more oxygen than is normal and decrease its ability to adapt to stressful situations.The inefficient heart is one that beats rapidly because it's dominated by the sympathetic nervous system, which speeds up the heart rate. Thus, the heart continuously beats rapidly, even at rest, and never has a true rest period. Because of lack of physical activities, there has been:

- An increase in sudden death from ventricular fibrillation (arrhythmic heartbeat, other coronary heart disease.
- An increase in the number of diabetic and cancer person
- An increase in stroke cases
- An increase in obesity victims which instance, may lead to death.
- Deterioration in performance in sporting activities, especially professional sportsmen

This research will therefore look into the effect of exercise in reducing the effect of the above stated issues,

Objective of the Study

Main Objectives

The main objective of my study is

- To identify the importance of exercise to the cardiovascular system of short distance runners.

Specific Objective

- To highlight the effect of inadequate exercise to the human system specifically Cardiovascular system.
- To highlight the importance of using the training principles so as to keep the cardiovascular system in an effective mode.
- To identify the effect of hyperactivity to the cardiovascular system.
- To give specific advice on the value of exercise to the entire body with more emphasis on the cardiovascular system.
- The relationship between exercises an heart rate – resting heart rate.

Significance of The Study

The study could be of great interest to the trainers and to a greater level of interest to the athletes because they are the ones who will justify the use of the basic theories used. This study will make the trainer and trainee know that an increase in the maximum cardiac output will one of the most considerable change in cardiovascular function which is as a result of training. It will also point out that even though the heart rate decreases moderately with this type of training there will still be increase in cardiac output due to the improved stroke volume. Also the cardiac output will continue to increase till the point where a plateau is reached. In other words, an increase in muscle blood flow is related to the increase in cardiac output, as well as, the redistribution of blood to muscles from non-active areas that can temporarily compromise their blood flow, and the increase in cross-sectional area of the large and small arteries and veins.These are only some or the occurrences that happen to the cardiovascular system as we do aerobic training. Exercise training increases cardiovascular functional capacity and decreases myocardial oxygen demand at any level of physical activity in apparently healthy persons as well as in most subjects with cardiovascular disease. This research work will ignite trainees to realize that regular activity is required to maintain these training effects. The potential risk of physical activity can be reduced by medical evaluation, risk stratification, supervision and evaluation. Exercise can help control lipid abnormalities, diabetes and obesity. In addition, aerobic exercise adds an independent blood pressure-lowering effect in certain hypertensive groups with about 8-10 mm Hg in both systolic and diastolic blood pressure measurements. There is a direct relation between physical inactivity and cardiovascular mortality and physical inactivity is an independent risk factor for the development of coronary artery disease.

Review of Literature

Introduction

This chapter reviews related literature on the effect of exercise on the cardiovascular system.Cardiovascular fitness is the ability to exercise at an elevated heart rate for a designated time while supplying adequate oxygen to the body. According to Honey Bourne, Hill and Moore (1996) in their book "Physical Education and Sports" states that

"The heart rate needs to increase during exercise in order to increase the supply of oxygen to working muscles and to remove waste products such as carbon dioxide and lactic acid".

It could be seen from this statement that before you begin to exercise your heart rate is caused by the release of cleanlier acting directly on the heart and the impact of emotional excitement on the medulla. As soon as the exercise begins the heart rate rises rapidly, mainly due to a nerve reflex response initiated by the muscle receptors that stimulates the cardiac

control centre. Also within the muscle chemo receptors respond to the cardiac control centre to increase heart rate. As the body continues to exercise the heart muscles begins to get warmer and venous return increase, increasing eh t hear rate further. It is certain the when you stop exercising the muscle receptors stop stimulating the cardiac control centre and the heart rate begins the fall quite rapidly. The activity of the chemoreceptor also reduces and this, combined with the reduced levels of adrenaline, the drop in venous return on the drop in body temperature returns in heart rate to normal within a matter of minute. According to Hellen Moors (2000) in his second edition book in advance Physical Education and Sports State that: "The heart rate increases in direct proportion to the increases in exercise intensity". One could believe that initially the cardiac output increases as a result of both the heart rate and the stroke volume increasing, but maximum stroke volume is achieved during submaximal work and any exercise in "cardiac output during maximal exercise is due solely to an increase in heart rate. If there is a progressive treadmill workout you will realize a change in both the heart rate steadily rise until a maximum heart rate is reached. During this stage, most of the energy is being produced anaerobically and you will soon have to stop exercising because of fatigue. Usually when one is working sub maximally the heart rate will usually rise until you reach a point where the oxygen delivered to the working muscles is sufficient to release enough energy aerobically to cope with the demand of the exercising. The heart rate will then reach a plateau. When you stop exercising, your heart rate does not immediately return to normal, but takes a number of minutes to recover? This is because the one exercising need to maintain an elevated rate of aerobic respiration in order to replenish some of the energy stores you have used during the exercise and also to remove some of the waste product that have accumulate for example lactic acid and carbon dioxide.

The increase and decrease rate of cardiac output

According to Arnheim and Prentice (200) tenth edition revealed that in training or exercise, "Stroke volume increase while heart rate is reduced at a given exercise load.From the above statement, it is clear that his heart is the main pumping mechanism circulating oxygenated blood throughout the body to the working tissue. As the body begins to exercise, the muscle use oxygen at a much higher rate and the heart must pump more oxygenated blood to meet this increased demand. The heart is capable of adapting to this increase demand through several mechanisms. Heart rate shows a gradual adaptation to an increase work load by increasing proportionally to the intensity of the exercise will plateau at a given after about two or three minutes.During higher intensity activities, maximal heart rate may be achieved before maximal oxygen consumption, which will continue to rise. The greater the intensity of the exercise the higher the heart rate will be.

