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Comparison of Acute Effect of an Intensive Short Term Exercise Session on Some Blood Coagulation Parameters and Fibrinolysis between Active and Non-active Male Students

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ABSTRACT

This study was conducted with the aim of assessing the acute effect of an intensive short term exercise session on some blood coagulation parameters and fibrinolysis between active and non-active male students. Method of this research was quasi-experimental. Statistical sample included 15 students in active group and 15 students in non-active group age ranged 18 – 24 years who were randomly selected. The subjects were healthy without any disease. Training program involved one session of short term intensive exercise in which the subjects should pedal on ergo meter for 90 seconds with frequency of 90 pedals per minute. This research contained two stages of blood sampling, one before short term intensive exercise session and the other after exercise session. Blood sampling from active and non-active groups was done separately by physician in the physiology lab of university and at the end one way ANOVA and post hoc test LSD were used for determining within group and between group differences of active and non-active students respectively. The effect of one short term intensive exercise session on platelets number and blood fibrinogen concentration in active and non-active male students wasn't significant ($P \geq 0.05$) and this effect on prothrombin time and partial thromboplastin was significant ($P \leq 0.05$).

Keywords: Short term intensive exercise, Blood coagulation factors, Fibrinolysis

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INTRODUCTION

Coagulation system mechanism and fibrinolysis can be provoked by heavy exercise. But its temporary relationship and clinical influences should be clarified. Physicians and athletes should be aware of homeostatic changes caused by intensive exercise. It is necessary to do more studies regarding this to specify the possible role of these changes in sudden death [18]. For example one disorder in homeostatic balance which is associated with increased fibrin deposit and increment of thrombin production, may be considered as an important risk factor [14]. Blood has numerous functions in body among which coagulation and fibrinolysis is of great importance. Blood coagulation is a complicated mechanism and influenced by many factors. Platelets play an important role in this mechanism and it has been proved that physical activity is one of the influencing factors on platelet function [3]. 6 to 17 percent of all sudden deaths have been related to sport i.e. it has occurred during exercise or a little after exercise. Sometimes the

victims were professional athletes who have been exercising for a long time. In other words, physical activity acts as a double- edge knife that can both cause untimely stimulation of blood coagulation system and also play a debilitative role against such instigations [2]. Homeostasis is an active and delicate balance between coagulation and fibrinolysis. Coagulation results from interaction among blood vessel walls, platelets and clotting factors. After endothelium damage, platelets stick to interior endothelium and form a septum for platelets which becomes permanent with fibrin deposit. Fibrinolytic system acts as a fluid state protector via breaking fibrin by plasmin. Plasmin is produced from plasminogen and by action of plasminogen activator [13].

Some studies regarding acute effect of exercise on homeostatic have shown changes in blood coagulation [17] blood fibrinalysis [19] and amount of platelets and their function [1, 6]. However it has been stated in another study that short term exercise brings about a hyperactive coagulation state and increased fibrinolytic activity. The later (increased fibrinolytic activity) may also influence the hyperactive coagulation state and it is supposed that this phenomenon has a part in acute coronary thrombosis in disposed individuals. Three comprehensive epidemiologic studies reported that physical activity may initiate an acute cardiac infarction in subjects with high cardiovascular risk [19]. Some studies have found that short term intensive exercise leads only to a little change in blood coagulation activity in healthy young individuals and fibrinolysis increases significantly in such cases [18]. In order to clarify various mechanisms of these changes it is necessary to do more assessment about blood clotting changes and fibrinolysis after different kinds of exercise especially quick changes in blood homeostatic due to short term intensive exercise. The effect of exercise on thrombin formation and fibrin analysis has been examined separately and simultaneously but the results seem contradictory and less consistent [8, 5, 16, 18]. Although it seems that short term exhaustive and intensive exercise might be of negative consequences for individuals, so far many studies have not been undertaken in this respect [18].Additionally the contradictory findings of researches undertaken by researchers mainly in terms of research methodology, duration, intensity of exercises, the significance of circulatory system and coagulation factors to be studied has set the researcher to study the reasons for various changes in coagulation factors in conducted studies and find suitable answer for following questions: What influence can an intensive exercise session have on blood coagulation factors (platelets, fibrinogen concentration. thrombin time and prothrombin time). And is the effect of maximal exercise session on coagulation system and fibrinolysis different in active and non-active people or not?

