The Effects Of Long Term Physical Activity On The Changes In The Rates Of In Apo Proteins A And B In Nonathlete

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Abstract: The Present study aims to evaluate the effects of a one-year-long volleyball practice on the changes in the rates of Apo proteins A and B in the blood serum of non-athlete men. In order to do so, 30 subjects were selected randomly from among non-athlete male students and then were divided into two control and experimental groups. The experimental group on average aged 23±2. Their average height was 172.2 ± 3 cm and the average weight was 69.6 ± 3.1kg. On the other hand, the control group aged on average 22 ± 2 and their average height and weight were 170.3 ± 3.8 cm and 69.3 ± 2.7 kg. The experimental group went through a one-year-long volleyball exercise program in which they had to practice for 90 minutes three times in a week. The control group did not have any special practice .The covariance analysis was used to probe the rates of Apo A and B and analyze the data. The rates of Apo proteins, measured before the test in both groups, were taken as the covariate to correct the groups' mean, increase the test's precision and lessen the error risk. The test results revealed that in the experimental group a one-year-long sport exercises has meaningfully changed the level of Apo A in the blood (P= 0.01). There was not a significant difference in the rates of Apo A in the posttest measurements in both groups (P= 0.01). The amount of Apo B was also meaningfully different in pre and posttest in the experimental groups but the changes in the rates of Apo B in both control and experimental groups did not differ meaningfully.[Karim Salehzadeh, Yousef aghdam, Morteza Jourkesh. **The Effects Of Long Term Physical Activity On The Changes In The Rates Of In Apo Proteins A And B In Nonathlete.** Journal of American Science 2011; 7(6):654-662].(ISSN: 1545-1003). http://www.americanscience.org.

Keywords: Long-Term Physical Activity; Apo Protein A; Apo Protein B; Non-Athlete.

1. Introduction

The proteins in the body of lipoproteins are called Apo lipoproteins or Apo proteins (Espinosa-Larranaga, F, et al., 2005). Lipoproteins are composed of so-called lipid proteins which are constructed by free cholesterols, Strifiet cholesterols, triglycerides, phospholipids and quartet lipids (Ernst J. Schaefer, 2002). Although Apo proteins take the minimal amount of 1% of Shilomicrones, they make nearly 60% of the high density HDLs. One or more types of Apo lipoproteins exist in each lipoprotein (L. Holme, et al., 2007). The major Apo protein in the HDL is called A and the major one in the LDL is called B (Martin, R et al., 2002). One of the important prognostic factors in cardiac diseases is the Apo proteins A and B ratio. This ratio must not fall below 0.5 (Mercedes R. 2009). Apo protein A for example acts as the cofactor for the lisitin-cholesterol asile transferaze enzyme (Mestek, M. L. 2009 and Parish S, et al., 2009). It also takes the role of the lipid carrier proteins like Apo protein D in carrying HDL and finally acts as ligands connecting lipoproteins to receiving molecules on the cells in different tissues such as Apo protein B100 and E for LDL receivers and Apo protein A1 for HDL cellular receivers (Durheim, M. T, et al., 2008).

Nowadays cardiovascular diseases are killing many people for they have inactive lifestyles and bad nutritional habits (Haram, P. et al., 2009). Different studies have revealed that the decrease in Apo protein A and increase in Apo protein B rate is the main cause of cardiovascular diseases (Parish, S et al., 2009). Thus, the rate of Apo protein A is an anti risk factor and its comparison to Apo protein B is a risk factor. This risk is larger in non athletes but about Apo protein B it is the opposite (Kodama, S et al., 2007 and Durheim, M. T et al., 2008).Nicklas, B. et al., (2009); Arthur S. (2009); Amy E. (2009) and other scholars' findings show that Apo protein B in the men and women's blood serum decreased meaningfully after a period of stamina practices.

