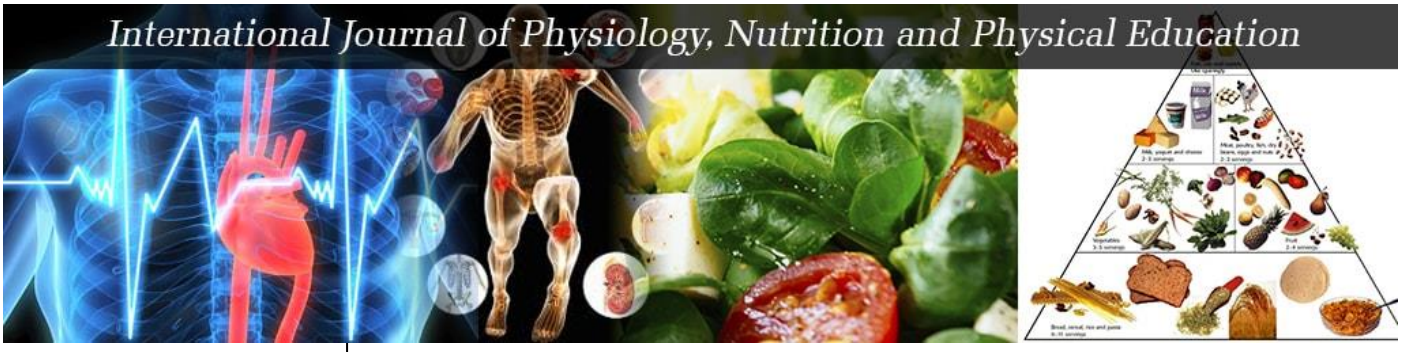

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Effect of varied aerobic training on hematological variables of college women

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Abstract
The aim of the study was to compare the hematological variables namely HDL-C, LDL-C, VLDL-C, TC, HDL-C/TC ratio and TG of college women. For the purpose of the study 90 college women students were selected as the subject. The age group of the subjects was ranged from 18-21 years. They were selected randomly. The subjects were further sub-divided into three groups namely Experimental Group-1, Experimental group-2 and the Control Group-3. Each group consists of 30 subjects. Hematological variables were measured through the blood sample of the subjects, which were determined by enzymatic method by using the stangen cholesterol kit and hybenga and pileggi's method was used in the laboratory. For the comparison, analysis of covariance was used and the significant level was set at 0.05 level of confidence. The study revealed significant increase in HDL-C and HDL-C/TC ratio. The result shows significant decrease in Total cholesterol and Triglycerides levels and there were no significant change for the LDL-C and VLDL-C in the experimental groups as a result of six months progressive aerobic training programme.

Keywords: Hematology, high density lipoprotein cholesterol, low density lipoprotein cholesterol, very low density lipoprotein cholesterol, total cholesterol, high density lipoprotein cholesterol ratio

Introduction
Simply put, the word aerobics means "with oxygen" while this definition may sound quite vague, once you have a better understanding of what aerobics actually is, it will make more sense. Aerobic training can be considered any physical activity that has the ability to elevate your heart rate to its target heart rate and maintain that level for a minimum of 20 consecutive minutes. Achieving an "aerobic effect" can be defined as participating in a physical activity that elevates your heart rate to your target heart rate and maintains that level for a minimum of 20 consecutive minutes.

Hematology the word extracted from the Greek Haima, "blood" and is the study of blood, the blood forming organs, and blood disease. Hematology also have the study of physicians specialized in hematology are known as hematologists or hematologist. There are routine work which mainly includes the care and treatment of patients with hematological disease, although some may also work at the hematology laboratory viewing blood films and bone marrow slides under the microscope, interpreting various hematological test and blood clothing test results. In some institutions, hematologists also manage the hematology laboratory.

Objective of the Study
The objective of the study was to find out the effects of aerobic training on hematological variables of college women.

Methodology
In this section the procedure for selection of subjects, selection of variables criterion measures, experimental design, procedure for administration of tests, administration of training programme and the statistical technique employed for analysis of data have been describe.

