

A Comparative Study to Find out the Efficacy of Aerobic Exercises vs Resisted Exercises in Modifying Lipid Profile in Sedentary and Overweight Individuals

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Abstract

Objectives: To compare the effectiveness of aerobic exercises and resisted exercises in modifying lipid profile in sedentary and overweight individuals. **Background:** Sedentary and overweight are known risk factors for coronary heart disease. Exercise (aerobic or resisted) modifies the lipid profile. There exist a need for comparison which is efficient in modifying lipid profile. **Methodology:** It is a pre and post comparative experimental study dividing Group A as aerobic and Group B as resisted training. 30 subjects aged between 21-40 years with borderline lipid levels were recruited as 15 in each group. The subjects were given Baecke physical activity questionnaire and BMI was calculated. Then pre and post test values of LDL, TG and HDL were taken in both groups. Group A was given with aerobic exercise training of jogging for period of four weeks whereas Group B was given with resistance training for four weeks (50% of 1-RM, 75 % of 1-RM, 100% of 1-RM) 10 repetitions of squats, leg curls, leg press, knee extension exercises in 3 workouts per session. **Results:** The results showed that there is a significant difference between pre and post values of LDL, TG and HDL in both the groups with significance level of $p < 0.05$. When compared between the groups it is observed that the resisted exercises are more effective than aerobic exercises. **Conclusion:** Resistance training was found to be effective when compared with aerobic training in modifying lipid profile in sedentary and overweight individuals.

Keywords: Lipid Profile; Resistance Training; Aerobic Training.

Introduction

The rising prevalence of coronary artery disease complications represents a public health crisis and there is association of risk factors. Physical risk factors include lack of exercise, sedentary lifestyle, overweight. Physiological risk factors include mainly lipid profile-in high density lipoproteins (HDL), low density lipoproteins (LDL) and very low density lipoproteins (VLDL) and chylomicrons [1]. These contribute to developing CAD.

Lipid abnormalities causes high LDL cholesterol, low HDL cholesterol, or high triglycerides. Physical activity has a significant effect on lipid profile. The physical activity will reduce the LDL susceptibility to the oxidation process which in turn decreases the progression of atherosclerotic plaques [17,18]. There will be a TG clearance from plasma and increase in HDL-C in response to exercise.

Aerobic exercise has a significant effect on lipid profile. There are moderate changes in body fatness in relation to aerobic exercise [20]. Resistance exercise also has an effect in reducing lipid profile. These exercises help in reducing LDL, TC and TG levels and they increase the HDL concentrations [22,23,24]. There is inadequate literature suggesting the efficacy of aerobic versus resisted exercises in modifying lipid profile in sedentary and overweight individuals.

Thus the primary purpose of the study is to compare aerobic versus resisted exercises in sedentary and overweight individuals in modifying lipid profile.

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Methods

Study Design and Subjects

We performed a comparative study that consists of 30 healthy sedentary and overweight individuals between the age group 21-40 yrs. All Subjects residing in and around Bangalore were selected through convenient sampling. During the first session, Subjects identified as sedentary by Baecke physical activity questionnaire, overweight individuals with BMI between 26-29 were included. Pre and post exercise regime lipid TG, LDL, HDL were analysed in the oral pathology department, The Oxford Dental College –Bangalore and values are noted that it is done after fast for 9-12 hours and only water intake was allowed. Subjects with borderline levels of lipids i.e. LDL – 130 to 159 mg/dl, TG - 150 to 199 mg/dl, TC – 200-239 mg/dl and HDL- <40 mg/dl were recruited in the study. Subjects were excluded If they (1) were identified as obese, (2) with kidney problems, (3) any other medical conditions like hypertension and diabetes and (4) smoking, alcohol habits. The Oxford College Ethical Review Board approved this study and informed written consent was obtained from the included subjects.

Intervention

Subjects were divided into 2 groups called Group A and Group B. Each group consists of 15 subjects. Group A was exposed to aerobic exercises and Group B to resisted exercises. *Group A* performed aerobic exercise of jogging for 30 min at 75% of HR max. At first ten minutes of warm up exercises are given in the form of fast walking followed by 30 minutes of jogging followed by ten minutes of normal slow pace walk with deep breathe. This exercise regime continued for 4-5 days per week for four weeks *Group B* performed resisted exercises -PRE of 1 rm. At first warm up exercises were given in form flexibility activities followed by 1RM (Delormes) 10 repetitions in 3 workouts with 4 minute intervals followed by cool down. It lasted for 4-5 days per week for four weeks. The 1RM were given with 50% of 1RM, 75% of 1RM and 100% of 1RM exercises of leg press, squats, knee extension, and leg curl exercises of lower limb.

