EFFECTS OF MORNING AEROBIC TRAINING ON LIPID PROFILE, BODY COMPOSITION, WHR AND VO_{2max} IN SEDENTARY OVERWEIGHT FEMALES

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Abstract

Aim: The fundamental cause of obesity and overweight is an energy imbalance between calories consumed and calories expended and a decrease in physical activity due to the increasingly sedentary persons. This study examined the effects of morning aerobic training on lipid profile, body composition, WHR and VO2 max in sedentary overweight females. Material and Method: 20 overweight (OW) subjects with mean age of 40.2 ± 6.2 years, mean height of 158.70 ± 5.96 cm and mean body weight (BW) of 65.81 ± 7.89 kg, assigned to training group (n=10) and control group (n=10) randomly. Aerobic Training consisted of 8 weekly period and 6 days per week was applied to subjects. Before and after the training period, the body fat percentage (BF), body mass index (BMI), the waist to hip ratio (WHR), blood lipid parameters (TG, CH, LDL, HDL), VO_{2Max} were measured. Results: The results showed that there were significant differences ($p<0.05$) between pre and post test values of LDL, HDL, BMI,WHR,VO_{2Max} and weight in the training group. Conclusions: 8-weeks morning aerobic training had significant effect on LDL, HDL, BMI, VO_{2Max} and weight except to TG. It could be concluded that the negative effects of sedentary living on individuals are decreased with morning aerobic training.

Keywords*: morning aerobic training, lipid profile, overweight, VO_{2max}*

Introduction

A sedentary life-style is associated with an increased risk for acute myocardial infarction and death from coronary heart disease (CHD) (Kokkinos et al, 1995). It is widely known that CHD is one of the main causes of death in most countries (Buyukyazi, 2008).This risk is approximately twice as high in sedentary persons compared with physically active people (Kokkinos et al, 1995). Physical inactivity is now recognized by the American Heart Association as an independent risk factor, comparable to the other established risk factors for coronary heart disease (Fletcher, Blair & Blumenthal, 1992). Increasing physical activity is strongly recommended to improve the coronary risk profile (Fletcher, Blair & Blumenthal, 1992; The Expert Panel, 1998). It is well established that habitual physical activity improves physical fitness in middle-aged men and women (American College of Sports Medicine, 1986). Low levels of physical activity and cardiorespiratory fitness are both associated with higher risk of all cause and disease specific mortality (Roohi & Niknam, 2008).

Exercises have an effect providing euphoria resulting from the secretion of endogen opioid. Prospective epidemiologic studies have strongly established that sedentary life style has increased the risk of coroner artery illness (Pfaffenbarger, 1993). Serum lipid concentrations are often used to evaluate the risk of CHD. Previous studies have shown that low serum concentrations of high density lipoproteins (HDL) together with high serum concentrations of total cholesterol (TC), triglycerides (TG) and lipoproteins are associated with an increased risk of CHD (Shearman et al, 2010).

Present information supports a favorable exercise training impact on lipid and lipoprotein profiles (Jorge et al, 2007). There is evidence showing both the beneficial effects of physical exercise on all the factors associated with metabolic syndrome in adults and the positive correlation of inactivity with all the risk factors that comprise this syndrome (Pate et al, 1995). In this sense, several health organizations such as the American College of Sports Medicine, the Brazilian Society of Cardiology, and the American Diabetes Association recommend the use of physical activity as a therapy for the risk factors associated with obesity (Moreira et al, 2008). Exercise activities accelerate body metabolisms. 300-500 kilocalories can be spent with an hour walking. As the level of total cholesterol and LDL-cholesterol rises, the risk of coronary artery disease increases. Every 1% decrease in the level of LDL-cholesterol lowers 2% the risk of the coronary artery disease occurrence. The accumulation of fat around abdomen, waist and hip increases blood lipids especially LDL/HDL cholesterol rate, blood pressure (Bp) and TG level, and thus increases the risk of cardiovascular disease (Maffeis, 2001; Sarria, 2001). Several studies suggest that abdominal adiposity, as measured by WHR, is an independent risk factor for CHD in men and perhaps also in women (Rexrode et al, 1998). The most commonly used index for body fat distribution is WHR. The World Health Organization recommended a WHR cut-off of 0.8 for women and BMI cut-off points of ≥25kg/m ^{2} for overweight (World Health Organization, 1998), a point used to show central obesity and an increased risk of cardiovascular disease in adult women (Vansant et al, 1998). The habit of regular exercise of normal to obese individuals protects their lifelong from chronic diseases and improves life quality.

