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INFLUENCE OF WALKING, JOGGING AND RUNNING EXERCISES MODERATES THE SELECTED LIPIDS AND LIPOPROTEINS ON MIDDLE AGED MEN

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Abstract

Active life style is the essential requirement for an individual to preserve the well desired health and wellness. Though there is no consensus on the concept of active lifestyle, physical educationists all over the world are trying to find out various means and methods to protect the health of individuals through active life style elements. The present study is aimed to achieve the effect of walking, jogging and running exercises on selected lipids and lipoprotein parameters which normally are considered as risk factors in the Coronary Heart Disease in middle-aged men in the age of 35 to 40 years. Forty men subjects of teaching and non teaching staffs were assigned to four groups, Department of Physical Education and Sports Sciences, Annamalai University. Selected subjects were three experimental groups and one control with ten members in each group. They are Group I as control, Group II as walking; Group III as jogging and Group IV as running. The duration of experimental period is 3 months (3 days /week).Walking; jogging and running exercises were performed by the experimental groups whereas the control remain as normal with the sedentary life. The Training Programme is scheduled by the research scholar of the Physical Education Department. Selected Biochemical variables such as Total cholesterol, Triglycerides, HDL and LDL were analyzed before and after the training period. Biochemical analysis was done by the concerned Biochemist, Department of Biochemistry, Rajah Muthiah Medical College, Annamalai University. Data were collected and statistically analyzed using ANOVA and DMRT. The resulting data revealed that 12 weeks of walking, jogging and running exercises were found to be benefitted in modifying the lipids and lipoprotein levels among middle aged men compared to control. It is predominantly effective in running men than other exercise groups. Hence the study concluded that running exercise prevails in retaining the normal healthy body and obstruct from various coronary heart diseases.

Keywords: Walking, Jogging, Running, Total cholesterol, Triglycerides, HDL, LDL

Introduction

A sedentary lifestyle is a major risk factor for coronary vascular disease (CVD) in the general population. Engaging in any activity such as housework or shopping is better than living a purely sedentary lifestyle, but participating in a planned exercise program will reap even more cardiovascular benefits especially for elders. Walking may be an ideal exercise for older adults because it is safe, cheap and easy to do (Riegel and Bennett, 2000). Regular aerobic exercise has been reported to improve cardiovascular function and assist in the prevention and control of hyperlipidemia, hypertension and diabetes mellitus (Thompson etal., 2003).

Numerous studies in middle-aged (40 to 65 years of age) and, to a lesser extent, older persons have shown that the major risk factors for coronary heart disease (which include cholesterol level, blood pressure, and cigarette smoking) are predictive of long-term outcomes in these age groups (Anderson etal., 1987; Stamler etal.,1993; Stamler etal.,1998; MacMahon etal., 1990).

In addition, primary and secondary prevention trials have convincingly shown benefits of reduction of certain risk factors, such as dyslipidemia and hypertension, in middle-aged and older adults (The Scandinavian Simvastatin Survival Study 1994; National Cholesterol Education Program 1993; National Blood Pressure Education Program, 1997). However, equally compelling data from observational studies or clinical trials are almost nonexistent in young adults (Berenson etal., 1998; Anderson etal., 1987; Klag etal.,1993). All major risk factors—age, serum cholesterol level, systolic blood pressure, and cigarette smoking—were significantly associated with death from coronary heart disease over 20 years in young men. Relative risks for the major risk factors were of generally similar magnitude in young and middle-aged men.

Physical exercise can lower the risk of CVD by a number of mechanisms. Exercise alone or in

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combination with dietary modifications can make lipid disorders, insulin resistance, and inflammation better in high-risk populations (Gill and Malkova 2006; Roberts etal.,2002; Roberts etal.,2006; Varady and Jones, 2005). Research has shown that long-term exercise training improves endothelial function, increases nitric oxide (NO) availability and reduces hypertension in patients with CVD (Kingwell, 2000; Higashi and Yoshizumi, 2004). Exercise training also induces the expression of antioxidant and anti-inflammatory mediators in the vascular wall that may directly inhibit the development of atherosclerosis (Wilund, 2007).

