The Effect of 6 Weeks Plyometric Exercises on Some Cardiovascular Risk Factors in 30-40-Year Athlete Men

Mohammad Khazaei, Akbar Yegane Hashemi, Ahmad Hematfar, Bijan Goodarzi
Department of Physical Education and Sports Science, Islamic Azad University, Boroojerd Branch, Boroojerd, Iran.

ABSTRACT
The onset of cardiovascular diseases outbreak is different in various countries such that in the early 1920s in U.S and in the 1930s in U.K and currently in developing countries, many people suffer from this disease (Refae, 2003). According to the available statistics, cardiovascular diseases have been recognized as the most important death factor in most of communities such that they are regarded as the first cause of death in people above 35 years (Nobahar, 2004). In the United States, one death occurs in every second due to ischemic heart diseases, imposing heavy economic and mental costs on communities (Casper et al., 2005). The amount of death due to cardiovascular disease is decreasing in developing countries since organized and long-term programs have been designed in these countries to improve proper lifestyles (Gunes et al., 1999). Although cardiovascular diseases is considered as a disease specific to old patients, about 50% of cardiovascular diagnoses and 15% of death due to this problem occur in patients below 65 years and most of people in young ages have at least two heart disease risk factors. In young people, this factor has mostly no sign and accordingly, no action is taken to control it. However, most of these factors are changeable and a significant ratio of heart diseases can be prevented through controlling cardiovascular risk factors (Amiri et al., 2003). The most common cause of coronary blood flow reduction is atherosclerosis. In specific people how have genetic sensitivity to atherosclerosis or in people who use excessive cholesterol and have inactive lifestyle, large amounts of cholesterol gradually deposit in different points of arteries under endothelium throughout the body. These deposit regions are gradually attacked by fiber tissue and calcified, resulting in the appearance of atherosclerosis plaques blocking blood flow completely or partially (Guyton, 2007).

INTRODUCTION

The research findings indicate desirable changes of lipid and lipoproteins and finally, the decrease of heart diseases risk due to physical activity and the increase of physical fitness. According to the obtained results, the prevalence of cardiovascular diseases in people who perform exercise is less than inactive people. American medical academy announced that even those people with less physical activity, compared to inactive people, are at the risk of heart diseases and other health problems. Another studies revealed the importance of physical activity and its relation with health risk factors. Shoumas performed a study on 2772 people that half of them were middle age males with the age range of 45 years. The subjects were classified into three groups of high, average and low physical activity. The obtained results showed that the amount of cholesterol, low density lipoprotein (LDL) and serum three glycerin of active subjects are less but their serum HDL is more. Durstine et al. showed that exercise with the intensities of 50% and 70% of the maximum consumed oxygen create identical responses in cholesterol. Gaesser indicated that exercise with the intensity of 60% of the maximum heart rate has no effect on cholesterol concentration. Williams et al. also reported that physical activity with the intensity of more than 70% of the maximum heart rate significantly influences cholesterol concentration. They referred to the higher impressionability of LDL-C from aerobic exercises. Investigating the effect of physical exercises on the profile of cardiovascular risk factors such as blood lipids in 630 men and women without heart problem, Taylor et al. revealed that physical activity, especially exercise with high intensity is resulted in the decrease of cardiovascular risk factors. Donovan et al. investigated cardio-respiratory changes of coronary heart diseases such as blood lipids 24 weeks after the exercise with the average intensity of 60% VO2max and exercise group

Corresponding Author: Akbar Yegane Hashemi, Department of Physical Education and Sports Science, Islamic Azad University, Boroojerd Branch, Boroojerd, Iran.
with high intensity of 80% VO\textsubscript{2}max but with equal energy cost in 42 men. As they concluded, there was no change in the amount of TC and LDL.