Selection of the Subjects
For the purpose of the study ninety college women free from deformities and ailments were selected randomly from Sagar Mahavidyalaya, Sagar, South 24 Parganas, West Bengal.

The requirements of the project were explained to the entire subject and all of them agreed voluntarily to undergo the testing and training programmes.

Selection of the Variables

The research scholar had gone through both critical as well as allied literature related to the problem. Keeping in the mind, the availability of equipment's acceptability to the subjects and the legitimate time that would be devoted for test in relation to the treatment (experimental variables) requirements and to keep the entire study unitary and integrated, the following hematological variables were selected.

Hematological Variables

1) High density lipoprotein-cholesterol.
2) Low density lipoprotein-cholesterol.
3) Very low density lipoprotein-cholesterol.
4) Total cholesterol.
5) High density lipoprotein cholesterol ratio.
6) Triglycerides.

Criterion Measures

Serum lipids and lipoprotein variables were measured through the blood sample of the subjects, which were determined by enzymatic method by using the stangen cholesterol kit and hybenga and pileggi's method.

Statistical Procedure

To compare the significance of mean difference among the experimental and control group on the selected variables, the analysis of covariance was applied. The label of significance was set at.05.

Result of the Study

Table 1: Ancova Table for the Data on HDL-C for Experimental Group-1, Experimental Group-2 and Control Group- 3 during Training

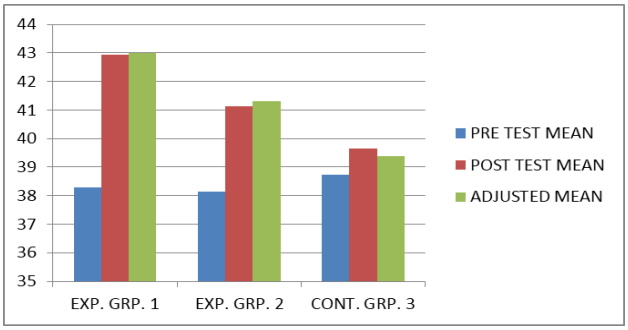
Source	Sum of squares	DF	Mean square	F	Sig
Pre	335.49	1	335.49	137.48	.000
Training	195.06	2	97.53	39.97	.000
Error	209.86	86	2.44		
Corrected total	708.97	89			

Shows the f-value [F(2,86)=39.97] for comparing the adjusted means of the criterion variable in three aerobic training groups experimental grup-1, experimental group-2 and control group-3. F statistics computed for aerobic training was significant because p-value associated with it was .000 which is less than .05. thus the null hypothesis of no difference among the adjusted means for the data on criterion variable in three training groups may be rejected at 5% level.

Since F-statistics is significant, post-hoc comparison has been made for the adjusted means of the three training groups, which is shown in table-

Table 2: HDL-C

Group	Pre test mean	Post test mean	Adjusted mean
EXP. GRP. 1	38.30	42.94	43.01
EXP. GRP. 2	38.14	41.14	41.32
CONT. GRP. 3	38.73	39.64	39.39



HDL-C

Fig 1: Pre, Post and Adjusted Mean of the Exp. GRP. 1, Exp. GRP. 2 and Cont. GRP. 3

i) There was no significant difference between the adjusted means of criterion variable in experimental group-1 and Experimental group-2.
ii) There was no significant difference between the adjusted means of criterion variable in experimental group-2 and control grup-3.
iii) There was no significant difference between the adjusted mean of criterion variable in experimental group-1 and control group-3.