MATERIALS AND METHODS

This study was an applicable quasi-scientific research with pretest and post test in two groups i.e. active and non-active individuals in which after sample selection, their blood samples before and after exercise were gathered. The statistical population involved the students in Islamic Azad University age ranged 18-24 years old. Using a questionnaire 30 athletes as active group and 50 non-athletes as non-active group were recognized eligible persons to take part in exercise program. These individuals were homogeneous in terms of age and past record of physical activity. They had no disease, smoking and drug taking experience. Then 15 subjects were randomly assigned to active group and 15 to non- active group.

Method of research conducting

Training program involved one session of short term intensive exercise in which the subjects should pedal on ergo meter for 90 seconds with frequency of 90 pedals per minute. This research included two blood samplings one before exercise test and the other after exercise test. The subjects were recommended to avoid physical activities before performance of exercise test. Then blood sampling was done. The blood was taken from brachial vein in a sitting and comfortable position. Because of sensitivity of the under experiment factors, the first blood samples were taken to the lab immediately. The second blood sampling was done right after performance of exercise test. Blood samples of each stage were put in experiment pipe separately and the opening of pipes was closed by paraffin and then they were transferred to the lab.

Data Analysis

After entering gathered data in SPSS and setting some labels for variables, the date were analyzed. Descriptive statistics was applied for measurement of central tendency, dispersion and diagram drawing. Inferential statistics was used for measuring data normal distribution and data congruity. One-way ANOVA and post hoc test were applied for determining within group differences and between group differences in active and non-active subjects respectively.

RESULTS

Before testing of hypotheses by use of Kolmogorov - Smirnov normal distribution of data was assessed. *Table 1* shows that age, weight, height and BMI of athlete and non-athlete students are normal. So parametric statistics can be used for comparing mean difference in two groups and making sure about group homogeneity.

Table 1- K-S test measures age, weight, height and BMI of active student (15) and non actives students.

Variable	*Group*	*Z**	*P- Value*
Age(yrs)	Active	0.771	0.592
	Non active	0.723	0.673
Weight(kgs)	Active	0.703	0.707
	Non active	0.390	0.998
Standing length(cms)	Active	0.526	0.945
	Non active	0.537	0.935
BMI	Active	0.560	0.913
	Non active	0.842	0.478

The results of independents T- Test show that two groups of students i.e. active and non-active groups are homogeneous in terms of age weight, height and BMI (P>0.05)*Table2*.

Table2- Mean comparison result between active students (N.15) and non-active students.

Variable	*Group*	*Mean*	*T*	*P- Value*
Age(yr)	Active	22.4	-1.267	0.216
	Non active	21.33		
Weight(kg)	Active	71.40	1.01	0.321
	Non active	73.66		
Standing length(cm)	Active	178.8	0.382	0.705
	Non active	178.13		
BMI	Active	22.36	1.28	0.209

The effect of one short term intensive exercise session on platelets number and blood fibrinogen concentration in active and non-active male students isn't significant (P ≥0.05).

The effect of one short term intensive exercise session on prothrombin time and partial thromboplastin time of blood in active and non-active male students is significant(p<0.05).

DISCUSSION

Table 3 & Figure 1 indicate that there is difference between blood fibrinogen concentration of active and non-active male students before and after exercise, but statistically this difference is not significant and both groups of students have responded to intensive short term exercise differently. Therefore it can be said that increase in blood fibrinogen concentration of active group after intensive short term exercise is independent from intensive short term exercise and being active or non-active is a reason for relative increase of blood fibrinogen concentration.