Examining the results obtained by 30 studies, Durstine et al. observed that aerobic activities totally caused a 5% decrease in LDL, a 4% decrease in three glycerin and a 5% increase of HDL. Although there are many studies have been conducted on the effect of selective exercises on cardiovascular risk factors, the intensity and optimum duration of physical activity necessary for decreasing cardiovascular risk factors have not yet been specified in details.

Most of studies performed on plyometric exercises have focused on the effect of these exercises on various physical factors. For example, Sadeghi et al. investigated the effect of plyometric exercises in water and land on aerobic power of life saviors; and Ramezan Pour et al. examined the effect of plyometric exercises on aerobic power of woman badminton players in Foulad Mobarak Club. However, no study has been performed regarding the effect of these exercises on cardiovascular risk factors. Also, many studies have investigated the effect of various exercises on cardiovascular risk factors but most of the exercises applied in these studies were aerobic and anaerobic and there is no literature referring to the effect of plyometric exercises on the mentioned factors.

Since physical activities involve a wide spectrum, the main research question is that whether these activities are followed by cardiovascular risks.

**The Research Objectives:**
The general objective of the study is to investigate the effect of 6 week plyometric exercises on some cardiovascular risk factors in 30-40 year trained men in Boroujerd City- Iran.

**The Research Hypothesis:**
1. 6 weeks plyometric exercises do not significantly influence total cholesterol (TC) in 30-40 year trained men.

Nowadays, secondary prevention is new base and foundation of cardiac rehabilitation. Secondary prevention indicates stopping the progress of available diseases and contributing the development of primary prevention or stopping the progress of covert diseases through decreasing multiple risk factors. As observed in various individuals, 100% prevalence of death is more in those who have had only one risk factor; therefore, secondary prevention is more effective relative to primary prevention to decrease death. Thus, cardiac rehabilitation is regarded as an important secondary prevention. As secondary prevention factor, appropriate physical activities may be acceptable tools in rehabilitation process to control and improve cardiovascular diseases including cardiovascular diseases, coronary artery, hypertension, congenital heart, and peripheral vascular) and other diseases such as obesity, chronic obstructive pulmonary, diabetes mellitus, and skeleton muscle and finally for renal diseases, stress, depression, anxiety, etc.

Hence, a new prestige has found among health and unhealthy parts of society as a need of appropriate lines following exercise. Sport is now regarded as a means to consume energy of the body. In this sense, sport is not necessarily running or heavy activities such that exercise can refer to walking around yard or even running, swimming, etc. Of course, advising sport is not the only kind of activity but, its intensity, repetition and duration should also be determined for each testee. It should be noted that performing physical activities can be both supporting for patient and may cause their sudden death or heart problems. Therefore, it is necessary to firstly establish physical activities security. In case of performing appropriate and continuous activities, physical exercises can foster cardiovascular system; so, exercises with appropriate intensities should be recommended to each patient.

**Heart Structure and Performance:**

Heart is the motor of blood circulation system; heart pumps blood into various tissues of body and supplies their health. Body members can continue to live until they feed from the blood flow pumped from heart. Therefore, it can be stated that heart is not everything but no organ can continue to live and has no value without heart. Heart is a muscular member and myocardium forms the major part of its muscular wall. The function of myocardium is ventricular pumping and its cells receive blood containing oxygen through coronary artery.

Myocardium metabolism is anaerobic and oxygen should continuously reached them since heart muscles cannot use anaerobic metabolism. So, coronary artery system is efficient when it provides adequate blood flow for myocardium. In case of lack of coronary artery’s blood flow adequacy to heart, a serious and threatening health problem is appeared which can cause dramatic events and consequences for patients, families and community. Accordingly, healthy heart is one of the most important health indices.

Heart has been consisted of three main muscles including atrial muscle, ventricular muscle and muscle fibers. Contraction method of atrial muscle and ventricular muscle is similar to skeleton muscle while muscle fibers are only weakly contracted; in return, due to rhythmic properties and their conduction rate form a stimulating system and a transmission system to promptly conduct neural impulses throughout heart. Heart has
been consisted of four separate pumps, 2 pumps are called atriums (stuffing) and 2 pumps are called ventricular powers).