In general active lifestyle has been recognized as the very best source, to maintain and develop optimum fitness levels especially of health related physical fitness. Inactive and indolent lifestyles would cause to increase various precipitating factors of deadly degenerative diseases like diabetes mellitus, hypertension, coronary heart disease etc. American college of sports medicine endorses the idea of active life style, to protect one's health in good condition and to escape from various degenerative diseases mentioned earlier.

The importance of exercise in a program of preventive medicine has reinforced the role of physical activity. There is relationship between physical activity levels or cardio-respiratory fitness and risk of fatal and nonfatal Ischemic Heart Disease indicate that a sedentary lifestyle or a low level of habitual physical activity increases the risk of IHD mortality. Higher level of circulating lipids in blood than normal levels may be considered as Hyperlipidemia and epidemiological studies indicate a general trend towards a greater incidence of Atherosclerosis and incidence of Cardio Vascular Disease among people with Hyperlipidemia. The percentage of Triglycerides is the most significant factor that the total cholesterol level as a risk factor in the development of CHD, because this substance involves in the development of the athrerosclerotic plaque in the blood vessels.

Physical exercises may be performed in many forms like running, dancing, playing games, weight training, recreational activities, yogasanas etc. The kind and type of exercise alone do not influence the kinds of biological adaptations in the human body. The load dynamics like density and intensity of exercise may target for different kind of biological adaptations in the human body. The benefits of physical activity include lowered blood pressure (Tipton, 1991; Arroll and Beaglehole, 1992), increased insulin sensitivity (Mayer-Davis etal., 1998; Houmard etal., 2004), elevated HDL-cholesterol levels (Kraus etal., 2002), and improved endothelial function(Clarkson etal., 1999). To our knowledge, however, no prospective study has reported these effects of exercise in Asian countries, where the prevalence of job-related physical activity has been reported to be high (Kromhout etal., 2001).

In the current study we examined the relationship between physical activities through walking; jogging and running program influenced the moderations of coronary risk factors on middle aged men.

Methodology

Selection of subjects

Forty middle aged men of teaching and non-teaching staffs were randomly selected as subjects from the Department of Physical Education and Sports Sciences of Annamalai University and their age ranges between 35-40years. Selected subjects were divided into four groups with ten members in each.

Experimental design

The study was intended to investigate the effect of walking, jogging and running training programme on selected coronary risk factors among middle aged men. The subjects in the entire four groups were oriented on the whole experimentation and its importance. Each group was thoroughly oriented about the exercise protocol of the respective group. Pre experimentation measurements were recorded for selected biochemical variables before the commencement of the experimentation and orientation period. The three training groups then followed the respective protocols of exercise specially designed for them, whereas the control group remained without any special kind of physical activity for the entire experimentation period of three months, one month basic foundation followed by two months of the protocol exercises by increasing their intensity, load dynamics and speed. The researcher took all the necessary precautions to see that all the subjects comply with the experimentation environment. The post experimentation readings were taken after the three months of experimentation period.

Group I acts as Control Group (without training) who did not participate any special training apart from the regular activities.

Group II –under went walking starts their workload with low intensity to medium intensity and for twelve weeks (3days/week)

Group III- served as jogging training group for twelve weeks (3days/week).

Group IV served as running group and the training initiated with low intensity to medium intensity workload. Training was conducted in the Department of Physical Education and Sports Science Annamalai University for a period of 3months (3days/week).

Training Programme

The experimental group underwent the exercise training consisted of 40 to 60minute sessions divided into five stages: warm-up (5 to 10 minutes); principal aerobic activity (10 minutes); cool-down (3 to 10 minutes); localized work (10 to 25 minutes); and stretching (5 to 15 minutes). During the principal activity, the intensity of the exercise was controlled by the heart rate, with the target rate being between 140-160 beats/min (American Heart Association).