Increment of mean of arterial pressure during heavy endurance training, leads to filtration of blood liquid to inter tissue organs. On the other hand increase of lactate, pro coagulation and anti coagulation ingredients and increment of vessels' peripheral resistance bring about increase of blood viscosity and consequently temporary increase of fibrinogen. The result of this research agrees with that of Mandalaki J [11] and Peery [15].

Table3-Result of variance analysis Blood fibrinogen concentration in active and non-active male students

Variable	Variance	Square mean	df	F-Value	P- Value
Blood fibrinogen concentration (mg/dL)	Within group	2693.400	1	5.628	0.025
	Between group	1008.600	1	2.127	0.158
	Fault	478.607	28	-	-

Figure 1- Mean of Blood fibrinogen concentration in active and non-active male students

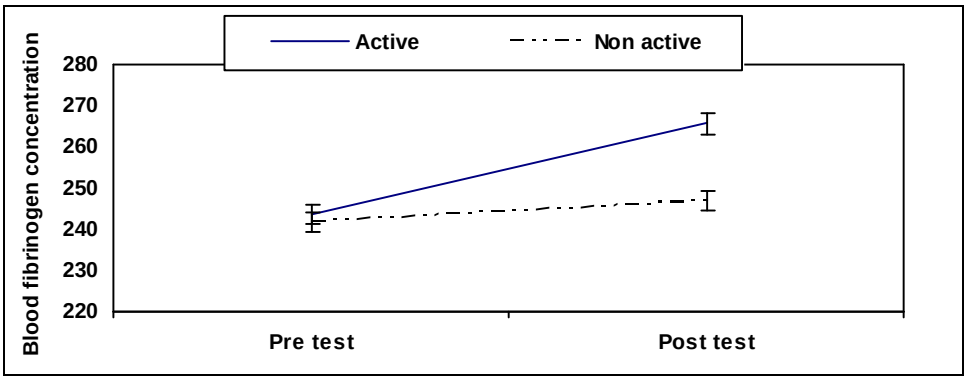


Table 4 & Figure 2 indicate that within group changes and between group changes are not significant. In other words one session of intensive short term exercise has no significant influence on platelet number of blood in active and non-active male students. Since between group changes are not significant and both groups of students have responded to intensive short term exercise similarly, it can be said that trifling increase in platelet numbers after intensive short term exercise is independent from exercise variable and being active or non-active has no impact on platelet number of blood serum in response to intensive exercise. This result is in accord with finding of Gonzales [7] and Dufaux [5].

Table4 - Result of variance analysis of platelets number in active and non-active male

Variable	Variance	Square mean	df	Value-F	P- Value
Platelets number	Within group	0.0000000018	1	0.793	0.381
	Between group	0.000000013	1	0.067	0.798
	Fault	0.0000000023	28	-	-

Figure 2- Mean of platelets number in active and non-active male students

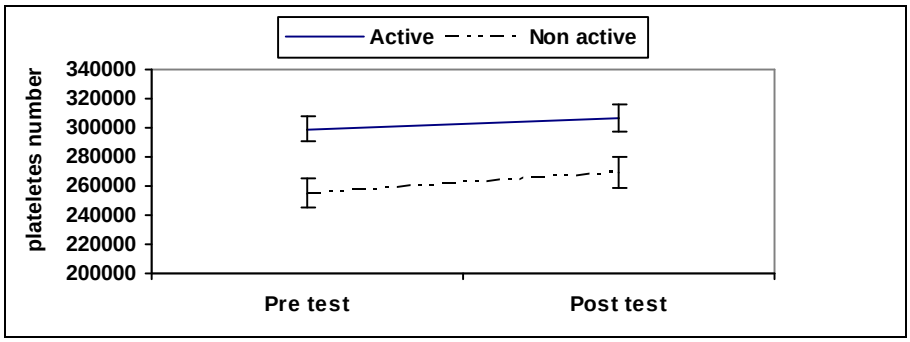


Table 5 & Figure 3 indicate that within group changes and between group changes are significant. In other words one session of intensive short term exercise has significant influence on prothrombin time in active and non-active male students. So it can be said that significant increase in prothrombin time after intensive short term exercise is dependent on exercise variable and being active or non-activity has impact on prothrombin time in response to intensive short term exercise. This result is in accord with finding of Jahangard [9], Lekakis [10], Paniccia [12] and Cerneca [4].