During filling atriums with blood, the volume, namely end diastolic volume, is naturally increased to 120-130 ml. Due to exercise, this value reached to 150-180 ml in the natural heart and stroke volume reached to a double amount of the natural state. A part of end diastolic volume which is pumped out of heart is called rejection fraction which typically is about 60% of end diastolic volume. During systolic contraction, atrium is rejected and its volume is decreased up to 70% ml (due to stroke volume) and the residual volume in each atrium is about 50-60 ml which is called end systolic volume. When heart is strongly contracted, end systolic volume can be decreased up to 10-30 ml.

The control of blood flow amount in coronary system is almost completely regulated through the response of vessels to the local nutritive needs of cardiac muscle and the blood flow amount is relatively increased depending the need of cardiac muscle to oxygen since the amount of oxygen consumption is the major determinant factor of coronary blood flow. In general, the amount of oxygen consumption of heart is closely related with the work performed by cardiac muscle. That is, more work of heart leads to more oxygen consumption and accordingly, more need of coronary blood flow. Therefore, when cardiac muscle needs excessive oxygen, the amount of coronary blood flow should be also increased. Now, if the coronary blood flow cannot appropriately increased, acute heart failure is caused, leading to relative ischemia and it caused strong pain called chest pain.

**Blood Lipids:**

**Cholesterol:**

Cholesterol is of the most important blood lipids; 75% of which are in the form of non-free cholesterol and its derivatives and 25% of which are in the form of free cholesterol. Cholesterol has various functions in body; it is of structural components of plasma membranes in all living beings and one of the necessary compounds to cellular survival and growth in animals; cholesterol precursor of bile acids and steroid hormones; it is of lipoproteins components and placed in their structure. The increase of cholesterol concentration in blood serum leads to the creation of plaque in internal arterial walls, causing atherosclerosis or arterial stiffness.

The increase of cholesterol causes the increase of coronary artery disease risk particularly among middle age people. The probability of creating coronary artery disease is less in a diet full of saturated fat and cholesterol. The decrease of cholesterol in blood plasma can effectively prevent the incidence of myocardial infarction, cerebral infarction and sudden death due to cardiovascular diseases. In case of the increase of cholesterol more than 120 mg/dl, the risk of myocardial infarction and angina pectoris is increased up to 4 times more than in people with natural cholesterol level. A 15% decrease of blood cholesterol can lead to a 35% decrease of the probability of cardiovascular diseases.

**Blood Lipoproteins:**

For the first time, lipoproteins were discovered by Macheboef. Lipoproteins are macro-molecules consisted of hydrophilic or hydrophobic lipids and apolipoproteins. These specific proteins allow lipids transportation in blood and lymph. The lower amount of lipids and the higher amounts of proteins in a lipoprotein leads to its lower size and higher specific weight which is so called HDL. But, the higher amount of lipid and lower amount of protein in a lipoprotein leads to its higher size and lower specific weight which is so called LDL-VLDL.

Lipoproteins are a set of several molecules which are in charge of carrying hydrophilic lipids such as cholesterol and plasma three glycerin. As one of the main factors of coronary heart diseases (CHD), it can be referred to the anomalies in the amount and metabolism of lipids and plasma lipoproteins and in most of patients with CHD, the increase of lipoproteins level is due to inactive lifestyle, overweight, and full fat diet. According to various and authentic evidences, blood lipids level and accordingly, the risk of CHD can be decreased by changing lifestyle and pharmacotherapy. HDL, LDL and VLDL have different roles in care of the incidence of cardiovascular diseases (CHD) since these lipoproteins are different in terms of risk creation level. It is believed that LDL and VLDL cause cholesterol dispose in artery wall while HDL causes clearing artery wall, prevents cholesterol dispose on artery wall and transmits it to liver for to being metabolized. Since lipoproteins play different roles, it is necessary to identify the amount of each of these lipoproteins to determine their risk amount. The ratio of cholesterol to HDL is the best index for cardiovascular diseases. The ratio amount of 3 or less causes the decrease of risk amount and higher ratio amounts cause the increase of risk.

