A study on physiological haematological and physical variables in relation to aerobic capacities among college going students

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Abstract

The purpose of this study was to compare the motor ability variables of physiological hematological and physical variables of high and low aerobic training groups of college going students of Tumkur Bangalore and Mysore University region of age between 19-21 for this purpose fifteen subjects were selected in each discipline comparison of selected motor ability and psychological variables. The variables selected for the study were resting cardiac rate, resting respiratory rate and resting systolic and diastolic blood pressure, body weight, percentage of body fat and total WBC, RBC and haemoglobin count. For this study cooper 12 minutes run/walk test was used. One-way analysis of variance (ANOVA) was used to find out the significant difference among different disciplines. The Scheffe’s post hoc test was used to find the significant difference in paired mean scores. It was concluded that there was significant difference between low and high aerobic group variables. The high aerobic group had better than the comparative of low aerobic group. The sportsmen must be given good physical conditioning training to enable them to improve the performance in their respective events.

Keywords: comparison, aerobic training WBC, RBC, Body weight

Introduction

Physical education aims for the all-round development of the children and to achieve this aims, this physical educators scientifically planned physical activities. In modern world promotion of physical education and sports in no longer a matter of dispute. Today physical education and sports are consider as international discipline because the build-up international understanding and universal brotherhood. Hence the promotion of physical education and sports is accepted as moral and social responsibility of each nation. Long ago Plato observed the body need to be vigorous in order to obey the soul: a good servant ought to be robust. The weaker the body the more it commands, the stronger it is the better to obey in order to think we must exercise our limbs, our sense and our intelligence that they body which furnishes them should be robust and sound.

Physical education is an indispensable part of health programmers. Its various activities should be planned as to develop the physical and mental health of the students, cultivate recreational interest and skill, and promote the spirit of team work, sportsmanship and respect of others. Physical education is therefore, much more than drill or a serious of regulated exercises. It includes all form of activities and games which promote the development of the body and the mind.

Physical education is the part of the general education on programme which is concerned with the growth, development and education of children through the medium of big muscle activities. It is education of the whole child by means of physical activities.

About Physical Education

Physical Education is the social process of change in behaviour of the human organism, originating primarily from the stimulus of social large muscle play and relative activity. Physical Education is an education through human movement where many of the education objectives are achieved by means of big muscle activities involving sports, games, gymnastic, dance and exercise. Optimum level of physical fitness is an ideal pre-requisite for the
individuals to participate in such kind of physical activity requires minimum or optimum Amount of physical fitness and the development of the required physical fitness INS an important aspect. But development of the physical fitness being the prime factor of consideration of the Physical Education and sports coacher around the world as it is essential for the participation of health fitness physical activity and highly skilled sporting activity. A person with optimum and sufficient level of physical fitness can participate in the physical activity and vice versa. Y participating in the physical activity one can improve the status of the physical fitness. Though optimum physical fitness is an unfathomable phenomenon it would be better to delimit the discussion to the meaning of physical fitness and the components of physical fitness.

As per eminent Physical Educationist throughout the world, the physical aspect of the development denotes the development of the individual physique and its various system to optimum so that the bodily status, of individual is optimally high, so as not to get affected by disease, injuries and also to carry on the physical rigors of the day to life without much stress. This is possible only when the individuals body is functionally well develop with regards to all the system of the body and all the system perform to the best of their required status, then the individual is said to have good physical development. So the physical and physiological efficiency leads to the health of the individuals, which in turn makes the individual is said to have very good physical development, makes the individual to participate more efficiency and more vigorously in physical activities so that the individual physical and physiological grown further. With regarding to mental development, a person should possess a highly developed neuromuscular coordination and latently the intellectual development, which can ensure the person to execute very graceful and coordinate physical movement.

The Aims of Physical Education are to enable the students

- Demonstrate a high level of interest and personal engagement showing initiative, enthusiasm and commitment.
- Show knowledge and understanding in variety of physical activities and evaluate their own and others performances
- Demonstrate the ability to critically reflect upon physical activity in both a local and intercultural context.
- Demonstrate the ability and enthusiasm to pass on to others in the community the knowledge, skills and techniques that have been learned.