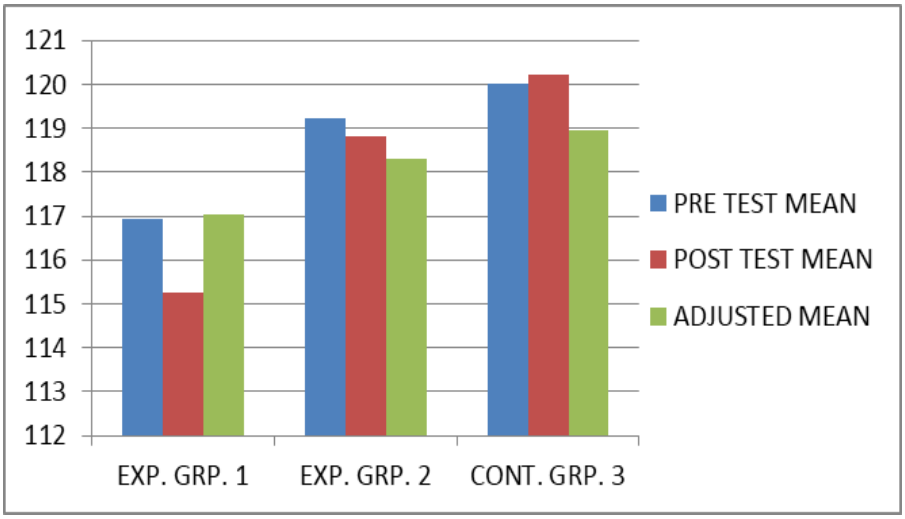
Table 3: Ancova Table for the Data on LDL-C for Experimental Group-1, Experimental Group-2 and Control Group-3 during Training.

Source	Sum of squares	DF	Mean square	F	Sig
Pre	9021.083	1	9021.083	3239.198	.000
Training	57.082	2	28.541	10.248	.000
Error	239.508	86	2.785		
Corrected total	9654.388	89			

Shows the f-value [F(2,86)=10.248] for comparing the adjusted means of the criterion variable in three aerobic training groups experimental grup-1, experimental group-2 and control group-3. F statistics computed for aerobic training was significant because p-value associated with it was .000 which is less than .05. thus the null hypothesis of no difference among the adjusted means for the data on criterion variable in three training groups may be rejected at 5% level.
Since F-statistics is significant, post-hoc comparison has been made for the adjusted means of the three training groups, which is shown in table-

Table 4: LDL-C

Group	Pre Test Mean	Post Test Mean	Adjusted Mean
EXP. GRP. 1	116.92	115.25	117.02
EXP. GRP. 2	119.23	118.80	118.30
CONT. GRP. 3	120.02	120.23	118.96



LDL-C

Fig 2: Pre, Post and Adjusted Mean of the Exp. GRP. 1, Exp. GRP. 2 and Cont. GRP. 3

i) There was no significant difference between the adjusted means of criterion variable in experimental group-1 and Experimental group-2.
ii) There was no significant difference between the adjusted means of criterion variable in experimental group-2 and control grup-3.
iii) There was no significant difference between the adjusted mean of criterion variable in experimental group-1 and control group-3.

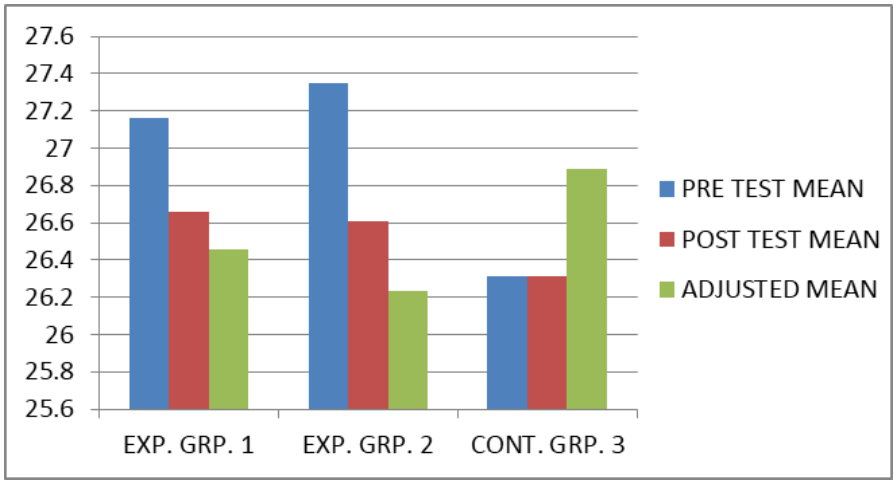
Table 5: Ancova Table for the Data on VLDL-C for Experimental Group-1, Experimental Group-2 and Control Group-3 during Training.