**The Effect of Exercise on High-Density Lipoproteins:**

High-density lipoproteins have a high percentage of protein (about 50%) and low amount of lipid (2%) and cholesterol (20%). The amount of HDL in blood serum in each 100 mm is averagely 3g that forms 37-30% of blood lipoproteins. HDL has the highest protein amount and carry about 20% of plasma cholesterol. It seems that the task of this molecule is to transmit cholesterol out of the artery wall (hepatic artery), i.e. the place where
the metabolism trend of coronary artery disease. Some other studies revealed that the increase of HDL restrains coronary artery diseases. In a 5-year study conducted on middle age men in 2013, John Pierre reported that HDL can be a dangerous factor for CHD relative to the increase of LDL.

The Effect of Exercise on Low-Density and Very Low-Density Lipoprotein:
LDL is of the most lipoproteins existing in human plasma which is the main transmitter of cholesterol both in the form of esterified and free. As the most important lipid existing in the structure of LDL, cholesterol forms 40-60% of its total lipid. 24-32% of cholesterol is in the form of free and esterified. VLDL is highly similar to CHYLOMICRONs. This similarity is so high that researchers call them three glycerin-rich particles such that three glycerin forms 60-70% of VLDL and only 10% is cholesterol which is esterified type. CHYLOMICRONs is a kind of blood lipoproteins and the presence of APO B 48 is necessary for their accumulation and secretion although the role of APO B 48 is not completely clear in CHYLMICRONs metabolism. LDL transmits the highest amount of plasma cholesterol and is highly willing to attach to artery wall. Cholesterol sedimentation on arteries wall caused the increase of their walls’ thickness and the increase of blood flow in the thick region. If these changes occur in cardiac coronary vessels cause oxygen failure in cardiac tissues and the risk of infarction is increased in that region of heart. According to the reported studies, the increase of cholesterol causes the increase of low-density lipoproteins and the increase of three glyceride leads to the increase of very low-density lipoproteins. These two kinds of lipoproteins increase the risk of cardiac infarction.

Exercises and Blood Lipids:
The effect of physical activity on obesity and fitness has been investigated by many researches. The results of reverse relation between physical activity and obesity in children and adolescents with low physical activity revealed that low physical activity can lead to obesity.

Blood Lipids:
Increasing the amount of blood lipids leads to the increase of coronary diseases. With cholesterol, other lipids are also seen in blood which are called three glycerin. Generally, individuals with both high cholesterol and three glycerin have worse situation compared to those who only one of them is high in their blood.

The level of cholesterol and saturated blood lipids can be decreased by avoiding excessive saturated lipids. Of course, all kinds of cholesterol (high-density lipoprotein) cannot be considered as cardiovascular threatening factor. In fact, it is believed that high-density lipoprotein acts as a guard against cardiac coronary diseases. Regular exercises cause the increase of HDL-C component. HDL-C is not harmful since it carries cholesterol to liver to be changed into bile salt. Lipid deposits related to arteriosclerosis include three glycerin, cholesterol, phospholipid, collagen, fibroGen, and even placket accumulation. It should be noted that the incidence of coronary heart diseases in an individual with the blood cholesterol more than 259 mg is five times more than an individual with the blood cholesterol less than 200 mg.

Notably, the incidence of coronary heart diseases Incidence regarding the Level of Blood Cholesterol.

Smoking:
Nicotine inhalation causes narrowing of the respiratory tract and surrounding alveolar capillaries. Inhalation of this drug in resting status influences the work mechanism of heart and its rate. More number of cigarettes and
longer duration of smoking are threatening factor of coronary heart diseases and lung cancer. An individual consuming more than one packet cigarette per day face twice cardiovascular risk factors in comparison with a non-smoking individual.