Meaning of the Terms

Aerobic Exercise

Aerobic exercise (also known as cardio) is physical exercise of low to high intensity that depends primarily on the aerobic – generating process. Aerobic literally means “relating to, involving or requiring free oxygen, “and refers to the use of oxygen to adequately meet energy demands during exercise via aerobic metabolism generally, light— to-moderate intensity activities that are sufficiently supported by aerobic metabolism can be performed for extended periods of time. When practiced in this way examples of cardiovascular/aerobic exercise are medium to long distance running/jogging, swimming, cycling and walking according to the first extensive research on aerobic exercise conducted in the 1960s on over 5000 U/S air force personnel by Dr. Kenneth H cooper.

Definition

Metabolism is defined as the sum of chemical reaction taking place in a live organism to maintain life, aerobic means oxygen dependent and aerobic metabolism refers to an energy generating system under the presence of oxygen as opposed to anaerobic, i.e. oxygen independent metabolism aerobic metabolism uses oxygen as the final electron acceptor in the electron transport chain and combines with hydrogen to form water [1]. In essence the vast majority of adenosine triphosphate (ATP) synthesis takes place via aerobic breakdown of energy.

Body Composition

Body composition and somatotype were determined in junior Olympic competitors to evaluate the structural characteristics concomitant to high proficiency in various athletic activities. Underwater weighing and anthropometric determinations of somatic type were performed on 145 male and 133 female adolescent participants national meet competition in the sports of track and field, gymnastics, diving and wrestling. The most frequent differences within in either the male or female junior Olympic samples involved the performers in throwing events (shot-put, discus and javelin) that were taller, heavier, fatter and unique somatotype when compared to all or most other competitors. Additional structural differences, generally of a lesser magnitude also existed NAD supplies so that glycolysis can continue churning out its slow but steady stream of ATP. Because pyruvates are not needed in anaerobic respiration, fermentation uses them to help regenerate NAD. While employing the pyruvates in this way does allow glycolysis to continue it also results in the loss of the considerable energy contained in the pyruvate sugars.

The Krebs cycle

After glycolysis the pyruvate sugars are transported to the mitochondria. During this transport the three carbon pyruvate is converted into the two carbon molecule called acetate. The extra carbon form the pyruvate is released has carbon dioxide producing another NADH molecule that heads of to the electron transport chain to help create more ATP. The acetate attaches to a coenzyme A to form the compound because one of the molecules it starts with the four carbon oxaloacetate is regenerated by the end of the cycle to start the cycle over again.

The Krebs cycle begins when acetyl – CoA and oxaloacetate interact to form the six carbon compound citric acid. (The Krebs cycle is also sometimes called the citric acid cycle). This citric acid molecule then undergoes a series of eight chemical reactions that strip carbon to produce a new oxaloacetate molecule. The extra carbon atoms are expelled as.

- **Statement of the Problem**

In present society physical fitness has become most important element for all ages of people of both sexes. In order to gauge physical, physiological and haematological variables among university students. The primary purpose of the study is to compare the physical physiological and haematological variables between high and low aerobic capacities of men in college student those who are studying in Tumkur Bangalore and Mysore region.

Hypothesis

It is haphazardly acknowledged that people with better aerobic capacities have well-organized Cardio respiratory
fortitude and ideal body position with ideal body composition. Based on this the subsequent hypothesis is strained. It is hypothesised that there would be a significant difference in physiological haematological and physical variables of high aerobic and low aerobic capacities among Tumkur Bangalore and Mysore university region Men

Significance of the Study
- The study will help to know the improvement of the haemoglobin content on the subject after high aerobic training.
- The study will also help to prepare standard norms for selected physical physiological and haematological variables.

Delimitation
The study is delimited in the following factor
- Cooper’s 12 minute Run/walk test was used to assign the subjects into low and high aerobic capacities.
- The age of the students ranged between 18 and 22.

Limitation
The following uncontrollable factors associated with the study are accounted as limitations of the study.

Lack of previous studies in the research area. Literature review is an important part of any research, because it helps to identify the scope of works that have been done so far in research area. Literature review findings are used as the foundation for the researcher to be built upon to achieve my research objectives. There may be little, if any, prior research on my topic if I have focused on the most contemporary and evolving research problem or too narrow research problem.

Definition of the Term’s (Operational Definition)
Resting cardiac rate: The no of times heart contracts and relaxes in each minute of time while the body is at rest is called resting cardiac rate.

Resting respiratory rate: Respiration is the act or functioning of breathing by using the diaphragm and abdominal muscle. Respiration includes two movement inhale and exhale. Inhale is active movement whereas exhale is passive movement. The respiration goes on with alternate inhale and exhale movement.

Blood pressure: Blood pressure is the measure of force the heart needs to push blood through the body. Blood pressure is the resistance of the blood against the artery walls.