Table5- Result of variance analysis of prothrombin time in active and non-active male students

Variable	Variance	Square mean	df	Value-F	P- Value
Prothrombin time(sec))	Within group	2.204	1	16.531	0.000
	Between group	0.937	1	7.031	0.013
	Fault	0.133	28	-	-

Figure 3- Mean of prothrombin time in active and non-active male students

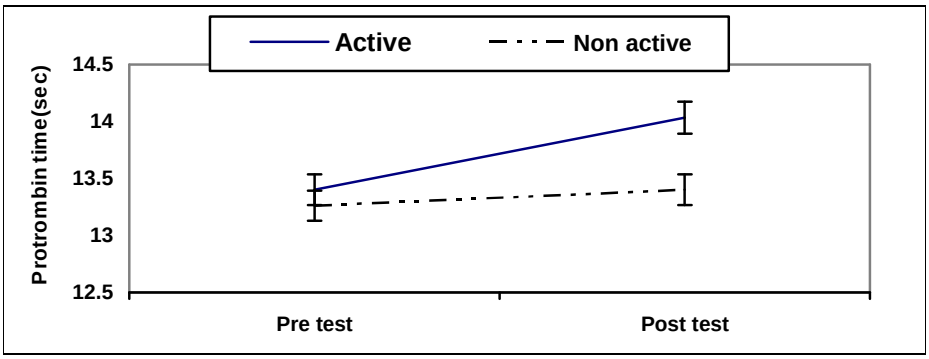
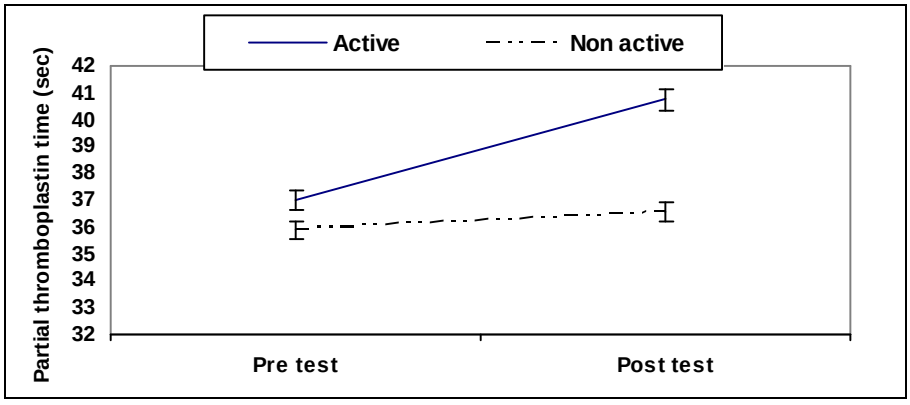


Table 6 & Figure 4 indicate that between group changes are significant. In this research partial thromboplastin time after one session of intensive short term exercise has increased in active and non-active male students. Since between group changes are significant and active and non active groups have responded to intensive short term exercise differntly, considering that changes of partial thromboplastin time in active students is more than that of non active students, it can be said that significant increase in partial thromboplastin time after intensive short term exercise is dependent on exercise variable and being active or non-active affects partial thromboplastin time in response to intensive short term exercise. This result is in accord with finding of Jahangard [9] and Cerneca [4].

Table 6 - Result of variance analysis partial thromboplastin in active and non-active male students

Variable	Variance	Square mean	df	Value-F	P- Value
Partial thromboplastin (sec)	Within group	426.133	1	13.470	0.001
	Between group	240.400	1	7.599	0.010
	Fault	31.637	28	-	-

Figure 4- Mean of partial thromboplastin in active and non-active male students



CONCLUSION

Physical activity can affect coagulation mechanism and bring about changes in coagulation system which depends on type and intensity of exercise. So physical educators are recommended to use findings of researches concerning this subject to administer training program so that prevent cardiovascular risks.

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