A second mechanism by which the heart is able to adapt to increased demand during exercise is to increase only to the point which there is simply not enough time between hearts for the heart to fill up. Stroke volume and the heart rate together determine the volume of blood being pumped through the heart in a given unit of time. Approximately 5 liters of blood are pumped through the heart during each minute. Thus the cardiac output is the primary determinant of the maximal rate of oxygen consumption possible. During exercise, cardiac output, approximately four times that experienced during rest in the normal individual and may increase as much as six times in the elite endurance athlete.

Exercise Effect on the Cardio Vascular System

A training or exercise affect that occurs with regard to cardiac output of the heart is that the stroke volume increases, which in exercise heart rate is reduced at a given standard exercise load. The heart becomes more efficient because it sis capable of pumping more blood with each stroke. Because the heart is a muscle, it will hypertrophy to some extent, but this hypertrophy is in no way a negative effect of training.Cardiovascular fitness is the most important aspect of any fitness program. Cardiovascular fitness should be the mainstay of any fitness program. This section is designed to explain the definition of cardiovascular fitness, the benefits of cardiovascular fitness, the different modes of cardiovascular fitness, and the criteria of cardiovascular fitness.During exercise, blood pressure can decrease (both systolic and diastolic pressures) at rest and during sub maximal exercise by as much as 10mm/Hg in people with hypertension. However, at maximal exercise intensity systolic blood pressure is decreased capered to pre-training.It is interesting to note that although resistance exercise can raise systolic and diastolic blood pressure significantly during the activity, it also leads to a long term reduction in blood pressure.

Endurance training increases blood volume while plasma volume accounts for a majority of the increase, a greater production of red blood cells also contributory factor. Recall that homoerotic is the concentration of hemoglobin per unit of blood. An increase in red blood cells should increase hematocrit but this is mostly the case. Because blood cells hematocrit actually reduces following training exercise.

It is clear that the research has some expected outcomes. This expected outcome is as a result of review of related literature of similar research conducted. For this particular research, the researcher believes that:

- The greatest percentage of maximum aerobic may be performed.
- Stroke volume increases while heart rate is reduced a given exercise load
- Heart rate increases in anticipation before the exercise even begins.
- Cardiac output increases proportionally with exercise intensity which is predictable from understanding the response of heart rate stroke volume of activity.

MATERIALS AND METHODS

Introduction

This research is carried out in the Western Area of Freetown, especially in the Western Rural District of Goderich. The chapter focuses on the methodology used in carrying out the research. Methods ranging from selection of the subjects, the instrument used, procedures followed and how the findings will be analyzed.

Research Design

Though there are many designs in conducting a research, but the researcher deems it fit to use the experimental research method.

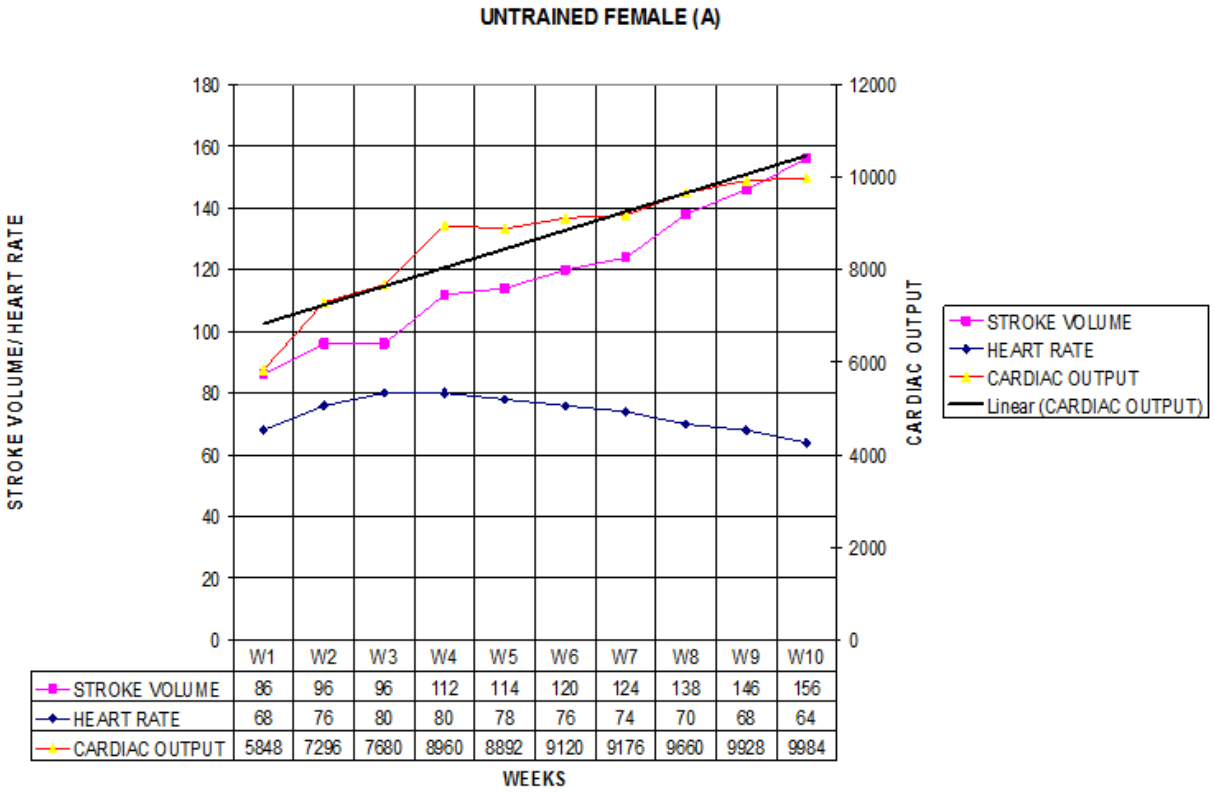
Population and Sample Selection

The population for the research includes all those who the researchers believe will respond accurately questioned posed to them and who will allow to be observed. The researchers selected twenty persons as a sample size. The sample is drawn from four categories of persons whose efforts when put together will yield the intended result. They are selected through the stratified random sampling method because the sample size targeted was heterogeneous set, and then the simple Random sampling method consideration is also given to the specific groups because of their orientations.