Blair and et al (1992) have described a lifestyle approach to physical activity; in which sedentary adults incorporate short bouts of moderate-intensity activity into their daily routines, such as increasing amount of exercise in the daily routines. However, a majority aerobic training program in previously studies including 3 days per week such as Vatansev, Husamettin & Cakmakci, Evrim (2010) that determine the effects of 8 weekly period-aerobic exercise in 3 days of the week on body composition and blood lipids of sedantery middle aged women, Saygın, Ozcan & Ali, 2011 and Ozturk & Mehmet, 2011 that determine the effects of 3 days per week for 12-week aerobic exercise program on health related fitness components and blood lipids in obese girls and Sunami et al (1999) that determine the effects of two to four times per week for 5 months Aerobic Training on the High-Density Lipoprotein Cholesterol Concentration in Healthy Elderly Subjects. Nonetheless, in previous literature infrequently determine effects of 6 days per week thus a characteristic of this study was that the training program involved exercising six days per week for 8 week morning aerobic training and it is likely that sedentary, overweight individuals would have to reduce body fat and aerobic training in morning. Therefore, the aim of this study evaluated the Effects of eight-week for six times in week morning aerobic training on lipid profile, BMI, WHR and cardio respiratory fitness (vo_{2max}), of sedentary females in Mashhad Malke Ashtar Sport Complex. Therefore, the aim of this study evaluated the Effects of eight-week for six times in week morning aerobic training on lipid profile, BMI, WHR and cardio respiratory fitness (vo_{2max}), of sedentary females in Mashhad Malke Ashtar Sport Complex.

Materials and methods

Twenty adult females with mean age of 40.4±6.7 years, BMI ≥25kg/m^2 and sedentary lifestyle for at least two years participated in this study voluntarily. Initially, all subjects in this study participated in a familiarization session. During the familiarization session, subjects were informed as to the experimental procedures, completed a personal/medical history form, and each subject signed the informed consent form. Subjects were accepted to the Resalat laboratory and a Malke Ashtar Sport Complex in two consecutive days between 8:00 and 9:00 a.m. for orientation and measurements in pre-test and post test. The subjects were asked to follow their usual normal nutrition habits and to avoid excessive physical activities during the study. On their first arrival, measurements of weight, height, BMI, WHR, subcutaneous skin folds and cardiorespiratory fitness determined by 1609 m (one mile) walk test. Weight was then measured, while the subjects were minimally clothed without shoes using digital scales and recorded to the nearest 100 g. Height was measured in a standing position, without shoes, using tape meter while the shoulders were in a normal position. BMI was calculated with Weight /height² (kg/m2), Waist circumference was taken midway between the inferior margin of the last rib and the crest of the ilium in a horizontal plane and hip circumference was measured over the greater trochanters, using a tape meter. These measurements were recorded to the nearest 0.1 cm. All measurements were taken by the same person. WHR was calculated by dividing the waist circumference to hip circumferences (Hao, Yong & Hoon, Peck, 2005). Cardiorespiratory fitness was determined by 1609 meter (one mile) walk test using Rockport fitness test (Kilne, G et al, 1987). After a brief warm up, the subject walked as briskly as possible for 1609 meters (one mile) with a heart rate monitor. Tester recorded heart rate (beats per minute) and time to completion. The formula used to calculate $VO_{2\ max}$was: 132.853-[0.0349 * Mass(kg)]-[0.3877 * Age(yr)] + [6.315 * Gender]-[3.2649 * Time(min)]-[0.1565 * Heart rate (bpm)] (Kilne et al, 1987). The validity of test was nearly high R=0.88 and Standard error of test was 5 ml/kg/min (Roohi, B, N & Niknam, z, 2008). Reported Skinfold thicknesses were used to estimate percent body fat (%fat) using the Jackson/Pollock the 3 Site Method (Laffayette caliper, USA) (Jackson, A, S & Pollock, M, L, 1985). On their second arrival, their blood samples were collected following a 12 h overnight fast, venous blood samples were collected from an antecubital vein (20 ml) in the sitting position after a 20-min rest between 8:00 and 9:00 a.m. Plasma was separated by centrifugation, and samples were stored at− 10 ◦C until assays were determined (within 48 h) in all samples.