Miller et al. (2006) and Espinosa et al. (2005) studied the amounts of HDL lipoprotein and Apo proteins A and B after long aerobic exercises. They found that in elder women, the HDL and Apo protein B decreased significantly in the subjects' blood however the Apo protein A did not have a big change. Parish et al. (2009), Green J. et al., (2005) and Kodama (2007) investigated athletes and non-athletes and revealed that in spite of other studies' findings, the rate of HDL and Apo protein A in athletes' body was larger than non athletes. Tokmakidis (2003) studied the effect of aerobic and stamina exercises on the rate of Apo protein A and HDL and concluded that their rate increases in both groups (William E. et al., 2003). In

another study by Slentz on active and inactive students, it was found that the amount of Apo protein B decreases significantly in active students after undergoing a long-term practicing (Slentz C. A. et al., 2007). On the other hand, Amy E. et al., (2008) and William et al. (2003) found that the variables do not show a big difference in both men and women after a long-term aerobic exercise. These different and sometimes paradoxical results can be found in many studies. Results achived by Green J. et al. (2005) and Haram P. et al. (2009) are good examples of this paradox. Fahlman (2002) found a significance fall in the amount of Apo protein B of the subjects after a long stamina exercise (Fahlman Boardly J. and Gerontol Aboil 2002). However Fontana et al. (2007) studied risk factors of cardiovascular diseases in an aerobic exercising period and found no meaningful difference between rates of Apo proteins A and B. Approving this, Von (2004) did not find a meaningful difference in the Apo protein A and B's changes (Von Stengel, Simon 2004). In spite of huge amounts of studies conducted in the field and the paradoxical conclusions they have drawn and the critical view toward exercise programs, the need for further investigation is felt even more greatly for there are still unclear points waiting to be clarified. Hence, the present study aims to find the answer to this question that if a popular long-term physical activity in a sport like volleyball affects the changes in the Apo proteins A and B's rates in blood serum of non-athlete men.

2.Material and Methods

Subjects

This study was a semi-experimental one conducted with one control and one experimental group. The subjects were 30 non-athletic men aged between 21 and 25 chosen through physical activities questionnaire to add to their homogeneity. They were divided into two groups of control and experimental.

Exercising protocol

The exercise in the present study included a one-year-long volleyball exercising done three times in a week. The sessions were each 90 minutes. Sessions' exercises had a definite pattern of length and difficulty (table 1). These exercises began with 8 minutes of stretches, and went on with 12 minutes of aerobic running with a 70% vo_2max severity, 7 minutes of muscles' warm up, 18 minutes of volleyball skills' practices, 40 minutes of a game and finally 5 minutes of recovery activities. It should be noted that all these activities were done between 4 and 6 p.m. on odd days in an indoor stadium.

Blood Sampling

48 hours before sampling, some proper advice including having no breakfast, no medicine, and no physical activities was given to the subjects. 24 hours before the beginning of the exercising period and 24 hours after the final session, 10_{cc} venous blood was taken by sterile exam tubes having EDTA [1] anticoagulant. They had not eaten anything for 17 hours. The temperature in both pretest and posttest location was 23 to 25 degrees centigrade and after sampling was done, specialists took the samples to the Pasteur laboratory.

Measuring Tools

Statistical Analysis

Descriptive statistics was used to analyze the data and reach the mean and standard deviation but in order to compare the Apo proteins A and B for the difference in the pretest amount and to compare Apo proteins A and B in the posttest in control and experimental groups, the covariant analysis was applied. The rates of Apo proteins measured in both pretest and posttest were considered as the covariates to decrease the error, improve the mean of groups and increase the precision. The statistical model used was as follows:

$Yij = B1 + B1Xij + Ti + Eij$ i = 1,…, a , j= 1,…,n

Yij = observing j in group i Xij = pretest Apo protein variable μx (covariate)

B0 = width from the source Ti = fixed effect of i (pretest) (posttest)

B1 = functionality coefficient (regression coefficient)

Eij= random risk

Total average equals $\mu = B_0 + B_1\mu_x$ and the groups average is $\mu = B_0 + B_1\mu_x + T_i$ where μ_x is the mean of covariate X.