Initial training with low intensity for few weeks (50%workload) and extended upto 75% work load to reach the target level.

Exercise Training Protocol – (Sports Medicine-www2.massgeneral.org/.../protocols/)

General Instructions

Progression from walking to jogging to running

- Walking /jogging /running should be done no more than three time a week.
- The program should be performed step by step. Do not advance your program until you can successfully completed the initial step. Let pain and swelling be your guide. If the activity creates pain, swelling or causes you to limp, go back to the previous step.
- Before starting the program and after completion of the program, allow 15 minutes to perform stretching exercises.
- Ice the injured area for 20 minutes after stretching.
- Training programme is performed for 12 weeks (3days/week). The protocol is followed for the rest of the weeks to complete the training programme. Continue to increase distance by 1/4 mile per session until you reach your desired distance. The speed and the distance is increased upto the training period and the subjects performed at the endphase.
- For distance runners, you can continue to increase distance by 1/4 mile per session until you reach your desired distance. when you have reached your training distance without causing any pain or swelling, and have a normal running form, you can gradually start to increase your running speed.
- Be careful to be sure that you warm-up well and stretch lightly before workout, and stretch well again after workouts. generally, you should do some walking, cycling or jogging so that you break a sweat before starting the running program. You should then stretch before beginning the running drills. Ice your knee for 20 minutes following workouts after stretchng again as you are cooling down.
- The initial exercise dosage was prescribed individually. At the beginning of training, the steady state heart rate of every subject was measured manually during a performance of the endurance exercise. Intensity was progressively increased until the frequency of 140 to 160 beats per min was reached.
- Training started at this work load and was thereafter adjusted to meet changes in the performance capacity of the subjects. Adjustment was made periodically (once a week in the early phase of the study and later once a month) after measuring subjects' heart rates. Although a heart rate of 140 to 160 beats per min was generally the intensity objective, this objective was reduced whenever musculoskeletal complaints so dictated. All training sessions were conducted by the same trainer, together with an assistant. They taught the subjects to carry out their programs independently.

Phase1	Walking training programme			
Monday	Walk	1/4 Mile	Easy pace	1/2 Speed
Wednesday	Walk	1/4 Mile	Speed	3/4 Speed
Friday	Walk	1/4 Mile	Briskly	Full Speed
Phase2				
Monday	Walk	1/2 Mile	Easy Pace	1/2 Speed
Wednesday	Walk	1/2 Mile	Speed	3/4 Speed
Friday	Walk	1/2 Mile	Briskly	Full Speed
Phase3				
Monday	Walk	3/4 Mile	Speed	Speed
Wednesday	Walk	3/4 Mile	Briskly	Full Speed
Friday	Walk	1 Mile	Comfortable Pace	3/4 Full Speed

Phase1	Jogging training programme			
Monday	Jogging	1/4 Mile	Comfortable Pace	Walk mile 3/4
Wednesday	Jogging	1/2 Mile	Comfortable Pace	Walk Mile 1/2
Friday	Jogging	3/4 Mile	Comfortable Pace	Walk Mile 1/4
Phase2				
Monday	Jogging	3/1 Mile	Comfotable Pace	Walk Mile 1/4
Wednesday	Jogging	1 Mile	Normal	1 repetition
Friday	Jogging	1 Miless	Normal	1 repetition
Phase3				
Monday	Jogging	1/2 Speed	100mts Continue	2 repetitions
Wednesday	Jogging	3/4 Speed	100mts Continue	2 repetitions
Friday	Jogging	1Mile	Normal	2 repetitions