Data Collection

The approach used was observation. In the area of monitoring the heart rate per minute, the researcher has to do participant observation in order to ascertain if there is any increase in the pulse rate. The researcher has to observe the pulse |radial) before the activity and after the activity.

The \Heart Rate was also measured using a stethoscope and the stroke volume (SV) measured using the End Diastolic Volume (EDU) with a sphygmomanometer.



	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
STROKE VOLUME	86	96	96	112	114	120	124	138	146	156
HEART RATE	68	76	80	80	78	76	74	70	68	64
CARDIAC OUTPUT	5848	7296	7680	8960	8892	9120	9176	9660	9928	9984

Fig. 1.Chart showing the cardiac output of untrained athlete a (female)

The parameter and categories of groups that were under consideration were:

- Athletes
- Cardiac patients
- The elderly
- Medical personnel
- Sedentary or non-athletes

Considering the wide range of categories the researcher decided to use the composition of the heart rate and stroke volume to calculate the cardiac output on athletes and non-athlete/sedentary. As per the sample size five persons were selected from these four categories trained male athletes, trained female athlete, untrained female and untrained male.

Research Instrument/Technique

In a bid to get the requisite data or information about this piece of work, observation was the instrument used alongside sphygmomanometer; stethoscope and hand watch to get the required result.

Data Analysis

The study will entail both quantitative and qualitative process to make the analysis. A majority of the aspects assessed were numerical values and because the variables gathered are in the form of numerical values, it has to be in a tabularized form. These tables were used to measure, compare and analyze the result using rating scales. In this we use the quantitative approach some aspect of the research design is also qualitative because it involves the description in many words the effect of exercise on the cardiovascular system.

FINDINGS AND DISCUSSIONS

Introduction

This chapter deals with the analysis of the collected data. The data are analyzed qualitative and quantitative. Below are the charts that are analyzed.However, despite about twenty athletes and none athlete were used in the research process, only a few of them will be used in the analysis. In chart one, the individual under observation, was a non-athletes untrained female A). She was put on the field to train as a novice so as

to see how the cardiac output reacts to exercise. During the first week, before training commences, hear the heart rate (HR) was sixty-eight beat per minutes and her stroke volume was eight-six (86mls) per beat which summed up to five thousand, eight hundred and forty-eight milliliter which is about six (6) liters. As training continues, there is a steady decrease in the HR and a size0zag increase in the stroke volume (SV) at the start until it maintained a steady increase. Because IV. After ten (10) weeks of training the cardiac output (Q) increasedfrom about six (6) liters to about ten (10) liters. The linear cardiac output shows that the training schedule was not standard as it has a low correlation.

In chart two, the athlete started with a cardiac output (Q) of about six (6) liters. The HR shows little difference in the rate of declining. Though in week three (3) there was an increase in the beats per minute, yet she maintained a steady HR in the subsequent weeks. Though the HR was not moving within these weeks, there was a steady increase in the SV and subsequently on the Cardiac output (Q). At the end, there was an increase in cardiac output by three litres, making it to be about nine (9) litres pumped by the heart per minutes. In this athlete, there was a steady increase in workload, but the reaction of adaptation was slow:

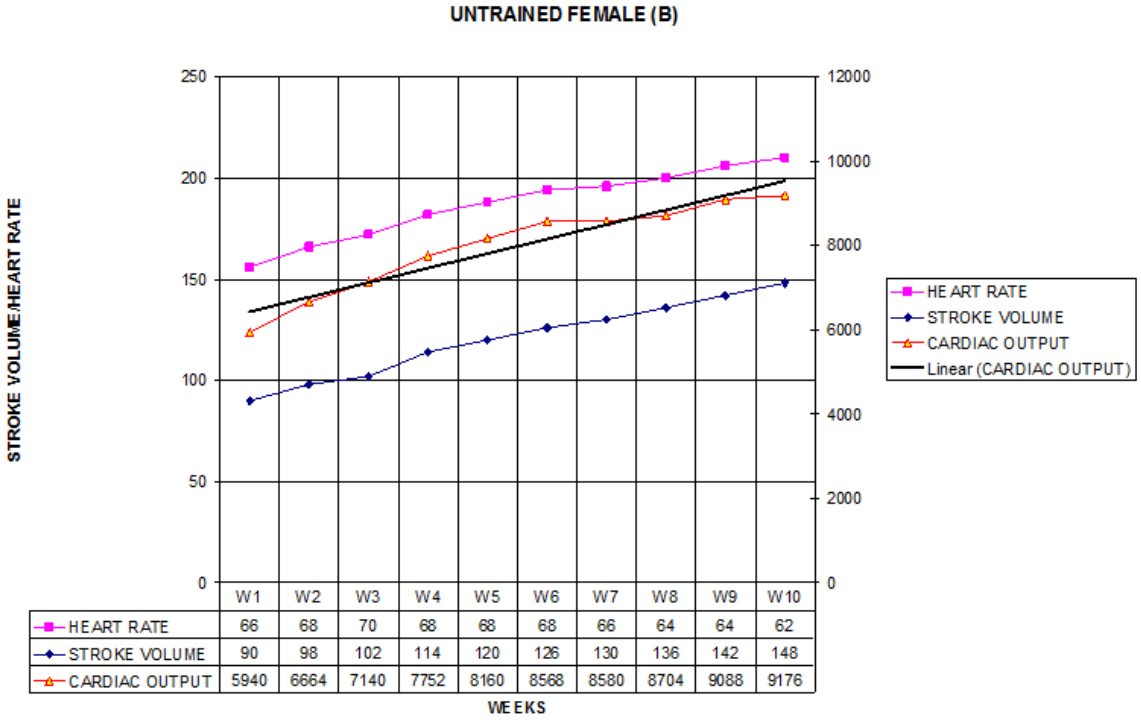


Fig. 2.Chart Showing the cardiac output of untrained athlete b (female)

