ANALYSIS OF THE CHANGES ON HDL CHOLESTEROL LEVEL IN RESPONSE TO RESISTANCE, AEROBIC AND COMBINATION TRAINING AMONG MIDDLE AGED MEN

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ABSTRACT

The objective of this study was to analyze the changes on high density lipoprotein cholesterol level in response to resistance, aerobic and combination training among middle aged men. To achieve the purpose of this study, forty middle aged men from the inhabitants of Ongole town, Prakasam District, Andhra Pradesh, India, were selected as subjects and their age ranged from 40 to 45 years. The selected subjects were randomly assigned into four equal groups of 10 subjects each. Group-I performed resistance training, group-II performed aerobic training, group-III performed combined resistance and aerobic training, and group-IV acted as control. The high density lipoprotein cholesterol level was selected as dependent variable. The research design of the study was random group design. The pre and post test data collected from the experimental and control groups on selected dependent variable were statistically analyzed by paired 't' test and Analysis of Covariance (ANCOVA). Since, four groups were involved, whenever the obtained 'F' ratio value in the adjusted post test mean was found to be significant, the Scheffe's test was applied as post hoc test. Further, percentage of changes was calculated to find out the improvement in high density lipoprotein cholesterol level due to the impact of experimental treatments. It was concluded that due to the effect of resistance training, aerobic training and concurrent resistance and aerobic training the high density lipoprotein cholesterol level of the middle aged men were significantly improved. Although, aerobic treatment was much better than resistance training and combined training in increasing high density lipoprotein level.

Key Words: *Resistance, aerobic and combined training, High density lipoprotein cholesterol level and Middle aged men*

INTRODUCTION

Cholesterol is the greatest health problem in our society but it is also essential to life. Cholesterol is not a deadly fat floating around in our arteries. Actually it is not fat at all, but rather an alcohol wax that at times behaves like fat. Cholesterol is a natural compound found in all animal tissues and is important for many structures and functions of our body. Cholesterol is one of the most important components of cell membranes, imparting stability and other properties. Cholesterol is also the precursor molecule for the synthesis of steroids, the largest group of hormones. Cholesterol and other blood lipids (fats and fat-like

substances) are fat-soluble and thus cannot float around freely in the water-like medium of the blood. For this reason they are packaged into lipoproteins-spherical molecular complexes that transport and regulate blood lipids. Nearly all of the cholesterol in the blood is carried by low-density and high-density lipoproteins, or LDL and HDL, respectively.

Much evidence now suggests that higher HDL cholesterol levels are associated with a lower risk of heart disease, and that low HDL cholesterol levels are associated with an increased risk of heart disease. Thus, HDL cholesterol appears to be "good." Many people don't like to hear it, but regular physical exercise may be the most effective way to increase HDL levels. Recent evidence suggests that the duration of exercise, rather than the intensity, is the more important factor in raising HDL cholesterol. Hence, exercise habits should be maintained year-round, year after to keep the benefits. This may look like an impossible task with personal effort needed for out weighting the possible reward. But once a regular pattern of exercise is established, activities become easy and natural. In fact, many people don't maintain their regular level of exercise (Vodak, 1995).

Though physical conditioning develops most of the components of fitness, it is expected that it will have an effect on lipoprotein profiles. Some modern texts seem to indicate that physical conditioning will strengthen all organs and all physiological functions of the body. Research work on the development and maintenance of physiological functions of human beings is an important area which requires a lot of investigation. By considering the above literature, in this study, an attempt has been made to compare the isolated and combined resistance and aerobic training for differences in their effectiveness on high density lipoprotein cholesterol level of middle aged men.

METHODOLOGY

Subjects and Variables

To achieve the purpose of this study, forty middle aged men from the inhabitants of Ongole town, Prakasam District, Andhra Pradesh, India, as subjects and their age ranged from 40 to 45 years. The selected subjects were randomly assigned into four equal groups of 10 subjects each. Group-I performed resistance training, group-II performed aerobic training, group-III performed combined resistance and aerobic training, and group-IV acted as control. The high density lipoprotein cholesterol was selected as dependent variable.