	Running training programme			
Frequency : 3 times per week, Repeat previous steps can be skipped if the running causes no problems.				
Phase 1				
Monday	Brisk Walk	3/4 Mile	Speed	Speed
Wednesday	Brisk Walk	3/4 Mile	Briskly	Full Speed
Friday	Run	1/4 Mile	Comfortable Pace	3/4 Full Speed
Phase 2				
Monday	Run	1/2 Speed	100Yards Continue	2 repetitions
Wednesday	Run	3/4 Speed	100Yards Continue	2 repetitions
Friday	Run		Full Speed	2 repetitions
Phase3				
Monday	Zig-Zag –Run	Round Corner	50 Yards	5 repetitions
Wednesday	Forward-Run Backward-Run	Gradual Stop	25 Yards	4 repetitions
Friday	Normal –Run	Continous	100 Yards	3 repetitions

Testing variables

Selected Biochemical variables include Total Cholesterol, Triglycerides, LDL and HDL was analyzed using Boehringer-Manheim Kit method. The Biochemical analysis was done by the concerned Biochemist in the Department of Biochemistry, Rajah Muthiah Medical College, Annamalai University, Chidambaram.

Statistical analysis

Biochemical variables were assessed before and after 3 months of training. The resulted data were collected and analyzed using ANOVA and the group means were compared by Duncan's Multiple Range Test (DMRT). There differences was considered to be significant when $p \leq 0.01$.

Results

Table 1 Changes in the levels of Total cholesterol and triglycerides in control and experimental training groups

Groups	Total cholesterol (mg/dl)	Triglycerides(mg/dl)
Control	219.22 ± 0.08^{a}	155.4 ± 0.2^{a}
Walking	200.05 ± 0.03^{b}	152.45 ± 0.3^{b}
Jogging	195.39 ± 0.02^{c}	150.14 ± 0.2^{c}
Running	190.04 ± 0.02^{d}	147.93 ± 0.3^{d}

Data represents mean± SD from 10 subjects in each group.
Values not sharing a common superscript letter (a,b,c,d) differ significantly at p<0.01(Duncan'smultiple range test)
Group comparison: Group one with all, Group 2 and 3 with 4.
The table value required for significance at 0.01 level of confidence with df 3 and39 is1.697

Table 2 Changes in the levels of HDL and LDL in control and experimental training groups

Groups	HDL (mg/dl)	LDL(mg/dl)
Control	39.52± 0.2[a]	134.9± 0.1[a]
Walking	42.56±0.1[b]	132.03±0.01[b]
Jogging	49.79±0.3[c]	130.06± 0.03[c]
Running	60.07± 0.2[d]	127.04±0.03[d]

Data represents mean± SD from 10 subjects in each group.
Values not sharing a common superscript letter (a,b,c,d) differ significantly at p<0.01(Duncan'smultiple range test)
Group comparison: Group one with all, Group 2 and 3 with 4.
The table value required for significance at 0.01 level of confidence with df 3 and39 is1.697

In Table 1 and 2 shows the levels of cholesterol, triglycerides, HDL and LDL in control and experimental groups. A significant increase in HDL and decrease in cholesterol, triglycerides and LDL were found in middle-aged men of experimental groups when compared to control. Twelve weeks of exercise training program shows better moderation on selected coronary risk factors in running men when compared to walking and jogging groups.

Discussions

The result of the study indicate that the running group significantly improved the HDL level and decreased the LDL, Total cholesterol and Triglycerides among middle aged men. It is also observed that 12 weeks of running exercise program produced better effect in modifying the selected coronary risk factors than other groups.

Exercise plays important role to decrease cholesterol level. Exercise can be divided into two categories. Firstly, anaerobic exercise and second is aerobic exercise. The anaerobic exercises are which the body system will use glycogen to increase energy in the body. But the aerobic exercise is which oxygen to increase energy in the body. In the other word, aerobic exercise is an activity that can do in prolonged period. If we want to decrease the cholesterol level, we must use the aerobic exercise. However, we must know the principles of exercise. According to Powers and Howley (2001), the exercise dose is usually characterized by the intensity, frequency, duration, and type of activity.