In order to evaluate the difference in Apo protein rates in both pretest and posttest, pendent sample method was used. Since the pretest and posttest samples were not dependant from each other, i.e. the subjects were those who were tested before and after the test, the changes in Apo protein rates in both control and experimental groups were tested through a multi regression model. The grouped variable was considered as a binomial variable with 0 and 1 for control and experimental groups. The multi regression model used is as follows:

$Y_i = B_0 + B_1X_{1i} + B_2X_{2i} + B_3X_{1i}X_{2i} + E_i$

Considering Apo proteins A and B, mg/dl, B_0, B_1, B_2 and B_3 regression parameters and Apo proteins in pretest X_{1i} and the X_{2i} number assigned to groups beside 1 for experimental group and 0 for the control one and the mutual effect of Apo proteins on pretest X_{2i} and X_{1i} and the random error E_i and the evaluated

[1] Ethylene Diamine Teta Acetic Acid

regressions for the experimental group which is for the control group.
$E(y_i) = (B_0 + B_2)+(B_1 + B_3)X_{1i}$ and is $E(y_i)=B_0+B_1X_{1i}$

Table 1. Volleyball exercises program of a session, three times a week for one year.
Cholesterol, triglyceride, and LDL-HDL-VLDL were measured by an auto analyzer set (Co BAS miRAS) using photometric method. This set was made by Roche in Switzerland. The measurement was done by diagnostic laboratory gates of Pasteur Laboratory. Spectrophotometeric method with Randox was used to identify Apo proteins A and B by an auto analyzer set (RA1000) made in England.

exercise	stretches and flexibility	aerobic running	muscles warm-up	skills' practices	game of volleyball	recovery	the whole session
length of session (minutes)	8	12	7	18	40	5	90
severity of exercise (HR max)		70%					

3. Results
The descriptive data for the subjects are presented in table 2. on the other hand other tables show the relationship between Apo proteins A and B in the subjects of both experimental and control groups.

Table 2. least square means of Apo protein A in control and experimental groups accompanied by standard error and P value.

Group	Apo protein A Lsmeans(mg/dl)	Standard Error	P-Value
Control	119.783	1.1185	<0.0001
Experimental	127.951	1.1185	

Table 3. least square means of Apo protein B in control and experimental groups accompanied by standard error and P value.

Group	Apo protein B Lsmeans(mg/dl)	Standard Error	P-Value
Control	108.438	1.0256	0.0006
Experimental	102.362	1.0256	

The difference between two groups in the amount of Apo protein B based on P=0.0006 is meaningful.

Table 4. Means, standard error, t value and P-value of differences of pre and post trial values of Apo proteins in experimental group.

Variable	Mean(mg/dl)	Standard Error	T Value	P-Value
(Apo protein A 1- Apo protein A0)	6.06666	1.9284	3.15	0.0071
(Apo protein B 1- Apo protein B0)	-4.80000	1.1514	-4.17	0.0009

Table 5. Means, standard error, t value and P-value of differences of pre and post trial values of Apo proteins in control group.

Variable	Mean(mg/dl)	Standard Error	T Value	P-Value
(Apo protein A 1- Apo protein A0)	-2.06666	0.98786	-2.09	0.0551
(Apo protein B 1- Apo protein B0)	-2.60000	0.70912	3.67	0.0025

Apo proteins A and B amounts in pretest and posttest of experimental group.

Table 6. comparison of $\frac{B}{A}$ ratio in both control and experimental groups.

Subjects	test phases	Apo B/A ratio	Changes in Apo B/A ratio	meaningful difference
experimental group	pretest	95%		
experimental group	posttest	86%	9.3% decrease	
control group	pretest	79%	3.4%increase	12.7%is not meaningful
control group	posttest	83%		

Apo protein A

The P value for B_1 , B_2 and B_3 were meaningful ($P<0.05$) and the regression slope was not similar in two groups. The estimated regression for Apo protein A in control group was:

Apo A = 16.153 + 0.850413(Apo A_0)

The estimated regression for the experimental group is as follows:

Apo A = 52.7027 + 0.61753(Apo A_0)