Leg Press Exercise

Subject seated in the leg press machine, place his feet on cross piece. The subject lowers the weight as far as possible push the weight back up to starting position.

Squats

Subject was instructed to stand with feet wider than shoulder width and toes out at a comfortable angle, bending their knees and lowering the body keeping the knees in line with the toes push back up. They will be instructed to not to lock the knees and keep their abdominals and back straight and tight. Progression of it is lowering the body further more with losing balance.

Knee Extension

Subject sat in the machine and placed the shin underneath the padded weight section from the starting position to extend the knees to lift up the weight keeping firmly on the seat. Then subject was instructed into slowly lower the knees after reaching straight leg position.

Leg Curl

Subject lying in prone on a leg curl machine and hooks their heels under the padding. With the leg straight to start curling up as far as the subject can, until the hamstrings are fully contracted. Lower the weight back to starting position. The subjects are requested to not to smoke or take alcohol during the program.

Statistical Analysis

The study was conducted with 30 sedentary and overweight subjects to find out the efficacy of aerobic exercise vs resisted exercises in modifying lipid profile in sedentary and overweight individuals. The data was carefully collected and calculated. In this study paired t-test was used as a statistical tool for detecting the significant difference between the pre and post exercises measurements considered for the study. Unpaired t test is used to find the comparison of two independent groups. Descriptive statistics (mean and standard deviation) were also calculated for all the measurements considered for the study.

Table 1: Distribution of subjects by study groups and gender

Gender	Group A	%	Group B	%	Total
Male	12	80.00	13	86.67	25
Female	3	20.00	2	13.33	5
Total	15	100.00	15	100.00	30

Table 2: Mean and SD age of subjects by study groups

Summary	Group A	Group B	P value
Mean age	31.80	31.67	0.9525
SD age	6.88	6.30	

Table 3: Comparison of pretest and posttest TG scores in group A and group B by paired t test

Groups	Test	Mean	SD	Mean diff	SD diff	% of effect	Paired t	P value
Group A	Pre test	163.40	9.39					
	Post test	157.67	9.61	5.73	1.28	3.64	17.3494	0.0000*
Group B	Pre test	163.67	8.76					
	Post test	155.73	8.21	7.93	0.88	5.09	34.7687	0.0000*

**p<0.05

From the table 1 the gender in both the groups is compared. They showed that both the groups are having males in more number than females. It is 80.00% and 86.67% of males in Group A and Group B and 20.00% and 13.33 % of females in both groups.

In table 2 the age difference was compared in both the groups and the mean age in both the groups was 31.80 in Group A and 31.67 in Group B. this shows that the two groups are age matched at p=0.9525.

In the above table the pre and post values of TG are compared of Group A. The mean and SD of pre test were 163.4 ± 9.39 and posttest were 157 ± 9.61. the mean difference of both groups is 5.73± 1.28 at t= 17.3494 at p=0.0000. This shows that there is a significant difference between the pre and post values of Group A. From the above table the pre and post

values of TG are compared of Group B. the mean and SD of pre test were 163.67 ± 8.76 and post-test were 155.73± 8.21. the mean difference of both groups is 7.93 ± 0.88 at t= 34.7687 at p=0.0000. This shows that there is a significant difference between the pre and post values of Group B.

Comparison of TG Values within Group A and Group B

A significant difference is observed between pre test and post test TG scores in Group A at 5% level of significance. It means that, the pre test TG values were higher as compared to post test in Group A. A significant difference is observed between pre test and post test TG values in Group B at 5% level of significance. It means that, the pre test TG values are higher compared to post test in Group B.

Table 4: Comparison of group A and group B with respect to TG scores by unpaired t test

Variable	Group	N	Mean	SD	t-value	p-value
Pre test TG	Group A	15	163.40	9.39	0.0804	0.9365
	Group B	15	157.67	8.76		
Post test TG	Group A	15	163.67	9.61	0.5925	0.5583
	Group B	15	155.73	8.21		
Difference TG	Group A	15	5.73	1.28	5.4783	0.0000*
	Group B	15	7.93	0.88		

*p<0.05

In the above table and graph 4 the pre test mean and SD TG values of both Group A and Group B are compared and the t= 0.0804 at p= 0.9365. This shows that there is no difference between pre test values of TG between the two groups.

In the above table the post test mean and SD TG values of both Group A and Group B are compared and the t= 0.5925 at p= 0.5583. This shows that there is no difference between post test values of TG between the two groups.