Training Protocol

Training programme was administered to the middle aged men for twelve weeks with three training units per week. The experimental group-I performed resistance training, group-II performed aerobic training and group-III performed concurrent resistance and aerobic training. The resistance training program was a total body workout consisting of 3 sets of 6-10 repetitions on 8 exercises that trained all the major muscle groups. A percentage of each subject's one-repetition maximum for each exercise was used to determine the intensity of each week. The intensity and number of repetitions performed for each exercise was progressively increased. The aerobic training consists of continuous running with 65-80% HRR. The running intensity was determined by a percentage of heart rate reserve (HRR). The intensity was increased as training progressed. Resistance training group performed only resistance exercises three days in a week for 12 weeks. Aerobic training group performed only aerobic training three days in a week for 12 weeks. Concurrent resistance and aerobic training group performed every odd numbered week resistance training in the morning session and aerobic training in the evening session. Every even numbered week they performed aerobic training in the morning session and resistance training in the evening session.

Collection of the Data

The data on high density lipoprotein cholesterol were collected prior to the commencement of experiment (pre test) and after twelve weeks of training period (post test). Both the pre and post tests were administered under identical conditions, with same apparatus, testing personal and testing procedures.

Statistical Technique

The data collected from the experimental and control groups on high density lipoprotein cholesterol were statistically analyzed by paired 't' test to find out the significant differences if any between the pre and post test. Further, percentage of changes was calculated to find out the chances in high density lipoprotein cholesterol level due to the impact of experimental treatment. In order to nullify the initial mean differences the data collected from the four groups prior to and post experimentation on high density lipoprotein cholesterol were statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). Since, four groups were involved,

whenever the obtained 'F' ratio value in the adjusted post test mean was found to be significant, the Scheffe's test was applied as post hoc test to determine the paired mean differences, if any. The level of confidence is fixed at 0.05 for significance.

RESULT

The pre and post test data gathered from the four chosen groups on high density lipoprotein were analyzed statistically and the derived outcomes are displayed in table-I.

Table-I: Analysis of 'T' Test on High Density Lipoprotein of Chosen Groups

Group	Test	N	Mean	SD	DM	%	't'
Resistance	Pre	10	41.80	1.03	1.70	4.06	7.96*
	Post	10	43.50	0.84			
Aerobic	Pre	10	41.40	1.07	3.70	8.93	9.34*
	Post	10	45.10	1.19			
Combined	Pre	10	41.30	1.15	2.00	4.84	13.41*
	Post	10	43.30	1.16			
Control	Pre	10	41.70	1.19	0.20	0.47	0.41
	Post	10	41.90	0.73			

** Table value for df 9=2.26 (0.05 level)*

The mean and also SD scores on high density lipoprotein of resistance, aerobic, combined training and control subjects during the two testing periods (pre & post) are 41.80 $\pm$ 1.03, 43.50 $\pm$ 0.84, 41.40 $\pm$1.07, 45.10$\pm$1.19, 41.30$\pm$1.15, 43.30 $\pm$ 1.16 and 41.70$\pm$1.19, 41.90$\pm$0.73 respectively. The derived 't' values (7.96, 9.34 & 13.41) are much higher than the mandatory value (df-9=2.26) for significant (0.05 level). It proved considerable variations between the initial and final scores (pre & post) of resistance, aerobic, combined training groups on high density lipoprotein. Though, insignificant (0.41) variation was observed in control group.

Table-II: ANCOVA Output on High Density Lipoprotein of Chosen Groups

Mean	Group				SoV	SS	df	MS	'F'
	Resistance	Aerobic	Combined	Control					
Adjusted	43.39	45.16	43.41	41.83	B	55.04	3	18.34	23.03*
					W	27.88	35	0.79	

(Table value for df 3 & 35 = 2.87) **Significant (.05 level)*

The adjusted post test mean values on high density lipoprotein of resistance, aerobic, combined training and control subject's (43.39, 45.16, 43.41 & 41.83) vary considerably as

the derived 'F' ratio (23.03) is more than the necessary value (df 3 & 35 = 2.87) for significance (0.05 level). As it is found significant the follow up test (Scheffe's) was utilized as in table-III, in order to discover the paired mean variations.

