

A LITERATURE REVIEW ON THE EFFECT OF DIFFERENT TYPES OF TRAINING ON CHOLESTEROL LEVELS.

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Abstract.

This paper is a literature review of research articles on a topic that has been rarely studied in India. The following review aims at understanding how different types of exercise can affect Cholesterol. In this study, attempts have been made to analyze the effect of different kinds of training, such as Endurance Training, Resistance Training, and Combined Training on total Cholesterol, HDL-C, LDL-C, and Triglycerides. After reviewing the literature in this area the conclusion drawn is that Endurance Training, Resistance Training, and Combined training has a significant effect in reducing LDL-C Cholesterol, Triglycerides, and Total Cholesterol. However, Endurance training alone is more Beneficial in elevating HDL-C cholesterol. This literature may be effective if applied to the Indian population as India is being recognized for its fast growth as a capital for lifestyle illnesses as per the World Health Organization.

Key words: Endurance Training, Resistance Training, Mixed training, LDL-Cholesterol, HDL Cholesterol, Total Cholesterol and Triglycerides.

Introduction.

Blood Lipids are improved by regular exercise and eventually, it has a beneficial effect on endothelial cells of the blood vessel, which thus slows down or prevents the advancement of Arteriosclerosis. From the different therapy for obesity like Dietary Therapy, Exercise Therapy, Medication Therapy, and Behavior Therapy. Exercise therapy is considered the cheapest, Safe, and easiest method of all obesity treatment. Additionally, it was found that 67.5 % of obese people lacked exercise and high weight category people are those who sit on a chair for a long duration. These results suggest how physical activity is related to obesity. Calorie Restricted dietary therapy is Obesity treatment. However, this treatment also has a positive effect on losing weight but it also decreases lean body mass due to the loss of muscular tissues Basal metabolic rate, and Induction of Myofunctional disorder. (Lee & Heo, 2014).

Cardiovascular disease is a major contributor to death worldwide. Major Risk factor for cardiovascular disease is the low levels of High- density lipoprotein (HDL-C). HDL-C high levels are found in those people who are physically more active, suggested by cross-sectional data. Thus, the importance of the regular presence of oxygen exercise in raising serum HDL-C level and in decreasing the risk CVD has been widely accepted. However, findings of the presence of oxygen exercise have wide results, depending on the kind of exercise program (eg. Volume, intensity, etc) and characteristics of subjects at baseline. (Kodama et al., 2007).

Exercise such as walking, jogging, swimming, biking, golfing, etc is advised to prevent metabolic syndrome. Additionally, strength training was also advised. The findings of various studies have confirmed that physical activity is a good tool for preventing MS as it builds muscle mass, reduce percent body fat and body weight, limit diabetes, lowered the blood pressure and overall CV risk factors. (Ha & So, 2012).

Although it has been seen that aerobic exercise helps greatly in lowering blood LDL-C concentrations, it has also noticed that such exercise may end up in the loss of protein or muscle mass, effectively lowering resting metabolic rate and fat metabolism. Thus, by combining Aerobic and resistance training, excess muscle loss may be overcome to preserve muscle mass and build a pleasing increase in resting metabolic rate and fat metabolism. This may probably end up in a gained stimulus for decreasing blood LDL-C Concentration instead of performing aerobic training alone. (Shaw et al., 2009).

The purpose of the study is to examine effects of different types of training such Endurance Training, Resistance training and Mixed Training on Cholesterol Levels of Individuals

Review of Literature.Endurance Training and Cholesterol.

Leo & Heo (2014) in their study titled “Effects of Exercise Therapy on Blood Lipids of Obese Women” have found out that significant difference was seen in total cholesterol and triglycerides between the control and experimental group after the intervention. The present study was conducted on 24 obese women, they were further divided into experimental and control groups (n=12 each). The experimental group performed aerobic exercise 5 times a week for a total of 10 weeks at HRmax40 to 70 percent with diet restriction. Blood was taken to measure blood lipids profile of obese women, this was taken before and after the intervention. From the above study, we can conclude that after intervention significant improvements were found in total cholesterol and triglycerides in the experimental group. Thus it may be said that aerobic training helped to reduce total cholesterol and triglycerides.