Review of Related Literature
The series of Research work done related to the present investigation has been presented in this chapter. The scanning of review of related literature may serve as an important thing to the researcher for better understanding of the problem and to interpret the result.

Research takes the advantage of the knowledge that has accumulated in the past as a result of consistent human endeavours. It can never be taken in isolation of the work that has already been done on the problem that are directly or indirectly related to the study proposed by the researcher. Determined the maximum Oxygen intake of normal Japanese adolescents of 12 to 18 years of age during maximum running (8.6% uphill treadmill) after 2 mts. Warming up (160 ml/min of boys and 140 ml/min for girls) the subjects ran to exhaustion on the treadmill with speed which was increased by increments of 5cms/min. The Oxygen intake was measured by collection of expired air during 6 min. Before all out, heart rate was examined by recording ECG.

1. The maximum intake of boys increased linearly with age that of girls however was constant from age 12 and 18 years.
2. The maximum oxygen intake per body weight of boys increased with age while that of girls decreased.
3. The correlation coefficient between the body weight and the maximum oxygen intake were 819 (boys) and 451 (girls) though there was not always statistical significant in correlation in each age.

Conducted a study on maximal oxygen intake was determined by tread mill running, body composition by the formula of keys and Brozek. Fat free body weight which correlated with maximal oxygen intake (significant at 05) was the best maximal metabolic reference standard of these measures. A more satisfactory estimate of the maximal oxygen intake resulted from the inclusion of the fat free body weight total body fat and total body weight instead of the fat free weight alone.

Methodology
In this chapter the procedure followed in the selection of subjects, selection of variables, collection of data, instrument reliability, testers competency, reliability of data, orientation of subject, pilot study, experimental design and the statistical techniques used for analysis of data have been described in the following lines.

Selection of Subjects
For the purpose of this study boys were selected on the basis of coopers 12 meters run/walk test. From the upper 30th percentile 250 students were randomly selected for high aerobic capacity group and from the lower 30th percentile 250 students were studying graduate course during the academic year. The subjects were free to withdraw their consent in any case of they felt any difficulty during testing period.

Selection of Variables
The investigator has gone through the available literature and had discussion with various experts and his research supervisor before selecting the variables. The available techniques for the purpose of analysis, feasibility, reliability of procedure and the outcome were extensively taken care of before finding the variables. After analyzing the various factors associated with the present study, the following variables are selected as criterion variables.

Criterion Variables
a. Physiological variables
1. Resting cardiac rate
2. Resting respiratory rate
3. Resting systolic blood pressure
4. Resting Diastolic blood pressure
b. Haematological variables
1. Haemoglobin estimation
2. RBC count
3. WBC count
c. Physical variables
1. Percentage of body fat
2. Lean body mass
3. Total body weight

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Selection of Tests
Even though many tests are variable, the investigator has selected the standardized tests which are ideal for the chosen subjects and most suitable for the purpose of the present study.

Pilot Study
The testing procedure was finalized after conducting a pilot study. To meet this purpose 10 boys were selected at random from the selected subjects. The researcher along with other experts has assessed high and low aerobic capacities by employing coopers 12 mts. Run/walk test. After classifying the boys with high and low aerobic capacities the selected criterion variables were measured with the help of the research scholars and pathology department.

Collection of Data
The data on physiological variables, hematological variables are physical variables were collected by administering the test respectively. Data was collected after completed of aerobic training the schedule of aerobic training was 6 week. Two days after the selection of high and low aerobic subjects for the coopers 12 mtr run/walk test.

Training schedule as follows

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Morning session</th>
</tr>
</thead>
<tbody>
<tr>
<td>First week</td>
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</tr>
<tr>
<td>Second week</td>
<td>Thursday–Monday</td>
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<tr>
<td>Third week</td>
<td>Thursday–Monday</td>
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<tr>
<td>Fourth week</td>
<td>Thursday–Monday</td>
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<td>Fifth week</td>
<td>Thursday–Monday</td>
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<tr>
<td>Sixth week</td>
<td>Thursday–Monday</td>
</tr>
<tr>
<td>Seventh week</td>
<td>Thursday–Monday</td>
</tr>
</tbody>
</table>

Table 1: Training schedule as follows
Each training period having 50 minutes (10 minute warming up, 30 minute aerobic training, 10 minute warm down)

I. Physiological Variables
1. Resting cardiac rate
Instrument: stop watch
Procedure: the pulse /heart rate of each of the subjects was recorded between 6 and 7 am consistently. Before recording the resting heart rate the subjects were asked to remain lying in the beds. To record the pulse rate per minute the pulse was palpated at the radial artery for one full minute for each subject. The rate was expressed in terms of heart beats per minute.