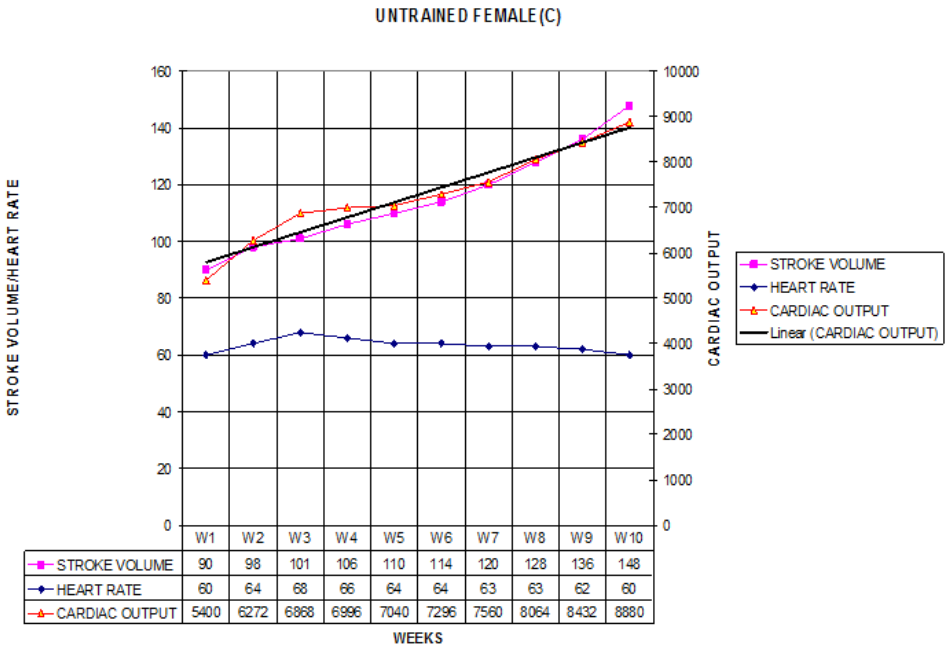
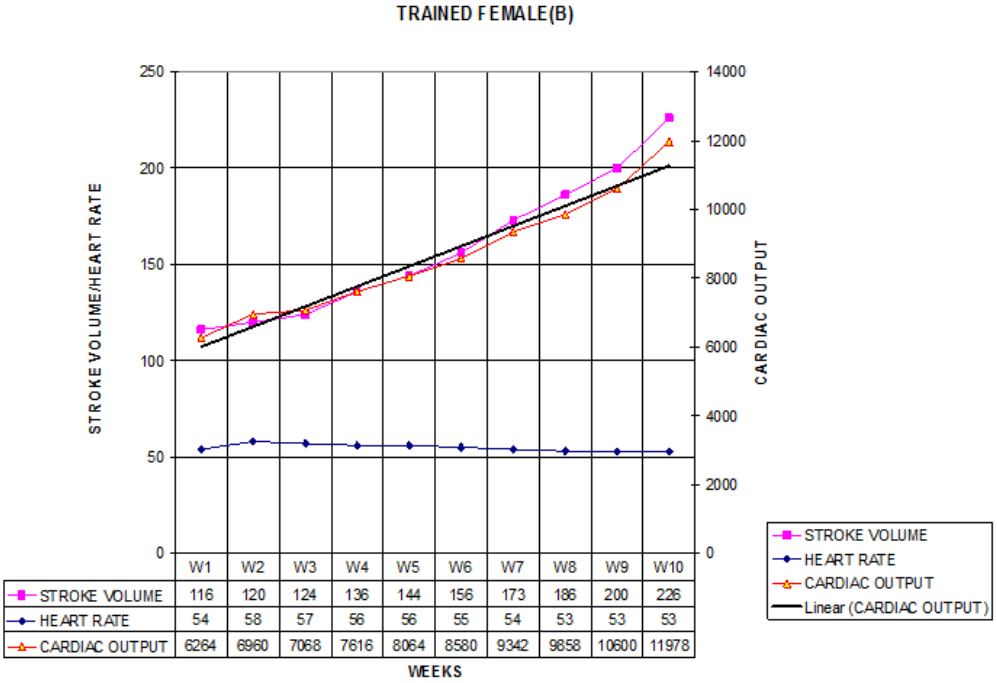


Fig. 3. Charts showing the cardiac output of untrained athlete c (female)