Previous studies show that doing exercises, increase HDL cholesterol level in the body system (Hardman, 1989; Hill, 1989; Shepard, 1980). HDL cholesterol identified as good cholesterol. In the blood stream, HDL cholesterol removes cholesterol from blood and tissue cells. HDL cholesterol may also be able to collect cholesterol from the plaque, reversing the process that leads to heart attacks.

Powers and Howley (2001) said, fats are primary fuel source for muscle during low intensity exercise (i.e. <30% VO 2 max), whereas carbohydrate is the dominant substrate during high-intensity exercise (i.e.>70% VO 2 max). The influence of exercise intensity on muscle fuel selection illustrated that exercise intensity increases, there is a progressive increase in carbohydrate metabolism and a decrease in fat metabolism. Therefore, the level of fat reduces triglyceride. Triglyceride is one of the cholesterol elements in the blood vessels.

Jamaluddin and Khairul (2003) state that HDL cholesterol more than LDL cholesterol, carries the LDL cholesterol from the blood vessels and sends it to the liver. Therefore, it cannot build up in artery walls and block the free flow of blood. Instance, there is great benefit in bringing HDL numbers up and even greater benefit by doing both – lowering LDL / increasing HDL cholesterol. Lowering LDL cholesterol is easier to do than raising HDL cholesterol. Lowering LDL cholesterol usually using B3 (Niacin) and other method of medications. But, raising HDL cholesterol must be adhering when go out for exercise.

Many researchers have been done the research concerning exercise and heart disease. Williams (1988), has done a research to asses the relationship of exercise amount and exercise intensity to coronary heart disease risk factors measured cross-sectional in runners. In this research subjects' reported average running amount (kilometers run per week) and running intensity during their best recent 10-km race (kilometers per hour) in 7059 male and 1837 female recreational runners. Ten kilometer race velocity (kilometers per hour) is known to be related to exercise intensity during training.

Research finding has shown exercising more intensely could improve coronary heart disease risk factor level beyond that achieved by exercise amount alone.

Urata et al. (1987) has done a research about effect of mild aerobic exercise on serum lipids and apolipoproteins in patients with coronary artery disease. Activities were examined in 11 male patients with coronary artery disease and 4 healthy male controls. The mild aerobic exercise program involved exercise intensity at 50% of maximal oxygen uptake, as determined from the blood lactate threshold, for 60 min periods 3 times per week for 10 weeks. Following mild aerobic exercise, serum levels of high density lipoprotein cholesterol (HDL-C) were increased significantly from 50 + 11mg/dl ($P<0.05$) with a simultaneous increase in apoliporpotein A-1 (apo A-1) in normal controls. There was significant correlation between the initial HDL-C level and the change in HDL-C level following the exercise program in the combined group of normal controls and patients with coronary artery disease.

Moreover, although evidence to the contrary exists (Brownell etal.,1982; Durstine and Haskell 1994; Horby-Petersen etal.,1982), it is generally believed that exercise training causes favorable changes in blood lipids and lipoprotein cholesterols (Durstine and Haskell 1994; Kiens etal.,1980; King et al.,1995; Thompson etal., 1988; Tran etal.,1983). On this basis, exercise is typically included in the treatment paradigm for those with high-risk lipid profiles (Fletcher, 1992; National Cholesterol Education Program 1993). However, well-controlled comparative training studies in men with above-average cholesterol are rare and currently inconclusive. TC, LDL-C, TG, and HDL-C concentrations are variously reported to be raised, lowered, or unchanged in hypercholesterolemic men after exercise training (Altekruseand Wilmore 1973; Holloszyetal., 1964; Huttunen etal., 1979; Superko and Haskell, 1987; Sutherland etal., 1983). Conclusions that can be drawn from these published studies are limited by the absence of a control group (Altekruseand Wilmore 1973), differences among studies in mode and volume of training, subject pretraining lipid levels, diet control, and genetic basis for the elevated cholesterol, as well as by a failure to control for the acute effects of the most recent training session (Holloszyetal.,1964; Huttunen etal.,1979; Superko and Haskell, 1987).