(Kodama et al., 2007) in their study titled “Effect of Aerobic Exercise Training on Serum Levels of High-Density Lipoprotein Cholesterol”, have reviewed 25 research papers and noticed that the mean score of change in HDL-C was significant, however, the changes were small. It was found that to increase HDL Cholesterol minimum of 900 kcal should be expended per week or 120 minutes of exercise should be performed for a week. The univariate regression analysis has identified that when an individual prolongs the exercise session for 10 minutes, it has a positive relationship with increasing HDL-C cholesterol. In contrast, it was noticed that there is no relationship between exercise frequency or intensity. Meta-regression analysis identified that subject with BMI 28 and Total Cholesterol level of 220mg/dl has a greater increase in HDL-C level compared to those people who have less than BMI 28 & total cholesterol 220 mg/DL. It is concluded that aerobic exercise performed regularly slightly increases HDL-C. It was found that the minimum volume of exercise should be performed to significantly increase the HDL-C level. Exercise duration was considered an important factor for exercise prescription. This study was more effective for those who have an initially high level of total cholesterol or low body mass index.

(Ahmeti et al., 2020), in their study titled “Endurance Training vs. Circuit Resistance Training: Effects on Lipid Profile and Anthropometric/Body Composition Status in Healthy Young Adult Women” found that post-hoc analysis indicated significant improvements in total cholesterol, High-density lipoprotein, Low-density lipoprotein, and triglycerides within the group for both Endurance and circuit Resistance Training groups. For the control group, only a significant decrease was found in Triglycerides. When between the group comparison was done, a significant difference was found in triglycerides and HDL Cholesterol in both the training groups however the control group showed a higher number in Triglycerides and HDL cholesterol. Total cholesterol and Low-density lipoprotein were more in the control group than the endurance training group. No significant difference was noticed between the resistance and endurance training group in the post-test. For the above study 57 women participants with a mean age of 23±3, bodyweight 165±6, body mass: 66.79±7.23 kg, BMI: 24.37±2.57 kg/m² were further divided into endurance training (N=20), circuit resistance training (N=20), and control group (N=18) were participants for the study, pre and post-test was conducted on total cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL). The endurance training group, underwent treadmill training 3 times a week for a period of 8 weeks similarly circuit resistance training group underwent equal times of circuit strength training. From the study, it can be concluded that 8 weeks of endurance and circuit strength training showed improvement in TC, HDL-C, LDL-C, and triglycerides. However, this study could not prove the difference of training benefits in each of these factors.

Leon and Sanchez. In their study have found out that HDL cholesterol raised by 4.6% whereas triglycerides level decreased by 3.7 percent and LDL cholesterol lowered by 5 percent however total cholesterol remained unchanged, although the ratio between HDL & LDL showed great improvement. this study was conducted on 4700 individuals. They underwent 51 different interventions for 12 weeks or more of Aerobic training. This study suggests that higher intensity and structure of aerobic exercise has a more beneficial effect for triglycerides and LDL Cholesterol than moderate level of exercise. From this study, we can conclude that aerobic exercise had helped in reducing bad cholesterol and raising good cholesterol

Resistance training and cholesterol

(Prabhakaran et al., 1999).in their study titled “Effect of 14 weeks of resistance training on lipid profile and body fat percentage in premenopausal women” Have found out that after fourteen weeks of resistance training there was a decrease in total cholesterol by 9 percent. LDL cholesterol saw a decrease of 14 percent. Total cholesterol /HDL cholesterol ratio and LDL/HDL cholesterol ratio decreased in the interventions group, However, no significant changes could be found in the case of triglycerides and HDL cholesterol. The Control group did not see any changes in any of these variables. After 14 weeks of training, it can be said can that total cholesterol was significantly lower in the intervention group than the control group. For this study 24 women participated, they were further divided into intervention groups and control groups. Interventions group had undergone resistance training (85 percent of 1 Rm) for 45 to day 50 minutes in a day, for 3 times a week continued for 14 weeks. The control group was not physically active. It was concluded that lipid profiles have shown healthy changes after resistance training.

