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Research Article

Effects of different resistance exercises on serum cholesterol among college students

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■ **ABSTRACT**

Different resistance exercise is gaining broad acceptance as a complement to prevention of cardiovascular risk factors. This article reviews the most current and reliable literature regarding the biological mechanisms for college women subjects. Forty bachelor of physical education female students (n=40) were randomly selected as subjects and their age ranged between 20 and 24 years. The selected subjects were randomly assigned into two equal groups such as experimental group (EG) and control group (CG) with twenty subjects each (n=20). The experimental groups underwent their respective experimental treatment for twelve weeks three days per week and a session on each day. Control group was not exposed to any specific training apart from their curriculum. Serum cholesterol was taken as variable for this investigation. Analysis of covariance (ANCOVA) was used to analyze the collected data. The results revealed that the experimental group (EG) produced significant improvement (p = 0.05) due to resistance training on serum cholesterol when compared to control group (CG).

■ **Key Words :** Resistance exercise, Total cholesterol

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Resistance training has been become the most widely accepted method for improving muscular strength and power (Kraemer, 1994). The adaptational changes and health implications of resistance exercise are very dynamic and variable to each individual. Youth sports have become more popular and in many ways, more competitive. Many young athletes and parents are seeking way to achieve a competitive edge. Many precious studies have explored the effect of different resistance training frequencies on developing muscle strength and size of adolescents (American College of Sports Medicine, 2000). Resistance training may be isotonic in design. This means that some part of the body is moving against some type of force. Heart rate is acutely elevated immediately following a workout and affected by the amount of resistance, the number of repetitions and the muscle mass involved in the contraction (Fleck, 1988).

Serum cholesterol is the sum of all the cholesterol in the blood. It is used to produce hormones and cell membranes and is transported in the blood plasma of all mammals (Emma, 2009). It is a waxy steroid of fat that is produced in the liver or intestines. In addition, cholesterol is an important component for the manufacture of bile acids, steroid hormones, and vitamin D. Cholesterol is an important and necessary for mammals, high levels of cholesterol in the blood can damage arteries and are potentially linked to diseases such as those associated with the cardiovascular system (Pearson *et al.,* 2003). The liver is the major production factory for cholesterol (about 70%). High cholesterol levels are strong indicators of those individuals that are prone to coronary heart disease (Olson, 1998). Elevated total cholesterol is a risk factor for coronary heart disease. The build-up of plaque in the artery may lead to narrowing (high blood pressure) or complete blockage (heart attack) of the vessel (Tymoczko *et al.,* 2002). As levels rise above 180 mg/dl, the risk for developing coronary

heart disease increases (American Heart Association, 2008). A reduction of 1per cent is shown to reduce the risk for coronary artery disease by 2 per cent for levels over 200 mg/dl (Gordon *et al.,* 1995). Resistance exercise helps to reduce the cholesterol level (Lyndon *et al.,* 1999 and Durak *et al.,* 1990). Two types of cholesterol: Good cholesterol or high density lipoprotein (HDL) and a bad cholesterol or low-density lipoprotein (LDL). In this study, resistance exercise has been applied to normalize the level of cholesterol in body.

■ METHODOLOGY

Forty female students (n=40) studying Bachelor of Physical Education, Department of Physical Education, Annamalai University, Tamil Nadu, India were selected as subjects and the age of students were between 20 and 24 years. The selected subjects were randomly divided into two equal groups of twenty subjects each (n=20). The groups were one experimental group (EG) and one control group (CG). During the training period, the experimental groups underwent their respective training programme for twelve weeks 3 days per week and a session on each day apart from their regular activities. Control group (CG), who did not participate in any specific training apart from their curriculum. Moderate intensity (60-70%) of resistance was used in this experimentation. Total cholesterol was selected as dependent variable for this study. It was measured by Oxidase enzymatic method using Boechringer Mannheim kit. These are the exercise used as a resistance 1.bench press 2. squat 3.push press 4. heel raises 5. arm curl 6. leg curl 7. leg press 8. shoulder press 9. sit ups.

Data analysis :

Mean and standard deviation were calculated for total cholesterol for each training group. And the data were analyzed by using analysis of covariance (ANCOVA). Statistical significance was fixed at 0.01 and 0.05.

■ OBSERVATIONS AND DISCUSSION

Table I shows that the pre-test mean of experimental and control groups were 168.82 and 171.47, respectively. The obtained F ratio of 0.93 for pre-test mean was less than the table value 4.10 for df 1 and 38 required for significance at 0.05 level and table value 7.35 for df 1 and 38 required for significant at 0.01 level. The post-tests mean of experimental and control groups are 142.17 and 169.62, respectively. The obtained F ratio of 76.66 for post-test mean was higher than the table value 4.10 for df 1 and 38 required for significance at 0.05 and table value 7.35 for df 1 and 38 required for significant at 0.01 level. The adjusted post-test mean of experimental and control groups were 142.11 and 169.62, respectively. The obtained F ratio of 73.56 for adjusted post-test mean was also higher than the required table value 4.11 for df 1 and 37 required for significant at 0.05 and 7.37 for 0.01 level (Fig.1).

