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The Effects of Regular Aerobic Exercises on Blood Lipids and Some Physical Fitness Parameters of Obese Boys

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Abstract: The aim of this study was to investigate the effects of 12 week aerobic exercise program on blood lipids and health related fitness components in obese boys. In this study, a total of 38 boys were recruited as exercise group (n=19) and control group (n=19). Participants joined sessions for 60 min per day, 3 days per week for 12-week. There were significant differences in weight, BMI, flexibility, sit-ups, hand grip for both hands, VO_{2max}, skin fold measurements (thigh, triceps, biceps, abdomen, suprailiac, subscapula and chest), body fat percent, heart rate, HDL, LDL, total cholesterol and triglyceride between pre-test and post test scores in the exercise group ($p<0.05$). It was concluded that regular aerobic exercise may affect health related fitness components and blood lipids positively in boys. In consequences, regular aerobic exercises can reduce obesity in boys.

Key words: Blood Lipids · Flexibility · Muscle Strength · BMI · $Maxvo_2$ · Aerobic Exercise

INTRODUCTION

Obesity and overweight is a global problem in childhood and it is one of the most serious public health challenges of the 21st century [1].

In Turkey, the prevalence of overweight among women is 24.3% and obesity 24.6%; while 25.9% of men were overweight and 14.4% were obese [2, 3]. Beside of this, childhood obesity is an increasing problem in Turkey, too. Obese children are likely to stay obese into adulthood [1]. Effective early strategies for the prevention of obesity need high priority. Although the physical activity is the one of the widely accepted strategy for the treatment of obesity, the role of physical activity in the prevention of obesity is still unclear [4]. Although there are several reports in the literature regarding the effects of exercise on health related physical components and blood lipids in obese girls [5], the effect of exercise on preventing obesity should be highlighted with more specific research. Earlier prevention strategies for kids may have decrease obesity in their later life [4, 6]. The aim of this study was to examine the effect of 12-week aerobic exercise training on health related physical fitness components and blood lipids in obese boys aged between 10 and 12 years.

MATERIALS AND METHODS

In this prospective study, the study group consisted of 38 obese boys aged between 10-12 years. They were selected from two elementary schools randomly and equally assigned to the exercise (N=19) and the control group (N=19) by using a numbering table for randomization. General physical examination, blood lipid, body composition, flexibility and muscular strength assessment tests were performed for all participants both before and after 12 week exercise program. Participants and their parents were informed about this study's aims and details. Informed consent was given and signed to their parents at the beginning of the study. All the measurements were performed 3 days before the exercise treatment and 2 days after exercise program terminated for both (exercise/control) groups. All measurements were made on the right side of the body. Caliper was placed 1 cm away from thumb and finger, perpendicular to skin fold and halfway between crest and base of fold. It was waited 1 to 2 sec. (and not longer) before reading caliper. Duplicate measures were taken at each site. *Body Fat percentage* was calculated by using Durnin-Womersley Formula for kids [7].

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Table 1: Aerobic Exercise Program

WEEK	1. W	2.W	3.W	4.W	5.W	6.W	7.W	8.W	9.W	10.W	11.W	12.W
Training Duration$_{(Min.)}$	50	50	60	65	70	75	80	85	90	90	90	90
Training Intensity $_{(\%)}$	20	25	30	35	40	45	45	50	55	55	60	60
Training Frequency$_{(Dy/W)}$	3	3	3	3	3	3	3	3	3	3	3	3

In this study Max VO2 was calculated by 20 m shuttle run test to determine aerobic fitness level [8, 9]. *Resting heart rate* was measured in the morning immediately after the participants awake. *Blood Pressure* was measured by using sphygmomanometer and stethoscope. The systolic blood pressure and diastolic blood pressure were recorded. *Flexibility* was measured by the "sit-and-reach" test [10]. The farthest test score of the three trials was recorded. The sit-and-reach test was conducted to measure flexibility of the hamstrings and lower back. *Blood Lipids Measurements:* Blood samples were drawn in a Medical Center in the morning Revise. Low Density Lipoproteins (LDL), High Density Lipoproteins (HDL), Total Cholesterol (TC) and Triglycerides measurements were performed by physicians by using Beckman Coulther STKS device. *1 min Sit-up test:* The subjects lied on their back, with their knees at right angles (90 degrees) and feet flat on the floor. The subject then attempted to perform one complete sit-up during 1 minute. Number of performed sit-ups was counted [11]. *Handgrip Strength test:* The handgrip strength of the right and left hands was evaluated using a Takei handgrip dynamometer (Takei, Tokyo, Japan). The test was performed in the standing position. Test was repeated 2 times with both hands and the highest score was recorded [12].