Lira et al., (2010) in their study titled “Low and moderate, rather than high-intensity strength exercise induces benefit regarding plasma lipid profile” have found out that, the 75 percent 1 Rm group, showed more triglycerides decrease compared to other groups and it was noticed that 110 percent group saw an increase in triglycerides concentration compared to 50 and 75 percent 1 Rm group. After resistance exercise in 50 and 75 percent RM group, noticed a greater concentration of HDL-c when compared

to 110 percent RM group. Thus 50 percent 1 RM group had higher HDL-C concentration after 48 and 72 hours than 110 percent Rm group. Additionally, a 50 percent 1RM group noticed less LDL-c concentrations than 110 percent RM group after 24 hours. However, there was no significant difference in total cholesterol concentrations. The study was conducted on 30 untrained volunteers placed accordingly to their 1 Rm performance into four different groups namely 50 percent 1 RM, 75 percent 1 Rm, 90 percent 1 Rm, and 110 percent 1 Rm. All groups performed the same total volume of exercise (sets * rep* load). The lipid profile was measured during rest and after 1, 24, 48, and 72 hours of exercise. It was concluded from this study that low and moderate exercise has shown better results on lipid profile compared to high-intensity exercise.

Sheikholeslami Vatani et al, (2011), in their study titled “Changes in cardiovascular risk factors and inflammatory markers of young, healthy, men after six weeks of moderate or high-intensity resistance training” have found out that triglycerides level in the intervention group showed no changes. LDL cholesterol and LDL/HDL cholesterol ratio in the interventions group lowered significantly. It was also seen that in high-intensity group HDL level increased and Plasma level of fibrinogen decreased. The beneficial effect was noticed in few inflammatory and cardiovascular risk markers after 6 weeks of resistance training in young healthy males. When you compare both the groups, the high-intensity group showed better results in reducing plasma fibrinogen and plasma HDL level than the moderate-intensity group. For the present study, 30 young healthy males were selected and were categorized into 2 different intensities and control group Moderate intensity group performed 45 to 55 percent of 1 Rm and High-intensity group performed 85 to 90 percent of 1 Rm and Control group had no training. Both the training groups performed exercise 3 times a week continued for a total of 6 weeks. It was concluded that the High-intensity group showed more effective results than a moderate-intensity group.

Fett et al,(2009) in their study titled “Circuit Weight Training vs Jogging in Metabolic Risk Factors of Overweight/Obese Women” have found out that, total body mass, fat body mass, BMI, plasma uric acid lowered and metabolic equivalent showed an increase in both circuit and jogging group. However, no changes were noticed for lean body mass, resting energy expenditure, and resting heart rate. Circuit weight training group lowered total cholesterol, Plasma triglycerides, nitrogen balance and flexibility showed improvement. The jogging group lowered waist/hip ratio, glucose, systolic blood pressure, LDL-cholesterol, and total cholesterol/HDL-cholesterol ratio increased. For the present study, fifty women were selected however only 26 could complete the study. In the circuit training group total of 14 members finished the study, their mean age was 36 and BMI mean average was 32. In the jogging group, 12 members finished the study, their mean age was 37 and BMI mean average was 29. Both the groups underwent 60 minutes of training in a day for thrice a week for first and during the second month, they underwent 04 days a week. From the study, it was concluded that both the group showed improvement in Cardiovascular and Metabolic risk factors. The circuit training group showed better changes incase of lipid profile and flexibility however glucose, waist to hip ratio, and blood pressure showed better changes in the jogging group. For better results aerobic and resistance, training together should be implemented for obese people.

Mixed training and Cholestrol

Tambalis, K.et.al (2009) in their study titled “Responses of Blood Lipids to Aerobic, Resistance, and Combined Aerobic With Resistance Exercise Training: A Systematic Review of Current Evidence” has found out that resistance exercise has a beneficial effect for the LDL-c Cholesterol levels, mixed training (Aerobic and resistance) showed improvement in Both HDL-c and LDL-c cholesterol where one showed an increase and other showed decrease respectively. High-intensity aerobic training showed a rise in HDL-c Cholesterol. For the present study, 84 studies were reviewed, out of which 58 were randomized control trials. While selecting the studies following criteria was considered, a minimum of 12 weeks of training should be implemented, they should measure at least one or more of this variables-Triglycerides, Total cholesterol, HDL, and LDL Cholesterol and should involve aerobic or resistance or combined exercise training. From the study, it could be concluded that results are inconsistent for combined training.