Training program

Subjects in the training group were performed slow running (10 minutes), stretching muscles and loosening joints (10 minutes), aerobic training program (30 minutes) and cool down (10 minutes). The intensity of training was 60-70% of target pulse rate calculated by Karvonen protocol (Karvonen et al, 1957). These training were completed six days in a week during 8 week. Target heart rate zone= [(HRmaximum − HRrest) × (60-70%) + HRrest] HRmaximum= 220-age (Karvonen et al, 1957).

Resting heart rate

Resting heart rate was measured in the morning immediately after the participants were awake. If subjects are not able to take a measurement first thing in the morning, make sure subjects lie down for at least 10 minutes before taking a measurement. Measurement was taken from the radial artery with forefinger and the middle finger of the right hand placed horizontally across the subject's wrist while sitting on the chair. After that, the number of pulse beats multiplied by two to give the 1 min heart rate (Saygın, Ozcan & Ali, Ozturk, Mehmet, 2011).

Statistical analyses

SPSS 16.0 Statistical package was used for analyzing data. The data of the subjects before and after 8-week training compared between training and control group were analyzed with Paired and independent Samples t-test.

Results

Results revealed significant differences from pre to post-test measurements in the training group for BW, BMI,VO_{2max}, HDL and LDL ($p<0.05$) values. In control group, there were no significantly changes in all variables and There were significant differences between the training and control groups for BW, BMI, VO_{2Max}, TC, LDL and HDL ($p<0.05$) values (table 1).

Discussion and Conclusion

Physical activity is a key contributor to health. Accumulating evidence indicates that sedentariness is a risk factor for cardiovascular and other major diseases (Frankish et al, 1998). Even moderate levels of activity confer health benefits, and for most people, additional health benefits may be derived by becoming more active. Moderating factors for prevention of major diseases which may be accessed through moderate levels of activity include weight management and stress reduction (Pate et al, 1995; Anonymous, 1996). The role of lifestyle change with regard to diet, weight control, and physical exercise can be vastly important in management of abnormal blood lipids and lipoproteins (Jorge et al, 2007). However, there are controversial studies related with the exercise type and duration leading to changes in the lipid metabolism. Considering physical activities and exercise physiology are primarily intended for sportsmen, more detailed researches are required into the exercises for sedentary people. We planned this study for this intention. The main finding of this study was that 8 weeks of aerobic training improved $VO_{2\ max}$, HDL and impaired weight, BMI and LDL in the exercise group. These results were also in line with the previous literature that found improvements in health related parameters of overweight and obesity females participants as a result of aerobic exercise program (Roohi, B, N & Niknam, z, 2008; Vatansev, Husamettin & Cakmakci, Evrim, 2010). In this study, it has been determined that there was significant difference ($p<0.05$) between the values of BW, BMI, WHR, TC and HDL given after 8-week aerobic exercise protocol in favor of the last test. In a recent study, for example, conducted by J. Shearman et al. (2010), The Effect of Physical Activity on Serum Lipids, Lipoprotein, and Apolipoproteins were examined. Thirty-seven sedentary, healthy adult males were randomly allocated to an exercise group (n=20) who underwent 12 weeks of aerobic physical activity or a sedentary group (n=17) who acted as non-exercising controls. The results indicated that in Compared with sedentary controls, participants who exercised showed an increase in peak aerobic capacity and Apo A-1: Apo B ratios as well as lower levels of adiposity, serum TG. However, both sedentary and exercise groups showed reductions in total serum cholesterol and LDL. We too have demonstrated in this study that exercises have affected positively $VO_{2\ max}$ as aerobic capacity but remained unchanged in serum TG concentrations in both sedentary and exercise groups. In another study by Kokkinos et al (1995), was reported that the women with lowest cardiorespiratory fitness category had less favorable lipid profiles, blood glucose levels, blood pressures and anthropometric indexes than those in the moderate and high fitness categories. Suggesting that HDL-C does not increase only as a result of exercises (Gupta et al. 1993; Oyelola & Rufai, 1993). There are also some studies claiming that LDL decreases with exercises (Hartung, et al 1993, Sucic & Oreskovic, 1995). Besides, some studies allege that LDL does not change with exercises (Giada,et al, 1995). We established in this study that HDL increased but LDL decreased in the exercise groups before and after exercises. In another study by Moreira et al (2008), the effects of aerobic exercise with intensities of 10% below the anaerobic threshold on cardiac risk variables in overweight adults were examined. total body mass (TBM), BMI, waist circumference (WC), hip circumference (HC), WHR and body composition, in addition to TC, and TG were assessed before and after the protocols lasted 12 weeks, three times a week. They reported that TBM, BMI, WC and body composition variables showed significant changes in the endurance training (ET) groups. TC and HC values were significantly reduced in the ET group. In this study, on the other hand, we found that 8 week morning aerobic training (six days in a week) at 60-70% of target heart rate changes lipid Profile, WHR and $VO_{2\ max}$, significantly in overweight females. As a result, morning aerobic training causes favorable changes in lipids and lipoproteins. Furthermore, the role of lifestyle change with regard to diet, weight control, and physical exercise is becoming more important in today's health care of chronic disease. These can be vastly important in management of abnormal blood lipids and lipoproteins. It has been proved with the obtained results that the negative effects of sedentary living on individuals are decreased with aerobic training.