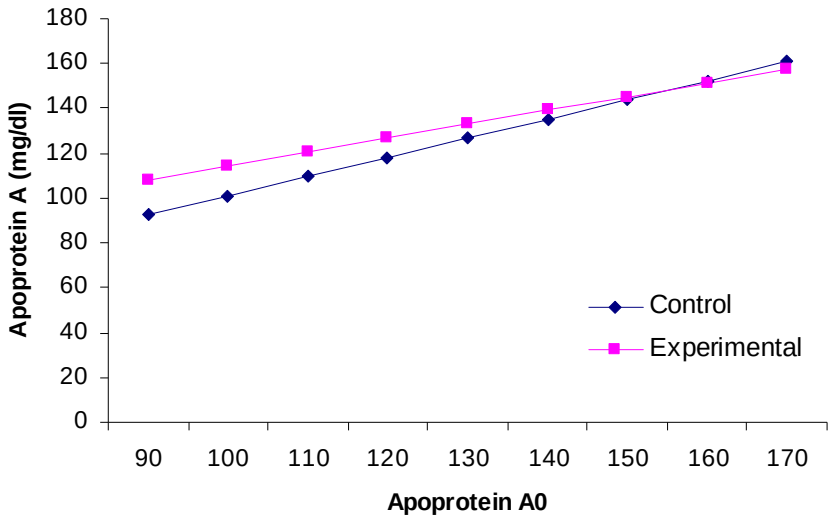

Figure 1. The changes in Apo protein A in both experimental groups dependent on initial Apo protein measurements in two pretests.

Apo protein B

The P value for B_1 and B_2 were meaningful in $P<0.05$, but for the B_3 that was not meaningful. The regression slope for different groups were different and the estimated regression on Apo protein B in the control group is as follows:

Apo B = 11.20778 + 0.9112599(Apo B_0)

The estimated regression in the experimental group is as follows:

Apo B =2.9028 + 0.983645 (Apo B_0)

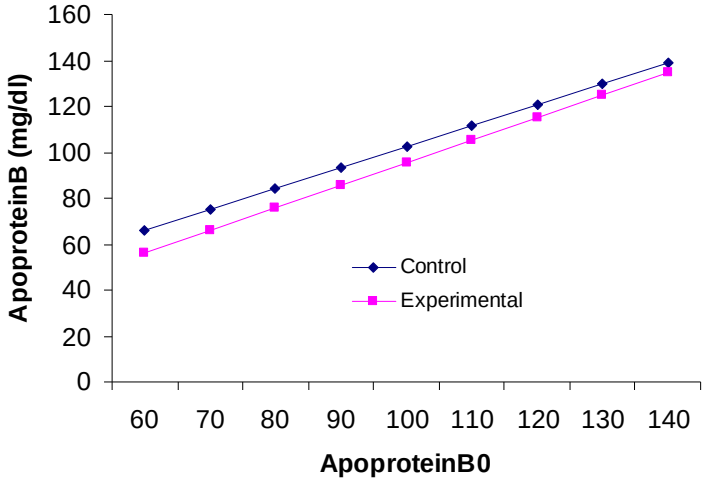

Figure 2. Apo protein B changes in both control and experimental groups dependent on initial Apo protein measurements in the pretest

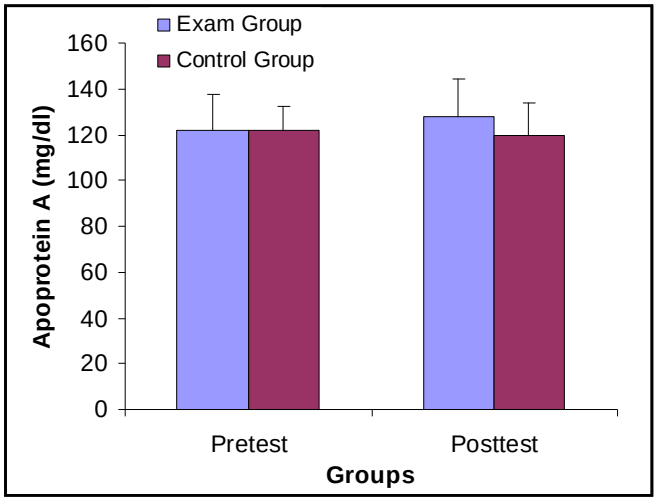

Figure 3. Comparison of Apo protein A changes in both control and experimental groups