Shaw et al.,(2009), in their study titled “Comparison of aerobic and combined aerobic and resistance training on low-density lipoprotein cholesterol concentrations in men” have found out that the control group showed no significant change in LDL cholesterol. Both the groups i.e aerobic and combined training noticed similar and significant fall of LDL-cholesterol. The present study was conducted on 38 healthy participants with their mean age of 25 years and 6 months, who were never trained before and subjects were at borderline with high LDL-cholesterol. They were further divided into the control group (n=12), aerobic training group (n=12), and Combined training group (n=13). The exercise training group performed training for 16 weeks and three times in a week. Aerobic training group performed exercise for 45 minutes at 60 percent of maximal heart rate by using treadmills, rowers, steppers, and cycle ergometers. After every four weeks intensity was increased by 5 percent. The combined exercise group performed equal duration of resistance and aerobic training. The combined exercise group performed 22 minutes of aerobic training by using combinations of treadmills, rowers, steppers, and cycle ergometers at 60 percent of maximal heart and eight resistance exercises for 2 sets of 15 repetitions at 60 percent of 1 Rm. Aerobic training intensity was similarly raised as the Aerobic training group and 1 Rm was newly calculated after every four weeks and appropriately intensity was adjusted. The Control group was asked to maintain their normal routine and not to indulge in any planned physical activity. It was concluded that

both types of training showed a similar decrease in LDL-cholesterol. It can be said by doing additional aerobic training does not cause any benefits in decreasing LDL-cholesterol

S.J Yang, et.al (2011) in their study titled “Effects of a three-month combined exercise program on fibroblast growth factor 21 and fetuin-A levels and arterial stiffness in obese women” have observed that after the intervention program BMI, waist circumference, Systolic blood pressure, diastolic blood pressure, and triglyceride levels were lowered significantly. baPWV values increased significantly and FGF21 levels lowered slightly. However, Fein –A levels did not change greatly. For the present study 40 obese women (nondiabetic) with their mean average of BMI = 27.6 ± 2.4 kg/m² were subject to the study. The exercise program included 45 minutes of aerobic training at 60-75 percent of the maximum heart rate and 20 minutes of resistance training, five times a week for a 3 months period. It could be concluded that 3 months of combined aerobic and resistance training lowered the FGF21 levels as well as arterial stiffness in obese Korean women.

Ha & So, (2012), in their study titled “Effects of Combined Exercise Training on Body Composition and Metabolic Syndrome Factors” have found out that after using ANOVA, no interaction effects (time * group) could be identified on the MS-related factors of blood lipid components such as triglycerides, high-density lipoprotein, glucose, total cholesterol, and low-density lipoprotein. Though on percent body fat, waist circumference, systolic blood pressure, and diastolic blood pressure interaction effects (time * group) were identified. For the present study, the exercise group consists of (n=7) and control group (n=9). The exercise group trained for 80 minutes which include 10 minutes of warm-up, 30 minutes of aerobic exercise at 60 to 80 % of maximum heart rate, 30 minutes of resistance exercise for 10 to 15 repetitions of maximum (RM), and at last 10 minutes of cooling down. The exercise group performed the above-mentioned training 3 times a week and continued for 12 weeks. It could be concluded that after 12 weeks of interventions percent body fat, Waist Circumference, Systolic Blood Pressure, and Diastolic Blood Pressure was lowered. However, it did not reduce MS-related factors of blood lipid composition such as Triglycerides, HDL cholesterol, glucose, Total Cholesterol, and LDL cholesterol of obese Korean female college students.

Conclusion.

From the different studies reviewed on different age groups, it may be said that in most of the studies it was found that endurance training had helped in lowering LDL-C Cholesterol, Total Cholesterol, and Triglycerides and Raising HDL-C Cholesterol. However, it showed Contradictory results where few studies suggest High-intensity exercise is helpful in raising HDL-C cholesterol and Lowering LDL-C Cholesterol, Total Cholesterol, and Triglycerides whereas some study favors Low-intensity exercise for the all the above results.

After reviewing several studies it may be said that resistance training alone helped in lowering LDL-C cholesterol and triglycerides However HDL-C Cholesterol didn't show many changes except one study where high-intensity resistance training helped in raising HDL-C Cholesterol.

After undergoing various studies it may be said that combined training helped in Lowering HDL-C cholesterol and triglycerides. However, no much significant evidence is present to say that combined training raised HDL-C cholesterol and lowered total Cholesterol.

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