Source	Sum of squares	DF	Mean square	F	Sig
Pre	1537.692	1	1537.692	950.263	0
Training	6.795	2	3.398	2.100	.129
Error	139.163	86	1.618		
Corrected total	1678.999	89			

Shows the f-value [F(2,86)=2.100] for comparing the adjusted means of the criterion variable in three aerobic training groups experimental grup-1, experimental group-2 and control group-3. F statistics computed for aerobic training was significant because p-value associated with it was .129 which is less than .05. thus the null hypothesis of no difference among the adjusted means for the data on criterion variable in three training groups may be rejected at 5% level.
Since F-statistics is significant, post-hoc comparison has been made for the adjusted means of the three training groups, which is shown in table-

Table 6: VLDL-C

Group	Pre Test Mean	Post Test Mean	Adjusted Mean
EXP. GRP. 1	27.16	26.66	26.46
EXP. GRP. 2	27.35	26.61	26.23
CONT. GRP. 3	26.31	26.31	26.89



VLDL-C

Fig. 3: Pre, Post and Adjusted Mean of the Exp. GRP. 1, Exp. GRP. 2 and Cont. GRP. 3

i) There was no significant difference between the adjusted means of criterion variable in experimental group-1 and Experimental group-2.
ii) There was no significant difference between the adjusted means of criterion variable in experimental group-2 and control grup-3.
iii) There was no significant difference between the adjusted mean of criterion variable in experimental group-1 and control group-3.

Table 7: Ancova Table for the Data on Total Cholesterol for Experimental Group-1, Experimental Group-2 and Control Group-3 during Training

Source	Sum Of Squares	DF	Mean Square	F	Sig
Pre	14477.682	1	14477.682	4866.837	.000
Training	626.008	2	313.004	105.220	.000
Error	255.830	86	2.975		
Corrected Total	14834.869	89			

Shows the f-value [F(2,86)=105.220] for comparing the adjusted means of the criterion variable in three aerobic training groups experimental grup-1, experimental group-2 and control group-3. F statistics computed for aerobic training was significant because p-value associated with it was .000 which is less than .05. thus the null hypothesis of no difference among the adjusted means for the data on criterion variable in three training groups may be rejected at 5% level. Since F-statistics is significant, post-hoc comparison has been made for the adjusted means of the three training groups, which is shown in table-

Table 8: Total Cholesterol

Group	Pre Test Mean	Post Test Mean	Adjusted Mean
EXP. GRP. 1	173.36	167.52	166.28
EXP. GRP. 2	174.15	170.1	168.07
CONT. GRP. 3	168.53	169.32	172.64