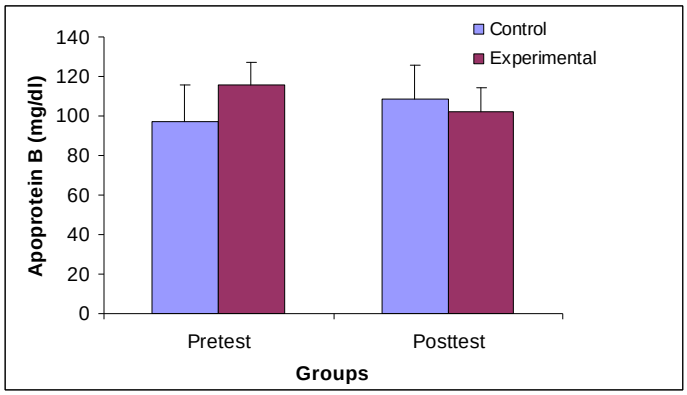

Figure 4. Comparison of Apoprotein B changes in both control and experimental groups

4.Discussion

Different studies in modern countries have revelaed that Apoproteins A and B ratio is an important factor in estimating the risk of cardiovoscular diseases (Miller G. et al., 2006; Konstantinos et al., 2009). Several methods have been used to change this ratio and the most important one is physical activities. However different studies have reached different conclusions. Each of these studies have focused on a specific sport. Green et al., (2005) studied 24 weeks of cycling with 50 and 80 percent of Vo_{2max} on the ratio of Apoproteins $\frac{B}{A}$ and reached similar results (Green J. et al., 2005).

Despite the results of the above-mentioned study and other similar ones demonstrate that regular physical activities increase the HDL and decrease LDL and VLDL. the increase in HDL hinders cholestrol sedimentation in blood vessels (O'Donovan, G and et al., 2005; Jacobs et al.,2006; Durheim et al., 2008; Haram et al.,2009; Jenkins et al ., 2009; Konstantinos et al. 2009; Michael L et al., 2009). As the HDL raises, Apoprotein A being a major part of it raises as well (Press et al., 2003; Sharma, A et al ., 2003; O'Donovan, G et al., 2005; Michael L. Mestek ., 2009; Parish S et al ., 2009) LDL triglysirides catabolize as the lipoprotein lipaze enzymes begin activity through Apoprotein A on the blood vessels. Accordingly, as the Apoproteins increase by physical activities, catabolism of LDL and VLDL tryglysirides grows (Tall, A, 2002; Sharma, A et al ., 2003; Von Stengel, Simon 2004; Stefan Branth et al., 2006; Parish S et al . 2009). Most of the studies conducted approve the positive role of physical activities and show that they affect the increase in Apoprotein A and decrease in Apoprotein B meaningfully. In spite of these findings, some other studies have rejected them (Green J. et al. 2005; Espinosa-Larranaga F. et al. 2005; Miller G. et al. 2006; Fontana L. et al. 2007; Kodama S. and et al. 2007; Parish S. et al. 2009). In order to clarify a bit more on the topic and considering the fact that many people have turned from individual sports to ball games to block the risk of cardiovoscular diseases, the present study have studied the effects of a long-term volleyball exercise on the changes in the Apoprotein A and B rates in non-athlete men. the results reveal that these activities do not change the Apoprotein A's amount in non-athlete subjects (P=0.01). The difference in the control and experimental groups' Apoprotein A is not meaningful (P=0.01). on the other hand, comparison of Apoprotein B in both control and experimental group in pretest and posttest shows a meaningful difference (P=0.01). This meaningful difference in the pretest and posttest of control group have been caused by the one-year-long volleyball exercises in which many factors including nutrition, physical activities and heredity are also important. As it can be seen, this exercise may change the Apoprotein rate slightly in the subjects in experimental group in pretest and posttest. Although this slight increase in the amounts measured in the pretest and posttest is equal (+6.06666), in the control group this rate shows a litlle fall (+2.60000). This difference in the mean of the subjects in both control and experimental groups have made the T=3.15 and P=0.0071 so it can be infered that the change in the Apoprotein A rate has been sufficient in the experimental group and it can be defined and thus it is meaningful. the findings of the present stuy are in complete concordance with the findings of Green (2005); Haram et al. (2009); Jacobs et al. (2006); O'donovan et al. (2005); Parish et al. (2009); Arthur S. Leon (2009); Micheal et al. (2009); Von Stengel (2004); Slentz et al. (2007); Nicholas et al. (2009); Metsios et al. (2008) and disagrees with findings of Espinosa et al. (2005); Fahlman (2002); Haram et al. (2009); Kodama (2007); Fontana et al. (2007); Amy E. et al. (2008) and William et al. (2003). The present findings show that although the rate of Apoprotein has changed in the experimental group significantly, analyzing the results on Apoprotein B present no meaningful differences in both control and experimental groups in the pretest and posttest (P=0.01). In this group Apoprotein B has decreased significantly (-4.8000) and this decrease may have huge effects on the cardiovoscular diseases' risk factors and reduce them (Fahlman, 2002; William, E et al., 2003; Von Stengel, Simon., 2004; O'Donovan, G. et al., 2005; Stefan Branth et al., 2006; Miller, G. et al., 2006; Fontana, L et al.,2007; L.Holme,A., 2007; Yourka D Tchoukalova et al., 2008). Thus it can be said that these activities had a meaningful effect on the Apoprotein B rate in the subjects under study. Overall it is proved that the Apoprotein B to A ratio is a prognostic factor in cardiac muscles' defects (Green j et al., 2005; Miller. G et al., 2006; Parish S et al ., 2009; Jenkins et al 2009). In the subjects of the control group this ratio $\{\frac{\text{pretest}}{\text{posttest}} = \frac{0/79}{0/83}\}$ had a 0.43 raise and in the subjects of the experimental group $\{\frac{\text{pretest}}{\text{posttest}} = \frac{\%95}{\%86}\}$ had a 9.3% fall. The difference in the B/A ratio was 12.7%, which was a huge difference, compared to the standard difference, and may be the cause of a big risk. It can be concluded that activities like the ones tested here cannot be supposed as the hindering factors against cardiovascular diseases risk factors (Miller. G et al., 2006; Kodama, S et al., 2007; Amy E. Griel et al., 2008; Parish S et al ., 2009). However, a huge fall can be seen for Apo protein B (Table 6), and findings of this research are in concordance with Michael et al.,