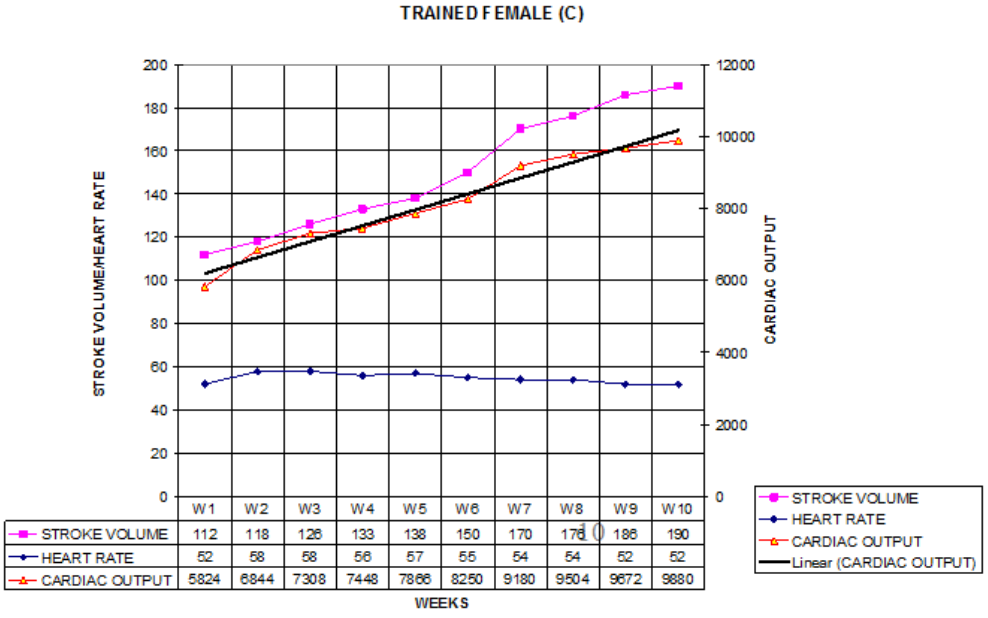
Considering the linear cardiac output of athlete C, there is an appositive correlation between the HR and SV. The athlete was not putting on her training schedule. The HR during the start of training ended up being the same after a ten (10) week period. The SV was increasing at a steady rate going a steady rate going a steady rise to the cardiac output.This category of the investigation shows athletes who are seasoned athletes. Referring to chart 6, the heart rate of this athlete is below the threshold though her starting cardiac output was about 5.7 litres per minute during her first week, also there was a slight increase in the HR in weeks two and three but began to realize a steady decline as she progresses. From the graph, the linear cardiac output shows that the athlete heart was giving more output that expected. By the end of the tenth week, she was able to give out over eleven litres of blood meaning the heart has become large in size and the releasing rate of the blood reduced.

Female B shows just a slight drop in the beat of the HR and an increase in the SV gives a rise in the Cardiac output. The increase in Q could not be seen much as the starting output was about 6.3 litres and after ten weeks of straining; there was an increase of about 5.7 litres. The increase in the stroke volume was because the athlete was a hypertensive patient during the weeks under review. The HR signifies that no significant impact was created that would have given rise to the SV.This chart shows an increase and decrease during the period of review, especially the first five weeks. When the athlete made a comebackfrom illness, she had wanted to go straight into her usual threshold (point of start) when on usual training, but because she was not fully recovered the HR was therefore not stable out was having a steady rise in the SV. At the end of the tenth week, she was just on the point that the HR started, but still maintains an increase in the cardiac output.



	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
STROKE VOLUME	116	120	124	136	144	156	173	186	200	226
HEART RATE	54	58	57	56	56	55	54	53	53	53
CARDIAC OUTPUT	6264	6960	7068	7616	8064	8580	9342	9858	10600	11978

Fig. 5. Charts showing the cardiac output of trained athlete a (female)

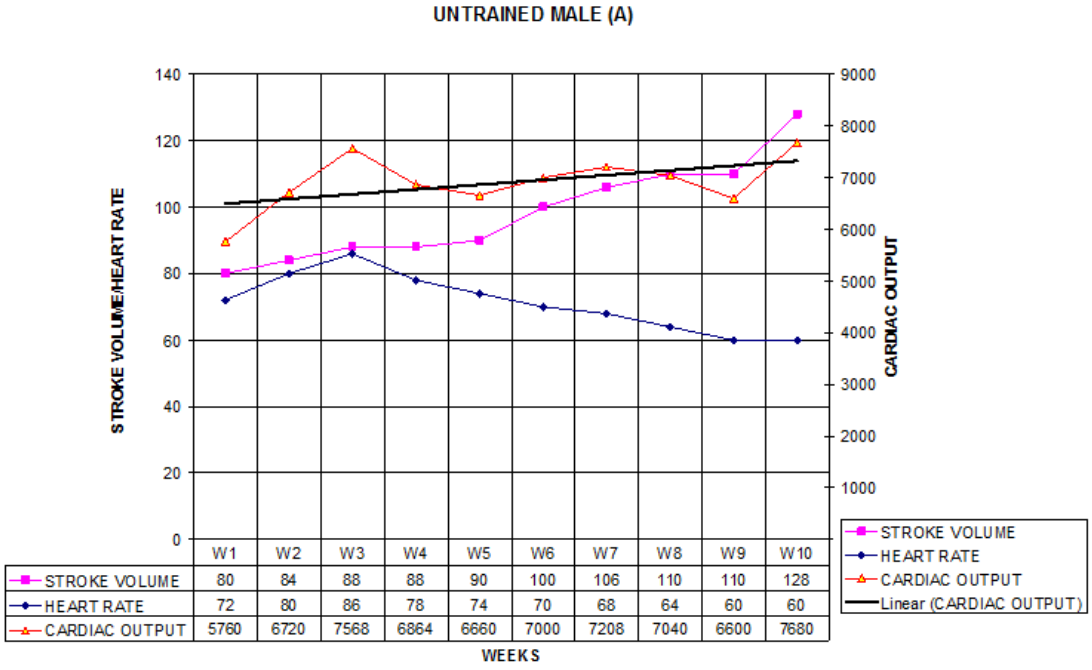


	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
STROKE VOLUME	112	118	126	133	138	150	170	178	186	190
HEART RATE	52	58	58	56	57	55	54	54	52	52
CARDIAC OUTPUT	5824	6844	7308	7448	7866	8250	9180	9504	9672	9880