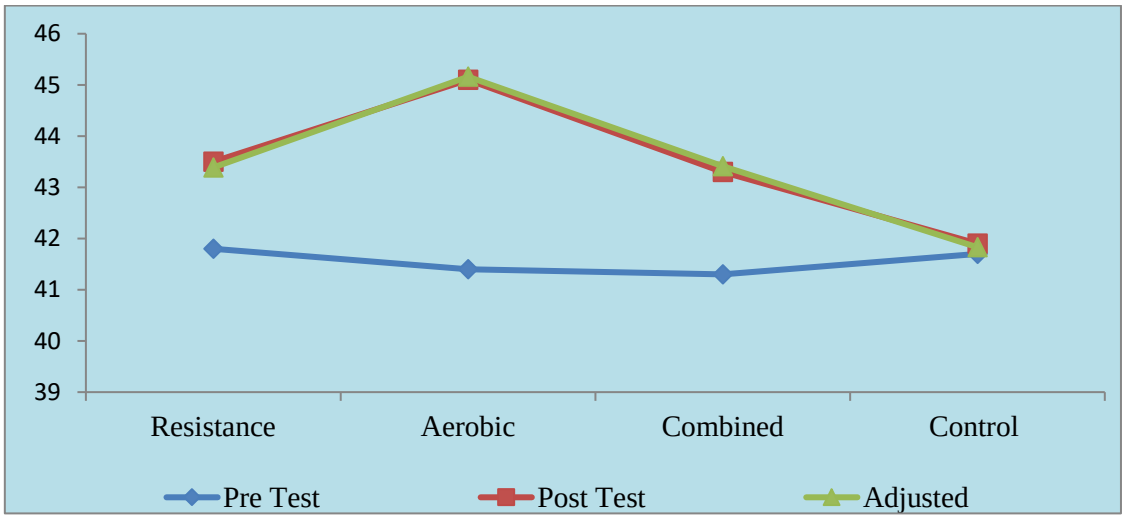
Table-III: Scheffe's Test Results on High Density Lipoprotein of Chosen Groups

Group's Adjusted Means				DM	CI
Resistance	Aerobic	Combined	Control		
43.39	45.16			1.77*	1.16
43.39		43.41		0.02	1.16
43.39			41.83	1.56*	1.16
	45.16	43.41		1.75*	1.16
	45.16		41.83	3.33*	1.16
		43.41	41.83	1.58*	1.16

*****Significant*

In response to resistance training (1.56), aerobic training (3.33) and combined training (1.58) the high density lipoprotein level was notably increased, although aerobic treatment was much better than resistance training and combined training in increasing high density lipoprotein, as these mean differences (1.77 & 1.75) were found higher than CI value (1.16). The pre, post and adjusted post test mean values found on high density lipoprotein of all groups are illustrated in figure-I.

Figure-I: **Diagram Showing the Pre, Post and Adjusted Post Test Mean Values on High Density Lipoprotein**



DISCUSSION

Activity levels have significant impacts on the lipids and lipoprotein levels of athletes (Kelley & Kelley, 2009). The possible reason for the elevation in HDL-C is exercise

training (Heitkamp *et al*., 2008). Altena *et al*., (2006) reported that 4 weeks of aerobic exercise training significantly increased HDL-C. Thirty minutes per day of vigorous exercise, like jogging, has sustained beneficial effects on HDL metabolism (Slentz, et al., 2007). Walking program improved the high density lipoprotein cholesterol (Ready et al., 1995; Irwin (2003); Fujino et al., (2002. According to Suter et al., (1990) jogging improved the high density lipoprotein cholesterol. Jafari et al., (2003) and Marti (1990) found that jogging improved the high density lipoprotein cholesterol.

Ades and Poehiman (1996) who studied the effects of numerous intervention trials in young subjects, suggest that aerobic exercise training exerts favourable effects on specific lipid sub fractions, in particular high density lipoprotein (HDL) cholesterol. Bonettle et al., (1995) suggest that exercise induces changes in the lipoprotein (a) in an untrained healthy individual. Increased physical activity induced a number of positive changes in the metabolism of lipoproteins. Triglycerides were lowered when the high density lipoprotein is increased. These above findings were supported by the study of Kin Jsier et al., (2001); Leon and Sanchex (2001), Leaksonen (2000), Lemura, Khare, Manchanda et al., (2000); Damodaran et al., (2002); Mahahan et al., (1999) and Schmidt (1997). In the present study beneficial changes in HDL cholesterol level in middle aged men was found hence, it is suggested that moderate intensity resistance and aerobic training can be included in the regular activities of middle aged people in order to elevate the HDL cholesterol level.