(2009); Parish et al., (2009); Arthur S. Leon, (2009); Metsios et al., (2008); Jacobs et al., (2006); Haram P. et al., (2009); and do not concord with the findings of Von, (2004); Green (2005); Parish S. et al., (2009); Miller et al., (2006). It should be noted that beside long-term physical activities, other factors like nutrition, sessions' number in a week, length and severity of exercises, caloric cost, smoking and medicines which were not controlled are of high importance in decreasing the amount of Apo protein B (Lee, I-M et al., 2003; Eisenmann JC., 2004; Fontana, L et al., 2007; Annie Motardand et al., 2008; Mercedes R. Carnethon, 2009). It is highly important for the caloric cost of individuals, amount of fat in the body, heredity, personal exercising methods are among the factors affecting amount of Apo proteins A, and B in both pretest and posttest levels and influence the research results (Sharma A. et al. 2003; Tokmakidis SP, Volaklis KA, 2003; Metsios, G.et al.,2008; Parish S et al.,2009; Mestek, M.L. 2009; Michael L. Mestek,2009). Overall conclusion can be drawn from this study that even if a one-year-long physical activity in the form of a three-session volleyball exercise increases Apo protein A rate meaningfully, higher increase may have a huge role in safety from cardiovascular diseases. Besides, these exercises may decrease the amount of Apo protein B meaningfully and bring the Apo protein B to Apo protein A ratio to the standard one. Accordingly, in both cases it can be said that biochemical, physiological, and physical shape is in a way that can be effective on cardiovascular condition and reduce the risk of diseases (Lee, I-M et al., 2003; William, E et al., 2003; Miller G et al., 2006; Slentz, C et al., 2007; Yourka D Tchoukalova et al., 2008; Parish S et al ., 2009; Michael L. Mestek, 2009). Changing lifestyles from an idle and static one to a more dynamic and active one may increase the energy usage (Martin R. et al., 2002; Jenkins et al. 2009; Parish S. et al., 2009; Mercedes R. Carnethon, 2009) and help have a healthier heart. Finally, it should be noted that there are many factors affecting the amount of Apo protein A and B as cardiovascular risk factors, and more studies are needed to clarify more on these factors and identify mechanisms of changes in Apo proteins A and B.

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