Although, it is assumed that smoking does not cause arteriosclerosis but it may cause the creation of small blot clots which lead to the obstruction of coronary artery which has been currently narrowed by arteriosclerosis.

**Fig. 2:** The Percentage of Coronary heart diseases Incidence regarding Smoking.

Compared with a non-smoking individual, an individual who smokes more than one packet per day is at a twice risk of heart attack (according to Loviglio).

**Physical Activity:**

Most of physicians believe that lack of physical activity is an important factor of cardiovascular diseases incidence. Athletes continued physical activity have less significantly suffered from cardiovascular disease compared to those stopped their physical activity. By the way, it seems that only physical activity during adolescence period cannot have a useful effect on the increase of life time unless physical activity is continuously performed.

**The Role of Physical Activity in Cardiovascular Health:**

The story of the role of sport and physical activity in heart muscle anemia diseases has been begun by the historical studies of Morris regarding driver helpers and bus drivers of London transportation station. In these studies, it was observed that coronary heart disease incidence in driver helpers whose job involves going up and down of the stairs, compared to bus drivers whose work is less active, is only 70% of their diseases incidence. This study also obtained identical results by investigating on foot postman and office-resident employees of London Post.

**Obesity and Under Skin Fat:**

Most of studies have shown that overweight is one of independent indicators of Diabetes and CVD in human. Most of environmental effects of leptin indicate the involvement of leptin in the metabolism of glucose and lipid, clot, and blood pressure regulation. The recent studies suggest that the increase of blood leptin due to the increase of lipid mass and other factors may be with accompanied with the increase of Insulin resistance syndrome risk, leading to hypertension through influencing sympathetic nerves, Insulin sensitivity and some hormonal reactions. High levels of leptin in hypertension and non-Insulin dependent Diabetes Mellitus (NIDDM) reveal the role of this hormone in the development of arteriosclerosis-related diseases. Patients with chronic heart problem show high concentration of serum leptin and its liquid receptors.

The role of leptin in producing clot, creating oxidative pressure in artery endothelial cells, the development of artery wall calcification, and artery smooth muscle cell proliferation in laboratory models has been well proved. Leptin is related with increasing the number of heart rate and probably, placket accumulation and clot formation. The increase of blood leptin which is common in obese people is regarded as an independent cardiovascular diseases risk factor. It is particularly an indicator for the first myocardial infarction due to ischemia.
**The Effect of Exercises:**

Just like many other studies on acute exercises, exercise programs do not influence leptin independently from the change of body fat amount. Of course, few studies have suggested that leptin may be decreased in trained women in spite of constant lipid mass and another research has also reported the effect of exercise on the decrease of plasma leptin 10 months after exercise independent from the change of body fat amount.

One of the important points in the primary studies on leptin concentration was that energy balance did not controlled in these studies and mostly, they focused only on taking blood sample before and after exercises. Since leptin, in fact, is sensitive to negative energy balance (fasting with limited calorie consumption), it is necessary that the plan can separate the effects of the exercise from the amount of energy received. In a study conducted on runner adolescents, Kraemer et al. measured leptin concentration in resting status and after exercise during on course of exercise. Resting leptin levels did not become balanced during 7 weeks; however, no significant decrease was observed in investigating acute responses.

Short term exercise courses (60 minutes with the intensity of VO\(_2\)max 75% during 7 days) also cannot create any change in leptin concentration in young and old healthy men. In this research, lipid mass was not measured but weight was constant. Again, Unal et al. measured leptin concentration in young athletes (in various sports) and healthy inactive testees. They referred to considerable low level of leptin after exercises, concluding that regular exercises decrease serum leptin levels by decreasing lipid percentage. In another study, Fritz et al. tested the effects of three types of endurance exercises including maximum muscular hypertrophy-endurance power on serum leptin. Their most important finding was that in normal people, these three kinds of exercises showed responses similar to resting sessions.