CONCLUSION

It was concluded that due to the effect of resistance training, aerobic training and concurrent resistance and aerobic training the HDL cholesterol level of the middle aged men were significantly improved. Although, aerobic treatment was much better than resistance training and combined training in increasing high density lipoprotein level. The result of the study produced 4.06% of improvement due to resistance training, 8.93% of improvement due to aerobic training and 4.84% of improvement due to concurrent resistance and aerobic training.

REFERENCES

Altena TS, Michaelson JL, Ball SD, Guilford BL, Thomas TR., (2006). Lipoprotein subfraction changes after continuous or intermittent exercise training, *Med Sci Sports Exerc*., 38: p 367-72.

Ades, P.A., Poehiman ET. (1996).The effect of exercise training on serum lipids in the elderly, *Am J Geriatr Cardiol.*, p.27-31.

Bonettle, A. et al., (1995). "Lipoprotein (a) and exercise", *The Journal of Sports Medicine and Physical Fitness,* 35(2): 131-134.

Damodaran, A. et al., (2002). "Therapeutic potential of yoga practices modifying cardiovascular risk profile in middle aged men and women". *J. Assoc. Physicians, India*. 50(5): 631-632.

Fujino, Y. *et al.,* (2002). "Walking exercise and its relationship to serum lipids in Japanese", *Journal of Epidemiol.,* 12(2).

Heitkamp, H. C., Wegler, S., Brehme, U., *et al*., (2008). Effect of an 8-week endurance training program on markers of antioxidant capacity in women, *J Sports Med Phys Fitness,* 48: p 113-119.

Irwin, M.L. *et al.,* (2003). "Effect of exercise on total and intra-abdominal body fat in postmenopausal women: A randomized controlled trial", *JAMA,* 289(3).

Jafari, M. *et al.,* (2003). "Evaluated the effects of physical exercise on plasma prebeta-1 high-density lipoprotein", *Metabolism,* 52(4).

Kelley, G. A., and Kelley, K. S., (2009). Impact of progressive resistance training on lipids and lipoproteins in adults: a meta-analysis of randomized controlled trials, *Prev Med*., 48: p 9-19.

Kin, Jsler A., Kosar SN, Korkusuz, F., (2001)."Effect of Step Aerobics and Aerobic Dancing on Serum Lipids and Lipoproteins", *J. Sports Med. Phys. Fitness*, 41(34): 380-05.

Leaksonen, D.E. et al., (2000). "Aerobic exercise and the lipid profile in Type-I diabetic men; A randomized controlled trail", *Med. Sci. Sports Exerc.*, 32(9): 1541-8.

LeMura, LM. et al., (2000). "Lipid and lipoprotein profiles, cardiovascular fitness, body composition and diet during and after resistance, aerobic and combination training in young women", *Euro J. Appl. Physiology*, 82(5:6): 451-8.

Leon, A.S., and Sanchez, O.A., (2001)."Response of blood lipids to exercise Training alone or combined with Dietary intervention", *Med. Sci. Sports Excerc*., 33(6): 502-15.

Mahahan A.S., Reddy KS., and Sachdeva, U. (1999). "Lipid profile of coronary risk subject following yogic lifestyle intervention", *Indian Heart* J., 51(1): 11-24.

Marti, B., *et al.*, (1990). "Effects of long-term, self-monitored exercise on the serum lipoprotein and apolipoprotein profile in middle-aged men", *Atherosclerosis,* 81(1).

Ready, A.E. *et al.,* (1995). "Walking program reduces elevated cholesterol in women postmenopause", *Canadian Journal of Cardiology,* 11(10).

Schmidt, T. et al., (1997). "Changes in cardiovascular risk factors and hormones during a comprehensive residential three months Kriya Yoga training and vegetarian nutrition", *Acta Physio.Scand Supp*., 640(12): 158-62.

Slentz CA., et al., (2007), "Inactivity, exercise training and detraining, and plasma lipoproteins, STRRIDE: A randomized, controlled study of exercise intensity and amount", *J Appl Physiol*., 103(3): 432-42.

Suter, E. *et al.,* (1990). "The effects of self-monitored jogging on physical fitness, blood pressure and serum lipids: A controlled study in sedentary middle-aged men", *International Journal of Sports Medicine,* 11(6).

Vodak, Paul. (1995). *Prevent Heart Disease, Exercise For A Healthy Heart,* BWL Publishing Company, USA, P. 9