Total Cholesterol

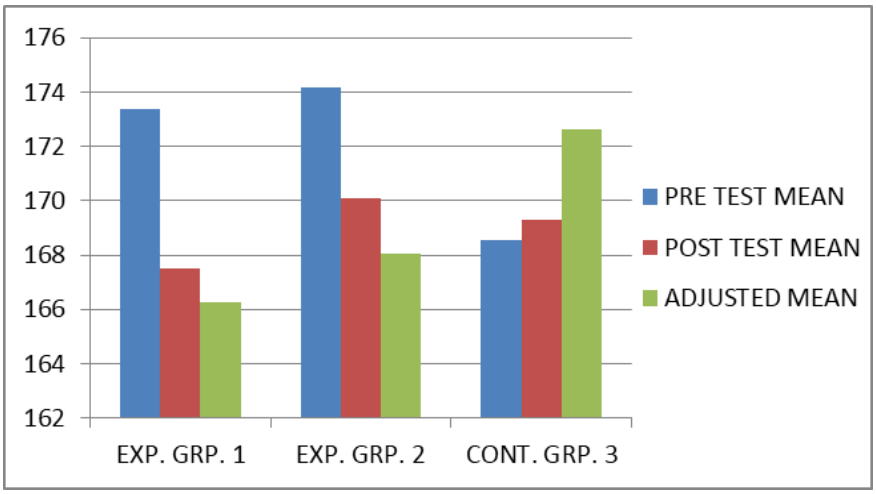


Fig. 4: Pre, Post and Adjusted Mean of the Exp. GRP. 1, Exp. GRP. 2 and Cont. GRP. 3

i) There was no significant difference between the adjusted means of criterion variable in experimental group-1 and Experimental group-2.
ii) There was a significant difference between the adjusted means of criterion variable in experimental group-2 and control grup-3.
iii) There was no significant difference between the adjusted mean of criterion variable in experimental group-1 and control group-3.

Table 9: Ancova Table for the Data on HDL-C Ratio for Experimental Group-1, Experimental Group-2 and Control Group-3 during Training

Source	Sum of Squares	DF	Mean Square	F	Sig
Pre	0.025	1	0.025	278.776	0
Training	0.005	2	0.002	26.2	0
Error	0.008	86	8.87		
Corrected total	0.039	89			

Shows the f-value [F(2,86)=26.2] for comparing the adjusted means of the criterion variable in three aerobic training groups experimental grup-1, experimental group-2 and control group-3. F statistics computed for aerobic training was significant because p-value associated with it was .000 which is less than .05 .thus the null hypothesis of no difference among the adjusted means for the data on criterion variable in three training groups may be rejected at 5% level.
Since F-statistics is significant, post-hoc comparison has been made for the adjusted means of the three training groups, which is shown in table-

Table 10: HDL-C RATIO

Group	Pre Test Mean	Post Test Mean	Adjusted Mean
EXP. GRP. 1	0.233	0.254	0.251
EXP. GRP. 2	0.221	0.237	0.243
CONT. GRP. 3	0.233	0.236	0.233

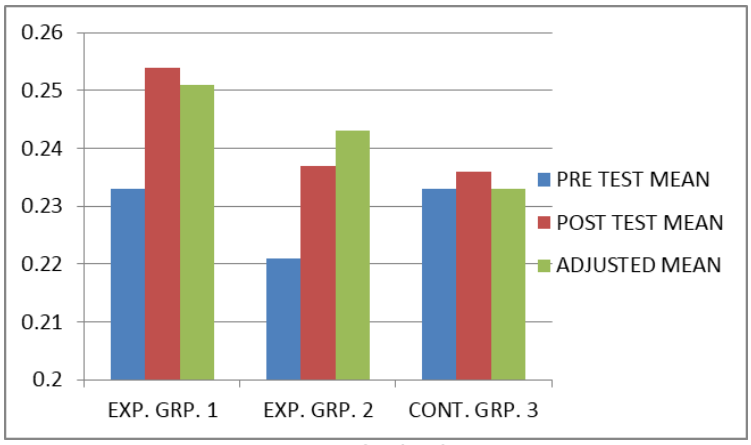


Fig 5: Pre, Post and Adjusted Mean of the Exp. Grp. 1, Exp. Grp. 2 and Cont. Grp. 3

i) There was no significant difference between the adjusted means of criterion variable in experimental group-1 and Experimental group-2.
ii) There was no significant difference between the adjusted means of criterion variable in experimental group-2 and control grup-3.
iii) There was no significant difference between the adjusted mean of criterion variable in experimental group-1 and control group-3.