From the same table the mean and SD were compared between the Group A and Group B and there the t= 5.4783 at p=0.0000. This shows that there is significant difference between the two groups.

Comparison of TG Values between Group A Group B

There is no significant difference is observed between Group A and Group B with respect to pre test TG values. It shows that, the pre test TG values are similar in Group A and Group B.

There is no significant difference is observed between Group A and Group B with respect to post test TG values. It shows that, the post test TG values are similar in Group A and Group B. A significant difference is observed between Group A and Group B with respect mean differences and SD's at 5% level of significance. Group B mean difference is higher than Group.

Table 5: Comparison of pretest and posttest LDL scores in group A and group B by paired t test

Groups	Test	Mean	SD	Mean diff	SD diff	% of effect	Paired t	P value
Group A	Pre test	138.93	4.23	4.47	0.81	3.33	21.2691	0.0000*
	Post test	134.46	4.56					
Group B	Pre test	141.71	4.42	6.97	0.89	5.17	30.3112	0.0000*
	Post test	134.74	4.32					

The pre and post values of LDL are compared of Group A. The mean and SD of pre test were 138.93 ± 4.23 and posttest were 134.46 ± 4.56 . The mean difference of both groups is 4.47 ± 0.81 at $t=21.2691$ at $p=0.0000$. This shows that there is a significant difference between the pre and post values of Group A. The pre and post values of LDL are compared of Group B. the mean and SD of pre test were 141.71 ± 4.42 and post-test were 134.74 ± 4.32 . The mean difference of both groups is 6.97 ± 0.89 at $t=30.3112$ at $p=0.0000$. This shows that there is a significant difference between the pre

and post values of Group B.

Comparison of LDL Values within Group A and Group B

A significant difference is observed between pre test and post test LDL scores in Group A at 5% level of significance. It means that, the pre test LDL values were higher as compared to post test in Group A. A significant difference is observed between pre test and post test LDL values in Group B at 5% level of significance. It means that, the pre test LDL values are higher compared to post test in Group B.

Table 6: Comparison of group A and group B with respect to LDL scores by unpaired t test

Variable	Group	N	Mean	SD	t-value	p-value
Pre test LDL	Group A	15	138.93	4.23	1.7550	0.0902
	Group B	15	141.71	4.42		
Post test LDL	Group A	15	134.46	4.56	0.1725	0.8643
	Group B	15	134.74	4.32		
Difference LDL	Group A	15	4.47	0.81	8.0031	0.0000*
	Group B	15	6.97	0.89		

In the above table 6 the pre test mean and SD LDL values of both Group A and Group B are compared and the $t=1.7550$ at $p=0.0902$. This shows that there is no difference between pre test values of LDL between the two groups. In the above table the post-test mean and SD LDL values of both Group A and Group B are compared and the $t=0.1725$ at $p=0.8643$. This shows that there is no difference between post-test values of LDL between the two groups.

From the same table the mean and SD were compared between the Group A and Group B and where $t=8.0031$ and $p=0.0000$. This shows that there is significant difference between the two groups.

Comparison of LDL Values between Group A Group B

There is no significant difference is observed between Group A and Group B with respect to pre test LDL values. It shows that, the pre test LDL values are similar in Group A and Group B. There is no significant difference is observed between Group A and Group B with respect to post test LDL values. It shows that, the post test LDL values are similar in Group A and Group B. A significant difference is observed between Group A and Group B with respect to mean differences and SD's at 5% level of significance. Group B mean difference is higher than Group A.

Table 7: Comparison of pretest and posttest HDL scores in group A and group B by paired t test

Groups	Test	Mean	SD	Mean diff	SD diff	% of efect	Paired t	Pvalue
GroupA	Pre test	35.07	2.66	3.20	0.68	8.36	18.3303	0.0000*
	Post test	38.27	2.55					
GroupB	Pre test	35.07	2.87	4.80	0.86	12.04	21.5692	0.0000*
	Post test	39.87	2.92					

* $p < 0.05$

In the table the pre and post values of HDL are compared of Group A. The mean and SD of pre test were 35.07 ± 2.66 and posttest were 38.27 ± 2.55 . the mean difference of both groups is 3.20 ± 0.68 at $t=$

18.3303 at $p=0.0000$. This shows that there is a significant difference between the pre and post values of Group A. The pre and post values of HDL are compared with Group B. The mean and SD of pre test

were 35.07 ± 2.87 and posttest were 39.87 ± 2.92 . The mean difference of both groups is 4.80 ± 0.86 at $t=21.5692$ at $p=0.0000$. This shows that there is a significant difference between the pre and post values of Group B.