2. Haematological Variables
a. Haemoglobin assessment
Instruments and Chemicals: Apparatus: Hemocue* Hb201* system counting chamber
Pricking needle
Rectified spirit
Stop watch
Bunsen burner
N/10 HCl

Procedure: The principle of the test in that the blood converted into acid haematin by the addition of N/10 HCl. The pipette, tube of the haemoglobin meter and the stirrer were thoroughly cleaned and dried. In the haemoglobin meter tube N/10 HCl was taken up to the 20th division on the percentage scale. The tube was placed in the comparator in the span provided for it. The pricking needle was sterilized in rectified spirit and then heated over the flame of a Bunsen burner. The top of the left finger of the subject was cleaned by using rectified spirit. The finger was allowed to dry up and then punctured with sterilized pricking needle. Exactly twenty cubic mm of blood was drawn into pipette by suction. The blood in the pipette was blown out into the N/10 Hydrochloric Acid contained in the haemoglobin meter tube and thoroughly mixed by rinsing the pipette with the acid several times.

Analysis of data Result and Discussion
The statistical theory test of data, consequence of the exploration decision and conversation on finding are presented in the particular chapter the present study was to undertook to explore on physiological profiles of male student with different aerobic capacities. The statistical analysis of the data collected was carried out for high and low aerobic of two hundred students for each group consistency of high and low aerobic capacities.

<table>
<thead>
<tr>
<th>S. No</th>
<th>Groups</th>
<th>Mean</th>
<th>Mean difference</th>
<th>Standard deviation</th>
<th>t ratio</th>
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<td>Respiratory rate</td>
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<td></td>
<td>Low aerobic</td>
<td>67.072</td>
<td>2.204</td>
<td>6.979</td>
<td>3.977*</td>
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<tr>
<td></td>
<td>High aerobic</td>
<td>69.276</td>
<td>1.903</td>
<td>3.213</td>
<td>3.692*</td>
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<td>Systolic blood pressure</td>
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<td></td>
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<tr>
<td></td>
<td>Low aerobic</td>
<td>119.328</td>
<td>2.728</td>
<td>3.934</td>
<td>3.012*</td>
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<tr>
<td></td>
<td>High aerobic</td>
<td>119.328</td>
<td>3.96</td>
<td>6.072</td>
<td>4.121*</td>
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<tr>
<td></td>
<td>Diastolic blood pressure</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low aerobic</td>
<td>68.324</td>
<td>3.464</td>
<td>5.96</td>
<td>3.615*</td>
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<tr>
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<td>71.788</td>
<td>0.466</td>
<td>0.736</td>
<td>3.294*</td>
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<td></td>
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<td></td>
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<tr>
<td></td>
<td>Low aerobic</td>
<td>69.276</td>
<td>2.204</td>
<td>6.979</td>
<td>3.977*</td>
</tr>
<tr>
<td></td>
<td>High aerobic</td>
<td>67.072</td>
<td>1.903</td>
<td>3.213</td>
<td>3.692*</td>
</tr>
<tr>
<td></td>
<td>Haemoglobin count</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low aerobic</td>
<td>13.383</td>
<td>0.973</td>
<td>0.466</td>
<td>2.615*</td>
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<td></td>
<td>High aerobic</td>
<td>14.536</td>
<td>0.537</td>
<td>0.736</td>
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<td>RBC count</td>
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<td></td>
<td>Low aerobic</td>
<td>4.88</td>
<td>0.445</td>
<td>0.934</td>
<td>3.640*</td>
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<tr>
<td></td>
<td>High aerobic</td>
<td>5.325</td>
<td>0.213</td>
<td>1.365</td>
<td>3.030*</td>
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<td></td>
<td>WBC count</td>
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<td></td>
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<tr>
<td></td>
<td>Low aerobic</td>
<td>8.144</td>
<td>2.36</td>
<td>1.738</td>
<td>4.558</td>
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<tr>
<td></td>
<td>High aerobic</td>
<td>5.784</td>
<td>1.365</td>
<td>4.223</td>
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<td></td>
<td>Body fat</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Low aerobic</td>
<td>19.957</td>
<td>3.918</td>
<td>6.979</td>
<td>3.977*</td>
</tr>
<tr>
<td></td>
<td>High aerobic</td>
<td>16.039</td>
<td>4.223</td>
<td>3.692*</td>
<td></td>
</tr>
</tbody>
</table>

Significance at 0.01 level of confidence
The respiratory rate of Low aerobic group and high aerobic groups are 69.276 and 68.874 bpm respectively. The mean difference of low aerobic group and high aerobic groups are 0.392 the standard deviations of low and high aerobic groups are 2.324 And 1.903 respectively the obtained t ratio is 4.124 is greater than the table value of 2.576 for degree of freedom 2 and 498 required for significance at 0.01 levels.