Stan Reents (2007) suggest, running is an excellent component of a weight-loss program. Distance running also provides beneficial effects for many chronic diseases. When studying the effects on blood lipids he found that Marathon runners have higher HDL values (ie., the "good" cholesterol) than joggers, who, in turn, have higher HDL values than inactive men: marathon runners: 65 mg/dl joggers: 58 mg/dl inactive middle-age males: 43 mg/dl

This observation was attributed to how much a person ran not dietary factors (Hartung GH, et al. 1980). Other studies support this. In middle-aged men, beneficial effects on blood lipids were seen in men who ran 7-14 miles per week but less dramatic effects were seen in men who ran less than that (Kokkinos PF, et al. 1995).

Persons who engage regularly in running and other endurance activities are not only leaner and more physically fit than generally sedentary individuals, but also are reported to have higher plasma concentrations of high-density lipoprotein cholesterol (HDL-C) and lower concentrations of total cholesterol, low-density lipoprotein cholesterol (LDL-C), very low-density lipoprotein cholesterol (VLDL-C), and triglycerides than sedentary control subjects (Wood and Haskell1979; Lehtonen and Viikari, 1978; Hartung etal.,1980; Enger etal., 1977). However, it is not well understood how amount(weekly dose) and duration (the length of time since initiating the activity) of exercise alters plasma lipid and lipoprotein levels, adiposity, and fitness, perhaps due to two common limitations of previous studies.

However many cross-sectional studies have selected runners, joggers,skiers, etc, participated in their sport for many years, while the few reported controlled longitudinal training studies have generally been limited to six months of training, and more frequently have been restricted to much shorter periods(Huttunen etal.,1979; Keins etal., 1980).This report first investigates a potential self-selection effect, that is, the possibility that individuals with certain lipid profiles may be more readily persuaded to adopt active lifestyles. Such an association would suggest that the several cross-sectional studies (Lehtonen and Viikari, 1978; Hartung etal., 1980; Enger etal., 1977) comparing lipoprotein levels among people with different reported activity levels offer inadequate support of the hypothesis that endurance sports elevate HDL-C and lower triglyceride, LDL-C, and VLDL-C plasma concentrations. In our study, undergoing 12 weeks of walking, jogging and running program initiated with the low intensity to moderate intensity significantly alters the cholesterol, triglycerides, LDL and HDL levels in middle aged men compared to control. Better effect was produced by running groups then other training men. It also focuses on the main issue of the relationship between running dose (in average miles per week) and physiological response over time in the setting of a three months randomized, controlled trial of initially sedentary men. Since exercise is the promoted intervention in this experiment, the presence of a pronounced dose-response relationship between adopted exercise levels and changes in lipids and lipoprotein levels would strongly suggest that exercise training induces changes in lipoprotein concentrations.

Conclusion

It is concluded that 12 weeks of training exercises promotes to a healthy life among middle aged men. Running exercise found to be more effective in retaining the HDL, and altering the coronary risk factors than walking and jogging. Running on middle aged men with moderate intensity totally changes the lifestyle activities and they were found to be very active, confident in their daily life. They were free from stress and make them selves ideal men.

However, it should be noted that more strenuous training programs that cause more beneficial changes in CHD risk factors may not be the most attractive ones for the elderly population because they may pose some risks for the elderly. In order to assure high compliance and attendance, exercise programs should be made attractive for them. We can propose that physical exercise should be made a life-long activity to optimize health-related benefits. Thus, exercising for 30-60 min per day, three days per week, at moderate intensity (60-65% of VO-2max) may lead to some health-related benefits, including improved blood pressures, body weight, BMI and cardio respiratory fitness (VO2max). However, if more favorable changes in most of the CHD risk factors are desired, a higher-intensity, longer-duration running program accompanied with diet is advisable.

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