Fig. 6.Charts showing the cardiac output of trained athlete c (female)

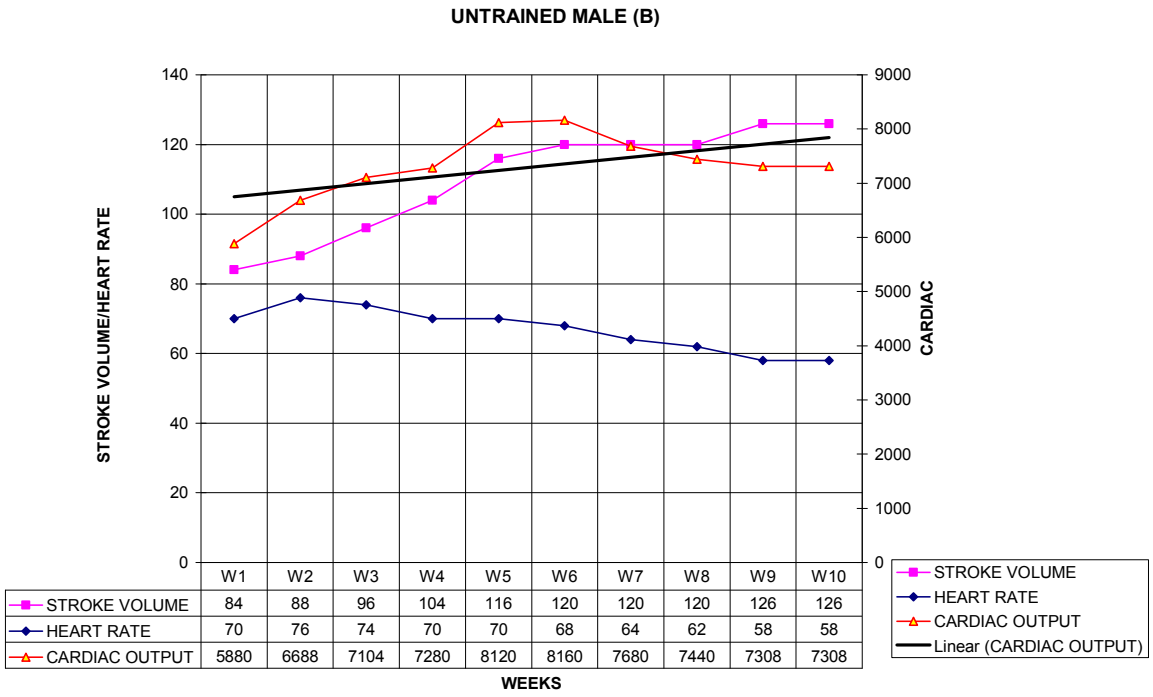
She falls below the linear cardiac output signifying little relationship between the HR and SV.The cardiac output of this athlete starts in the usual way, but begins to follow a trend that leads to the output going above the linear column. Both the heart rate and the stroke volume started increasing instead of the heart rate decreasing and the stroke volume increasing. It measures an irregular work schedule and could not increase up to eight (8) liters of blood pumped per minute at the end of the tenth week.Though the heart rate and stroke volume took their appropriate line by decreasing and increasing respectively, the cardiac output did not increase much and the linear output fall above the cardiac output itself.

The trend was not maintained, however, there is an increase in the cardiac output. In chart 13, the difference between the cardiac output and the linear output is not too far off. The athlete after started training in the first two weeks there was an increase in the heart rate because of the introduction of an increase workload that he has not been doing before, therefore the heart has to adjust itself so as to meet to the demands of the body. At the end of the tenth week, there was a little increase in the cardiac output.With this athlete, his starting heart rate was 50 beats per minute denoting the fact that he has been a trained athlete. His output was 5.7 liters per minute and as the week go by, the output began to increase steadily.



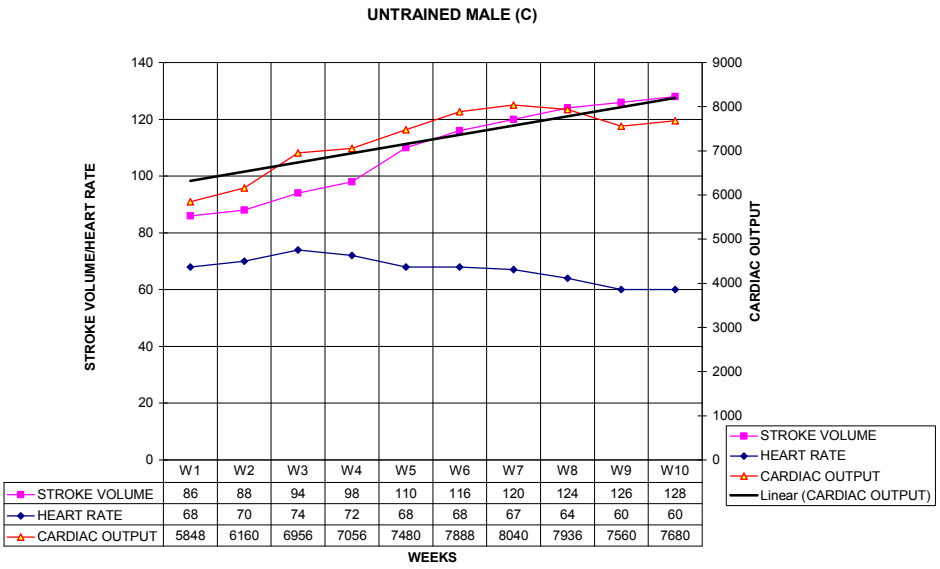
	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
STROKE VOLUME	80	84	88	88	90	100	106	110	110	128
HEART RATE	72	80	86	78	74	70	68	64	60	60
CARDIAC OUTPUT	5760	6720	7568	6864	6660	7000	7208	7040	6600	7680