Ryan et al. carried out an endurance exercise program during 16 weeks on obese women after menopause. As they observed, during these exercises, some women lost weight and some did not. In this study, plasma leptin was decreased with a weight loss of 36%. Of course, the changes in leptin levels were not consistent with the changes in resting metabolism or even plasma Catecholamin. In this study, researchers found that leptin reduction in the program of exercising with weight may be due to the increase of Insulin action.

**Methodology:**

In this study, the statistical population included 30-40 years old wrestler men of Boroujerd City who continuously participated in 3 sessions of wrestling exercises in this city. For the statistical sample, through an invitation announcements in wrestling exercises of the city, 45 people voluntarily participated in the study. Finally, 30 people who had all necessary conditions were selected as the statistical sample. These 30 people were randomly divided into two experimental and control groups.

**Data Gathering Instruments:**

One week before the experiment, the selected testees were referred to Takhti Sport Salon in Boroujerd City for physical and physiological tests. Initially, permission letter, medical questionnaire and the preparation for physical activity were completed by all the subjects and then, each subject referred to the considered place with the test sheet in their hands to measure their height, weight, age, etc.

**Plyometric Exercises:**

As shown in Table 1, the testees performed plyometric exercises program. The exercise program included the following items:
1. **Squat jump with one leg forward and one leg backwards:**
   Onset: the testess opened their legs forwards and backwards and bended the forward leg relative to hip and knee at a 90-degree angle.
   Procedure: the testees jumped upwards; used hands to lift their body; kept body at squat state through putting one foot forward and one foot backwards and came down in the same form. The jumps were more rapidly repeated (Figure 3).

2. **Show jumping:**
   Tools: one cone or hurdle
   Onset: the testee stands beside the considered object and transfer his/her weight on two fee.
   Procedure: while the testee laterally presses the earth, he/she vertically jumps right and left and lift his/her knees when laterally jumping from hurdle (Figure 4).

3. **Alternatively Pushing Body Forward:**
   Tools: a box with the height of 15-30 cm
   Onset: the testee stands on the earth and puts one foot on the box such that the heel is close to the box end and can jump upwards as much as possible by pressing the heel on the box. The feet are changed during coming down.
Fig. 3: Squat Jump Movements by Putting One Foot Forward and One Foot Backward.

Fig. 4: Show Jumping Movement.

Procedure: opening the foot and heel, the testees can lift himself/herself through the foot put on the box (before reaching to the earth, the foot on the box is bent two times). The testee uses fluctuating movements of arms to soar and balance (Figure 5).

Fig. 5: Alternatively Pushing Body Forward.
Data Analysis:
As shown in the following tables, individual characteristics of the testees such as weight, height and age are described. Then, the research hypotheses are tested. Individual characteristics, mean and standard deviation of the variables are presented in Table 1.

Table 1: Descriptive Data of the Testees.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Plyometric Exercises</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (year)</td>
<td>34/11 ± 4/57</td>
<td>4/21 35/77 ±</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>83/55 ± 10/91</td>
<td>87/22 ± 9/36</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>4/03 ± 174/00</td>
<td>174/89 ± 6/62</td>
</tr>
</tbody>
</table>

According to Table 1, it can be concluded that the testees in the plyometric exercises group and the control group have a normal and approximately identical status in terms of age, weight and height.

Kolmogorov–Smirnov Test and Levin Test:
After selecting the two groups and performing pretest evaluations, the data normality (K-S test) and variance homogeneity (Levin test) have been used. The obtained results are presented in Table 2.