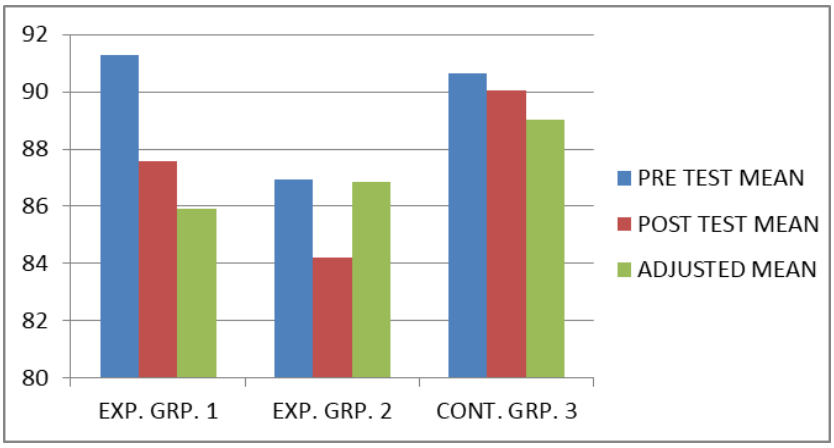
Table 11: ANCOVA Table for the Data on Triglyceride for Experimental Group-1, Experimental Group-2 and Control Group-3 During Training.

Source	Sum Of Squares	DF	Mean Square	F	Sig
Pre	46347.311	1	46347.311	13039.457	0
Training	153.85	2	76.925	21.642	0
Error	305.678	86	3.554		
Corrected total	47170.34	89			

Shows the f-value [F(2,86)=21.642] for comparing the adjusted means of the criterion variable in three aerobic training groups experimental grup-1, experimental group-2 and control group-3. F statistics computed for aerobic training was significant because p-value associated with it was .000 which is less than .05 .thus the null hypothesis of no difference among the adjusted means for the data on criterion variable in three training groups may be rejected at 5% level.
Since F-statistics is significant, post-hoc comparison has been made for the adjusted means of the three training groups, which is shown in table.

Table 12: Triglyceride

Group	Pre Test Mean	Post Test Mean	Adjusted Mean
EXP. GRP. 1	91.28	87.56	85.91
EXP. GRP. 2	86.95	84.19	86.85
CONT. GRP. 3	90.63	90.04	89.03



Triglyceride

Fig 6: Pre, Post and Adjusted Mean of the Exp. GRP. 1, Exp. GRP. 2 and Cont. GRP. 3

i) There was no significant difference between the adjusted means of criterion variable in experimental group-1 and Experimental group-2.
ii) There was significant difference between the adjusted means of criterion variable in experimental group-2 and control grup-3.
iii) There was significant difference between the adjusted mean of criterion variable in experimental group-1 and control group-3.

Discussion

The study revealed significant variations in the Hematological variables (Blood Lipid Profiles) as a result of the six months of progressive aerobic training among the college women students.

The high density lipoprotein fraction of cholesterol revealed significant changes in the experimental group as a result of six months of progressive aerobic training.

The low density lipoprotein cholesterol has shown no significant change in the experimental groups as well as a result of the training programme.

Very low density lipoprotein cholesterol has shown no significant change in the experimental groups as well as a result of the training programme.

The total cholesterol levels of the subjects of the experimental groups were significantly reduced as a result of the aerobic training programme.

The HDL-C/TC ratio was significantly increased in the experimental groups as a result of the training programme.

The results of the study have indicated significant decrease in triglycerides levels of the subjects as a result of the aerobic training programme.

Conclusions

On the basis of the findings of the study, the following conclusion may be drawn

1. The six months of aerobic training employed in the present study indicated favorable effects in increasing the HDL-C levels and in decreasing triglycerides and total cholesterol levels.
2. The above findings with respect to increase in HDL-C levels were further observed by an increase in the HDL-C Ratio.
3. The LDL-C and VLDL-C levels of the subject did not change significantly as the result of the aerobic training.

The finding with respect to lipoprotein variables having shown increase in HDL-C and decrease in triglycerides and Total cholesterol indicates the benefits of regular aerobic training in preventing arteriosclerosis and coronary heart disease. It has already been established that increase in HDL-C levels reduces the risk associated and is thought to be protective against coronary heart disease.

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