Fig. 7. Charts showing the cardiac output of untrained athlete a (male)



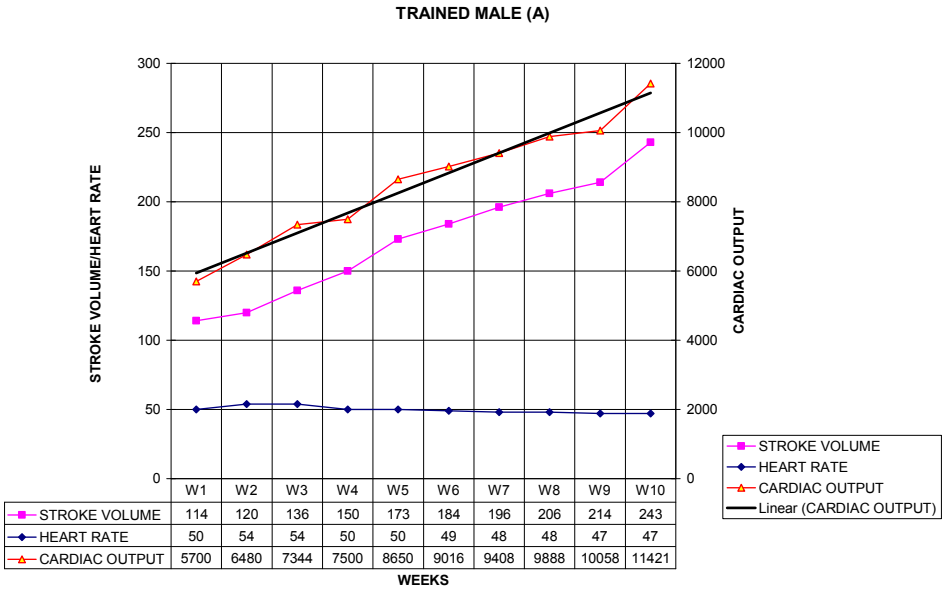
	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
STROKE VOLUME	84	88	96	104	116	120	120	120	126	126
HEART RATE	70	76	74	70	70	68	64	62	58	58
CARDIAC OUTPUT	5880	6688	7104	7280	8120	8160	7680	7440	7308	7308

Fig. 8. Charts showing the cardiac output of untrained athlete b (male)



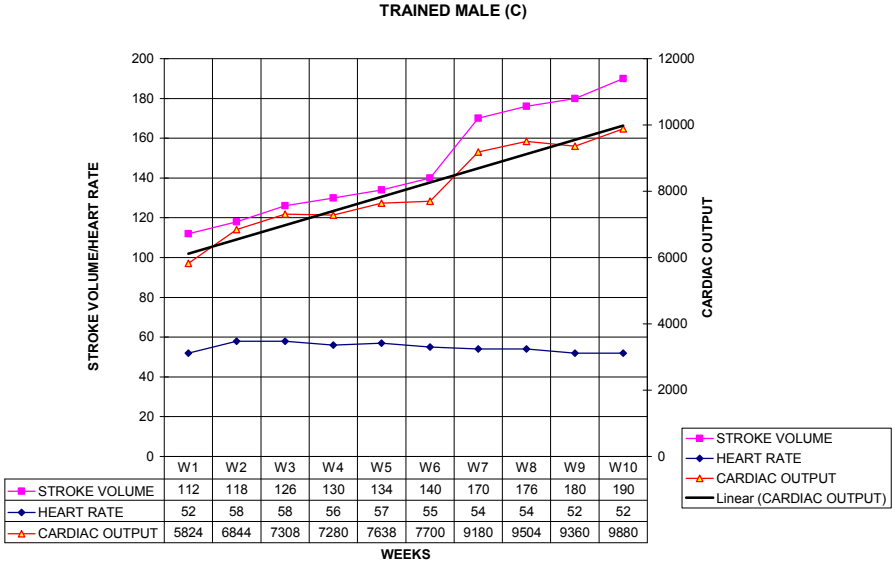
	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
STROKE VOLUME	86	88	94	98	110	116	120	124	126	128
HEART RATE	68	70	74	72	68	68	67	64	60	60
CARDIAC OUTPUT	5848	6160	6956	7056	7480	7888	8040	7936	7560	7680

Fig. 9. Charts showing the cardiac output of untrained athlete c (male)



	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
STROKE VOLUME	114	120	136	150	173	184	196	206	214	243
HEART RATE	50	54	54	50	50	49	48	48	47	47
CARDIAC OUTPUT	5700	6480	7344	7500	8650	9016	9408	9888	10058	11421

Fig. 10. Charts showing the cardiac output of trained athlete a (male)



	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
STROKE VOLUME	112	118	126	130	134	140	170	176	180	190
HEART RATE	52	58	58	56	57	55	54	54	52	52
CARDIAC OUTPUT	5824	6844	7308	7280	7638	7700	9180	9504	9360	9880

Fig. 11. Charts showing the cardiac output of trained athlete c (male)

At the end of the tenth week, the output had increased up to about 11.4 litres per minute. The heart rate only decreased slightly as the stroke volume increases significantly.The starting heart rate of this athlete shows that he has been training before now. The cardiac output was about 6.3 litres per minute and by the end of the tenth week it has increased to about 11.3 litres per minute which was an increase of about 5 liters. The cardiac output followed the usual trend that is supplied by the heart rate and the stroke volume.The heart rate of this athlete did not show any difference by the end of the tenth week.He started with 52 beats per minute and was increasing and falling intermittently. Though the stroke volume had increased yet the cardiac output shows a little difference at the end of the observed week. He started with 5.9 litres per minute and only increase just by 4.1 litres per minute, which ended up to a cardiac output of 9.9 litres per minute.