The obtained t ratio 3.779 is greater than the table value of 2.576 for degree of freedom 2 and 498 required for significance at 0.01 levels.

The systolic blood pressure of mean of low aerobic and high aerobic groups is 16.348 and 16.068 respectively. The mean difference is 0.28. The standard deviation of low and high aerobic groups is 1.619 and 1.834 respectively. The obtained ‘t’ ratio 3.779 is greater than the table value of 2.576 for degree of freedom 2 and 498 required for significance at 0.01 level.

Cardiac rate of Means of low aerobic groups and high aerobic groups are 14.357 gm/100ml and 13.363gm/100ml respectively. The mean difference is 0.994.gm/1

The obtained t ratio is 4.095 is greater than the table value of 2.576 for degree of freedom 2 and 498 required for significance at 0.01 level.

Haemoglobin count of that means of high and low aerobic groups are 14.357 gm/100ml and 13.363gm/100ml respectively. The mean difference is 0.994.gm/100ml the standard deviation of high and low aerobic groups is 0.740 and 0.468 respectively. The obtained ‘t’ ratio 4.095 is greater than the table value of 2.576 for degree of freedom 2 and 498 required for significance at 0.01 levels.

Haemoglobin count of that means of high and low aerobic groups are 14.357 gm/100ml and 13.363gm/100ml respectively. The mean difference is 0.994.gm/100ml the standard deviation of high and low aerobic groups is 0.740 and 0.468 respectively. The obtained ‘t’ ratio 4.095 is greater than the table value of 2.576 for degree of freedom 2 and 498 required for significance at 0.01 levels.

**Conclusion**

Within the limitation indicated on the basis of result on the present study the following conclusion wore follow.

Table shows indication of results.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Components</th>
<th>High aerobic group</th>
<th>Low aerobic group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RCR</td>
<td>RCR&gt; HA</td>
<td>RCR&gt; LA</td>
</tr>
<tr>
<td>2</td>
<td>RRR</td>
<td>RRR&lt; HA</td>
<td>RRR&gt; LA</td>
</tr>
<tr>
<td>3</td>
<td>SBP</td>
<td>SBP&lt; HA</td>
<td>SBP&gt; LA</td>
</tr>
<tr>
<td>4</td>
<td>DBP</td>
<td>DBP&lt; HA</td>
<td>DBP&gt; LA</td>
</tr>
<tr>
<td>5</td>
<td>HC</td>
<td>HC&gt; HA</td>
<td>HC&lt; LA</td>
</tr>
<tr>
<td>6</td>
<td>RBC</td>
<td>RBC&lt; HA</td>
<td>RBC&lt; LA</td>
</tr>
<tr>
<td>7</td>
<td>WBC</td>
<td>WBC&lt; HA</td>
<td>WBC&lt; LA</td>
</tr>
<tr>
<td>8</td>
<td>TBW</td>
<td>TBW&lt; HA</td>
<td>TBW&lt; LA</td>
</tr>
<tr>
<td>9</td>
<td>LBM</td>
<td>LBM&lt; HA</td>
<td>LBM&lt; LA</td>
</tr>
<tr>
<td>10</td>
<td>BF</td>
<td>BF&lt; HA</td>
<td>BF&lt; LA</td>
</tr>
</tbody>
</table>

**Recommendations**

Based on the major findings of the present study the following recommendations were made.

- The research was conducted among the first grade college of male students a similar study may be conducted among female students.
- The result of the study, based in the result it is recommended that the high aerobic activity as an intensive physical activity in college and school level to enhance physical and haematological and physiological variables.
- Further the study it is recommended that the high intensive high aerobic programme should be implemented exclusively for girls should enhance haemoglobin content since girls have low haemoglobin content level.
- It is recommended to include the different age groups such as less than 19 years of the students. in further study as the literature survey indicate that the transfer of learning effects best possible life style.
- The haemoglobin content of resting heart rate can be used as tool for the detecting of high aerobic group.

**References**