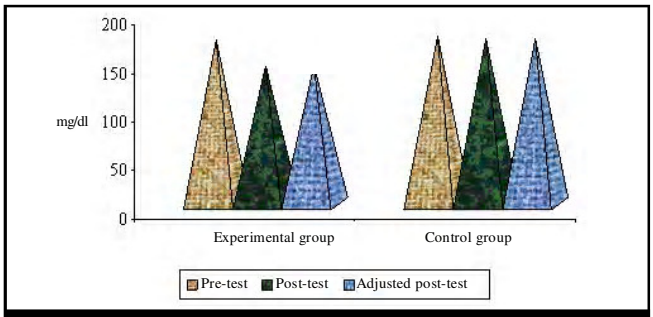

Fig. 1 : The pre-post and adjusted post-test mean values of experimental groups and control group on serum cholesterol

The result of the study indicated that there were significant differences between the post-test and adjusted post-tests mean of resistance exercise group and control group on cholesterol at 0.05 and 0.01 levels.

Many researches have revealed that different types of resisted exercises help to normalize serum cholesterol. Recent overviews have indicated that a 1per cent reduction in a person's total serum cholesterol level yields a 2 to 3 per cent reduction in the risk of coronary heart disease (Manson *et al.* 1992). Resistance exercise is one of the best training to improve physical fitness and muscle strength of female students (George and Thomas, 2011). Physical fitness can help to normalize the blood cholesterol level. The association between

Table 1 : Analysis of covariance on serum cholesterol of experimental group and the control group

Test		Experimental group	Control group	SOV	SS	df	MS	F- ratio
Pre-test	Mean	168.82	171.47	B	69.72	1	69.72	0.93
	SD	11.07	5.17	W	2836.57	38	74.65	
Post-test	Mean	142.17	169.56	B	7504.59	1	7504.59	76.66*
	SD	13.18	4.71	W	3720.01	38	97.90	
Adjusted post- test	Mean	142.11	169.62	B	7385.27	1	7385.27	73.56*
				W	3714.79	37	100.40	

F = (df 1, 38) (0.05) = 4.10 and (0.01) = 7.35; (P ≤ 0.05) and (P ≤ 0.01), F = (df 1, 37) (0.05) = 4.11 and (0.01) = 7.37; (P ≤ 0.05) and (P ≤ 0.01)

high serum cholesterol levels and the incidence and severity of coronary heart disease (CHD) is so pronounced in epidemiological studies that the National Heart, Lung and Blood Institute recognize this association as causal (Expert Panel, 1993) . Hurley *et al.* (1988) reported a 13 per cent increase in HDL cholesterol following 16 weeks of heavy strength training. Wallace *et al.* (1991) and Johnson *et al.* (1982) both reported positive changes in lipid profiles, but only during the highest volumes of training. Goldberg *et al.* (1984) showed that a programme emphasizing high volume with short rest periods increased HDL while decreasing LDL and serum triglycerides. Epidemiological research has decisively demonstrated that low concentrations of total cholesterol and low-density lipoprotein cholesterol (LDL-C) and high levels of high-density lipoprotein cholesterol (HDL-C) are associated with a decrease in coronary heart disease (Kannel, 1983). Several investigators have reported favourable changes in blood lipids and lipoproteins following a strength training intervention (Kokkinos *et al.,* 1990 and Braith and Stewart, 2006). It is evident from a number of the adaptations that occur with resistance training that there are several health-related benefits. Resistance training has been shown to reduce factors associated with coronary heart disease, diabetes and osteoporosis (Kohl *et al.,* 1992 and Manning *et al.,* 1991). Heart rate is acutely elevated immediately following a workout and affected by the amount of resistance, the number of repetitions and the muscle mass involved in the contraction (small vs. large mass exercises) (Fleck, 1988; Prabhakaran *et al*., 1999 and Thomas *et al.,* 1993). Interestingly, in terms of chronic adaptations, there appears to be a reduction in heart rate from resistance training, which is considered beneficial (Stone *et al.,* 1991). From the results of the present study and literature, it is concluded that the serum cholesterol was significantly reduced due to resistance exercise.

Conclusion :

Prevailing evidence supports the concept that physical exercise can help slow the progression of coronary heart disease (CHD). As health and fitness practitioners, designing exercise programmes that alter the individual's total cholesterol in a positive way is an important component to be included in programme objectives. Until specific recommendations based on further research are developed, we recommend resistance exercises as the best method to normalize cholesterol level. This study is concluded that there was a significant reduction on serum cholesterol due to resistance exercise during the age between 20 and 24 years of female college students.

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