Comparison of HDL Values within Group A and Group B

A significant difference is observed between pre test and post test HDL scores in Group A at 5% level of significance. It means that, the post test HDL values were higher as compared to pre test in Group A. A significant difference is observed between pre test and post test HDL values in Group B at 5% level of significance. It means that, the post test HDL values are higher compared to pre test in Group B.

In the table 8 the pre test mean and SD HDL values of both Group A and Group B are compared and the $t=0.0000$ at $p=1.0000$. This shows that there is no difference between pre test values of HDL between the two groups.

In the table the post test mean and SD LDL values of both Group A and Group B are compared and the $t=1.5975$ at $p=0.1214$. This shows that there is no difference between post test values of LDL between the two groups.

From the same table the mean and Sd were compared between the Group A and Group B and there the $t=5.5659$ at $p=0.0000$. This shows that there is significant difference between the two groups.

Table 8: Comparison of pretest and posttest HDL scores in group A and group B by unpaired t test.

Variable	Group	N	Mean	SD	t-value	p-value
Pre-test HDL	Group A	15	35.07	2.66		
Pre-test HDL	Group B	15	35.07	2.87	0.0000	1.0000
Post-test HDL	Group A	15	38.27	2.55		
Post-test HDL	Group B	15	39.87	2.92	1.5975	0.1214
Difference HDL	Group A	15	-3.20	0.68		
Difference HDL	Group B	15	-4.80	0.86	5.6569	0.0000*

Comparison of HDL Values between Group A Group B
There is no significant difference is observed between Group A and Group B with respect to pre test HDL values. It shows that, the pre test HDL values are similar in Group A and Group B.

There is no significant difference is observed between Group A and Group B with respect to post test HDL values. It shows that, the post test HDL values are similar in Group A and Group B. A significant difference is observed between Group A and Group B with respect mean differences and SD's at 5% level of significance. Group B mean difference is higher than Group A.

Discussion

In the present study there is comparison of both aerobic and resisted exercises in modifying lipid profile in sedentary and overweight individuals in the age group- 21-40 yr old who have borderline lipid levels.

Exercise training is accompanied by metabolic adaptations that occur in skeletal muscle and adipose tissue and that facilitate a greater delivery and oxidation of fatty acids during exercise [40]. This was

supported by Kelly GA [21] et al who did a study and concluded that aerobic exercise reduces TC and TG 3% and increases HDL-C by 2%. Katmarzyk [24] et al has did a study and concluded that there is a moderate changes in body fatness in related to aerobic exercise. Tolfrey [23] K et al in their study concluded that aerobic exercise has favourable effects in HDL-C, LDL-C, TG in children and adolescents.

From this analysis there is a difference in pre and post values of LDL and TG in group A. The HDL pre and post values were compared shows a significant difference between pre and post values of HDL. There is decrease in LDL, TG values and there is increase in HDL values. There is a difference between the TG values of pre and post in group B. According to statistical analysis the LDL values show significant difference between LDL pre and post values in group B. There is a difference in HDL pre and post values in group B. This shows that in this Group B also there is decrease in TG and LDL levels and increase in HDL levels. Resistance exercises will improve insulin resistance, muscular strength and endurance, enhances flexibility, increases fat loss, thus decreasing cardiovascular risk. This improvement was supported by Randy W Braith [26] in their study have concluded that the resistance exercise has significant effects in modifying lipid levels. Fabio S

Lira [27] et al in their study concluded that active resistance training will induce changes in lipid profile. Bharathi Prabhakaran [25] et al in their study have concluded that resistance training has a favourable effect on lipid profile and body fat percentage in healthy, sedentary pre menopausal women. From the above statistical analysis the resisted exercise is shown to be more effective than aerobic exercises as the mean difference of the pre and post test is more in resisted exercise group. The reason for the difference is due effect of resistance training sessions having influence on body fat when compared to aerobic exercise training in subjects with borderline lipid levels.

Limitations

The sample size is small for this study. The parameters like like VO₂ max, metabolic equivalents (MET's) and blood pressure were not taken into consideration as it is a small duration study and the lack of sophisticated environment. Females are less in number in the study. The TC and VLDL values are not taken into consideration. The follow up was not done.

Conclusion

From the above study results it is concluded that there is a difference among the Group A and group B when the values obtained were analysed. There is a significant reduction in post LDL, TG values and increase in HDL value in group treated with resistance training. The Group A treated with aerobic training also showed a decrease in LDL, TG and increase in HDL value, but not as much as Group B. The statistical analysis shows a significant difference whereas when comparing to clinical significance the difference among Group A and Group B is not showing that much variation in subjects with borderline lipid levels.

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