Table 2: Data Normality Test Results for the Two Groups.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control Group</th>
<th>Plyometric Exercises Group</th>
<th>Z-value</th>
<th>Sig.</th>
<th>Z-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholesterol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>0/500</td>
<td>0/964</td>
<td>0/664</td>
<td>0/789</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posttest</td>
<td>0/366</td>
<td>0/999</td>
<td>0/555</td>
<td>0/918</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>0/623</td>
<td>0/833</td>
<td>0/782</td>
<td>0/574</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posttest</td>
<td>0/539</td>
<td>0/934</td>
<td>0/539</td>
<td>0/934</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>0/690</td>
<td>0/727</td>
<td>0/741</td>
<td>0/642</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posttest</td>
<td>0/398</td>
<td>0/997</td>
<td>0/717</td>
<td>0/684</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>0/707</td>
<td>0/699</td>
<td>0/623</td>
<td>0/833</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posttest</td>
<td>0/886</td>
<td>0/412</td>
<td>0/478</td>
<td>0/976</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VLDL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>0/475</td>
<td>0/978</td>
<td>0/614</td>
<td>0/845</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posttest</td>
<td>0/577</td>
<td>0/893</td>
<td>0/708</td>
<td>0/697</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As shown in Table 2, in all the cases, the data related to the research variables have a normal distribution. The results obtained from variance homogeneity of the pretest data in the both groups are presented in Table 3.

Testing the Hypothesis:
With respect to the results obtained from the variables analysis, the research hypotheses have been tested using dependent t-test and one-way variance analysis.

The first research hypothesis:
6 weeks plyometric exercises do not significantly influence total cholesterol (TC) in 30-40 year trained men.

As shown in Table 4, dependent t-test has been used to investigate this hypothesis.

Table 4: Dependent T-Test Results for the Effect of 6-Week Plyometric Exercises on Total Cholesterol.

<table>
<thead>
<tr>
<th>Total Cholesterol</th>
<th>Mean and standard Deviation</th>
<th>Variance (%)</th>
<th>Dependent t-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pretest</td>
<td>posttest</td>
<td>Pretest</td>
<td>posttest</td>
</tr>
<tr>
<td>Plyometric exercises</td>
<td>41/34± 169/89</td>
<td>35/86± 166/22</td>
<td>-2/16</td>
<td>0/934</td>
</tr>
<tr>
<td>Control Group</td>
<td>40/46± 180/00</td>
<td>30/58± 190/89</td>
<td>+6/05</td>
<td>0/898</td>
</tr>
</tbody>
</table>

According to the data analysis, it can be concluded that:
Regarding the plyometric exercises group, the pretest and posttest data revealed that total cholesterol amount of the testees has been decreased to 2.16% before and after performing the exercises. Also, with respect to the obtained t-value (0.934) and significance level (0.378), it can be stated that 6 weeks plyometric exercises has not any significant effect on the amount of total cholesterol in 30-40 year athlete men. Regarding the control group, the pretest and posttest data indicated that total cholesterol amount of the testees has been increased to 2.16% before and after performing the exercises. Also, with respect to the obtained t-value (0.898) and significance level (0.396), it can be stated that 6 weeks plyometric exercises has not any significant effect on the amount of total cholesterol in 30-40 year athlete men.

Figure 6 shows the comparison between the pretest and posttest of the two groups.
Conclusion:
As the research findings revealed, it can be stated that plyometric exercises can effectively influence the indices related to cardiovascular diseases; it can be also considered as a useful factor in preventing cardiovascular diseases. To improve the quality of life and lifestyle, physical activity should be regularly performed. Moreover, since the increase of physical activity and the decrease of body fat can be effective in the increase of health and the decrease of cardiovascular risk factors, individuals should control their weight and authorities should attempt to improve public health level and decrease the risk of suffering from cardiovascular disease through holding educational workshops, lectures about the advantages of performing regular exercises and even adding physical training courses in universities and implementing plyometric exercises programs in physical training courses. Is the purpose of physical activities is merely the increase of public health or individuals are not interested in performing even and monotonous exercises, plyometric exercises can be performed to prevent cardiovascular diseases. Additionally, with respect to the limit range of these studies in Iran and the importance of the increase of physical activity to obtain and maintain health in the community, it seems necessary to conduct further studies in this regard.

REFERENCES