Summary

The main aim of this study was to examine the effect of exercise on the cardiovascular system. A sample size of twenty athletes was chosen of which we have five regular or seasoned athletes who were male, five regular or seasoned athletes who were female, five non regular athletes male and five non regular female athletes. These non-regular or untrained athletes were put together to have this ten week session of training so as to see the effect that exercise will have on their cardiac output. After this exercise, the data generated were analyzed using simple descriptive statistics technique and physiological calculation of the stroke volume and the Heart rate to arrive at the cardiac output: The main findings of the study were as follows.

In the untrained female, there is a slight difference between the Resting Heart Rate and the Heart Rate after exercise. The increase in cardiac output is minimal. The average increase in the cardiac output after the ten weeks of training was 3.74 litres through there were differences of individuals. Athlete A in the untrained female category recorded an increase of about 4.2 litre/minutes, athlete B, 3.3 litre/minute, athlete C 3.5 litres/minutes, athlete D 4.3 litres/minute /min and athlete an increase of 3.4 litre/min.

- The Heart Rate of the non- seasoned athlete is higher than the seasoned athlete while the stroke volume of the seasoned athletes is higher than that of the non-seasoned athletes.
- As the athletes increase their workload, so the heart increase in size and give out an increase in stroke volume and a decrease in Heart Rate so as to accommodate the extra or excess job that it has to do.
- With the non-athletes or the sedentary, after a period of ten weeks of equal training, their Cardiac output could only increase by an average of about 3.7 litres per minute while the trained athletes have an average of about 5.2 litres added to their output when it was in a resting state.
- From the study, one has noticed that the cardiac output increases proportionally with exercise intensity, which is predictable from understanding the response of heart rate and stroke volume of activity.
- Exercise places an increase demand on the cardiovascular system as oxygen demanded by the muscles increase sharply.
- During exercise the cardiovascular system performs the following functions.

i) Delivers oxygen to working muscles.
ii) Oxygenates blood by returning it to the lungs faster than when it is at rest.
iii) Transport heart, which is a by-product from the core to the skin.
iv) Delivers nutrients and fuel to active tissues so as to keep them active.
v) Transport hormones.

Conclusion

Exercising can affect the cardiovascular system in many different ways depending on the health status of the exerciser and the type of exercise that is being executed. With these athletes, the type of sub maximal exercise used was aerobic training. Aerobic training was viewed as an endurance workout that can lead to functional and dimensional changes in the cardiovascular system.When the exercises were done, the heart shows a moderate increase in size. This cardiac hypertrophy was because the heart was trying to adapt to the changes that occurring in the cardiovascular system.During the recordings, I realized an increase in the end diastolic volume because it will eventually cause an increase in the weight and volume of the heart. As a consequence, the heart has to adjust to the overload by increasing the left ventricular volume, which will cause an enlargement of the left ventricle.Cardiac output applies to the amount of blood pumped by the heart, which in return depends on the heart rate and stroke volume. An increase in the maximum cardiac output is the most considerable change in the cardiovascular function with result to aerobic training. Even though the heart rate decreases moderately with this type of training there will still be an increase in cardiac output due to the improved stroke volume. Cardiac output will continue to increase unto the point where a plateau is reached. This plateau means that the blood flow is sufficient enough to meet all of the metabolic requirements of exercise.

Recommendations

As a result of the findings, it is recommended that:

- Athletes are to exercise regularly as exercise reduces the possibility of suffering from osteoporosis and certain neoplastic disease
- The athlete should note the workload they are taking so that the heart will not be overworked which will lead to heart or cardiac attack.
- Physical inactivity is recognized as a risk factor for coronary artery disease, but exercise prevents the increase in cardiovascular diseases.
- People should exercise because exercise can help control blood lipid abnormalities, diabetes, and obesity.
- There is a direct relation between physical inactivity and cardiovascular mortality, and physical inactivity is an independent risk factor for cardiac attack so far mortality rate to be reduced, the athlete should embark on exercise.

REFERENCES

Armitage, A.L and Daiz R.W.M. 1982. Clerk and Lindsell on Torts. London: Styreet and Maxwell

Berne, R.M., and N.M. Levy: 'Cardiovascular Physiology,' 6th ed., Mosby, St. Louis, 1992.

Comroe,J.H.: Physiology of Respiration, year book, Chicago, 1965.

Fletcher, Gerald 1994. Cardiovascular Response to Exercise.

Grayson, E. 1978. Sports and the Law. London: Sunday Telegraph.

Guyton, A.C.: 'Functions of the Human Body,' 3ed., Saubder Philadelphia, 1969

Honey Bourne, Hill, and Moore, 1996. Physical Education &Sports

M C Ardle, W. and Katch, F and Katch V. 1996. Exercise physiology

Mansaray, Alpha Bassie.2003 edition. Questions and Answers (Unpublished Script)

Moore, Hellen 2000. Advance Physical Education and Sports.

Mull, R.F.,Bayless, K.G., ROSE, C.M. & Jamisseson. L.M. 1997. Rcreational Sport Mangement

Prentice and Arnheim 2000. Exercise and its benefits (10th Edition)

Rhoades, R. and Tanner, G 1995. Medical Physiology

Vander, Arthur J., 1993. Human Physiology: the mechanics of body functions

****