Table1. Changes in the health related physical fitness parameters and blood lipids in exercise and control group.

Variable	Control group			Training group			
	Pre-test	Post-test	P	Pre-test	Post-test	P	P
BW (kg)	64.45±9.60	64.16±9.95	.240	65.81±7.89	62.87±8.06	.000*	.000†
BMI (kg/m2)	25.38±3.12	25.25±3.25	.175	26.14±2.90	25.05±2.93	.000*	.000†
WHR	.79±.09	.77±.09	.164	.81±.13	.7540±.11	.045*	.105
BF (%)	28.11±3.79	29.33±3.63	.102	25.07±3.09	24.84±3.14	.386	.058
VO_{2Max} (kg/ml/min)	31.35±3.52	31.76±3.42	.080	32.87±5.51	36.56±5.30	.016*	.036†
TC (mg/dL)	194.40±32.11	199.10±28.48	.158	208.50±35.91	199.20±31.40	.116	.035†
TG (mg/dL)	125.20±45.70	117.80±47.43	.331	91.50±42.90	96.10±40.79	.193	.147
LDL (mg/dL)	128.40±27.10	133.60±18.78	.245	139.08±33.37	124.90±25.22	.045*	.017†
HDL (mg/dL)	42.60±9.34	40.90±6.57	.427	46.10±7.29	53.60±5.62	.003*	.004†

†Significantly difference compared with control group at $P < 0.01$

*Significantly difference between pre and post test at $P < 0.05$

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UČINCI JUTARNJEG AEROBNOG TRENINGA NA LIPID PROFIL, TJELESNI SASTAV, WHR I VO_{2max} KOD SEDENTARNIH ŽENA PREKOMJERNE TEŽINE

Sažetak

Cilj: Temeljni uzrok gojaznosti i prekomjerne težine je energetska neravnoteža između konzumirane energije i potrošene kao i smanjenje tjelesne aktivnosti uslijed povećanja sjedenja. Ovo istraživanje analizira učinke jutarnjeg aerobnog treninga na profil lipida, sastava tijela, WHR i VO2 max kod žena prekomjerne težine i sjedenja. Materijal i metode: 20 osoba s prekomjernom težinom (OW) prosječnog uzrasta 40.2 ± 6.2 g., prosječne visine 158.70 ± 5.96 cm i prosječne težine (BW) 65.81 ± 7.89 kg, sudjelovalo je u slučajno raspoređenoj trenažnoj grupi (n=10) kao i kontrolnoj grupi (n=10). Aerobni trening trajao je u razdoblju od 8 tjedana sa 6 dana vježbanja u tjednu. Prije i nakon trenažnog razdoblja izmjereni su postotak tjelesne masti (BF), indeks tjelesne mase (BMI), odnos struka i beda (WHR), parametri lipida krvi (TG, CH, LDL, HDL) kao i VO_{2Max}. Rezultati: Rezultati su pokazali značajnu razliku ($p<0.05$) u testovima prije i poslije tretmana u vrijednostima LDL, HDL, BMI, WHR, VO_{2Max} i tjelesne težine kod trenažne grupe. Zaključak: Osmotjedni jutarnji aerobni trening ima značajne učinke na LDL, HDL, BMI, WHR, VO_{2Max} i tjelesnu težinu i jedino nema na TG. Može se zaključiti kako su negativni učinci sedentarnog življenja pojedinaca smanjeni jutarnjim aerobnim treningom.

***Ključne riječi**: jutarnji aerobni trening, lipid profil, prekomjerna težina, VO_{2max}*

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