Protocol of Aerobic Exercise Training: Subjects in the exercise group performed aerobic exercises at an intensity of 50- 60% of their target heart rates. Training was performed three days in a week during 12 week each 60-90 minutes period. During first 5 training days, nutrition knowledge about how subjects consume fluid and caloric facts of nutrients was given to all subjects at the beginning of each exercise session. Each exercise class started with 10-12 minutes warming-up exercises and ended with 8-10 minutes cooling down exercises (Table 1). The exercise intensity and target heart rate was determined by using Karvonen method for each subject individually [7].

Statistical Analyses: SPSS 15.0 Statistical package was used for analyzing data. Differences between groups were evaluated with independent t-tests and pre-test and post test differences was compared with paired t-tests (p<0.05).

RESULTS

Paired sample t-tests results revealed significant differences from pre-test to post-test measurements in the exercise group for weight, BMI, flexibility, sit-ups, hand grip for both hands, MaxVO2, skin fold measurements (thigh, triceps, biceps, abdomen, suprailiac, subscapula, chest), Body fat percentage, resting heart rate and HDL, LDL, total cholesterol and triglycerides (p<0.05) scores. Furthermore, systolic and diastolic blood pressure scores were also significantly decreased in the exercise group from pre-test to post-test measurements (p<0.05) (Table 2).

In control group, however, there were significantly negative changes in all variables (weight, BMI, flexibility, sit-ups, hand grip for both hands, MaxVO2, skin fold measurements, body fat percentage, resting heart rate, HDL, LDL, total cholesterol and there was no significant changes in triglycerides values (Table 2).

DISCUSSION

The main findings of this study were 12 weeks of aerobic training improved flexibility, sit-ups, hand grip for both hands, VO_{2max} and impaired LDL, total Cholesterol in obese boys. These results are also in line with the previous literature that found improvements in health related parameters of obese participants as a result of regular exercise participation [4, 5 and 12]. Moreover, similar results have been reported in adults [13, 14].

Some studies that examined the efficacy of exercise training in obesity have documented little effect on blood lipid [15], while in our study we found much effect on blood lipids. In a recent study, for example, conducted by Wong *et al.* [14], the effects of 12-week exercise training on some health parameters of 13 to 14 years old obese boys were examined. In addition to typical physical education sessions, subjects participated in a combination of circuit based resistance and aerobic exercises 2 times in a week to monitor changes in aerobic

Table 2: Changes in the Health Related Physical Fitness Parameters and Blood Lipids in Exercise and Control Groups

	Exercise Group (n=20)			Control Group (n=19)		
Variables	Pre-test	Post-test	p	Pre-test	Post-test	p
Weight$_{(kg)}$	60,11±7,32	57,42±7,13	0,00	56,78±5,56	58,50±5,82	0,00
BMI$_{(cm)}$	26,57±1,57	24,79±1,95	0,00	26,21±1,04	26,58±7,16	0,01
Flexibility$_{(cm)}$	19,62±5,18	23,63±5,63	0,03	18,20±4,26	17,51±4,44	0,00
Sit-Up$_{(number/60sn)}$	16,37±9,97	25,47±9,69	0,00	10,58±3,23	9,41±2,84	0,01
R Handgrip$_{(kg)}$	20,55±5,92	23,02±7,09	0,00	18,55±4,43	19,29±4,48	0,00
L Handgrip$_{(kg)}$	19,08±5,18	20,43±6,10	0,04	16,71±4,23	17,01±4,00	0,19
Max. $VO_{2(ml/kg/min)}$	29,23±2,56	37,57±0,71	0,00	29,62±2,21	28,84±2,24	0,00
Thigh $_{(mm)}$	28,67±1,78	26,25±2,58	0,00	29,08±1,47	30,75±1,78	0,00
Triceps$_{(mm)}$	22,86±3,74	20,70±3,89	0,00	26,19±2,48	27,08±2,51	0,00
Biceps$_{(mm)}$	19,16±2,84	16,25±3,38	0,00	22,78±3,43	23,63±3,42	0,00
Abdomen$_{(mm)}$	27,71±3,96	24,46±2,50	0,00	28,24±3,22	30,32±3,11	0,00
Suprailiac$_{(mm)}$	27,93±4,98	25,30±4,48	0,00	28,85±2,03	30,79±2,12	0,00
Subscapula$_{(mm)}$	20,63±4,83	18,71±4,25	0,02	25,46±2,98	30,79±2,12	0,00
Chest$_{(cm)}$	21,67±3,89	29,21±3,21	0,03	22,90±2,58	24,00±2,51	0,00
BFP(%)	30,70±2,07	29,64±2,24	0,00	32,50±1,25	33,61±1,08	0,00
RHR$_{(Beat/min)}$	94,12±12,04	87,25±7,20	0,01	96,58±12,89	97,95±12,71	0,00
SBP$_{(mmHg)}$	12,76±1,77	12,21±0,90	0,15	13,20±1,03	13,36±1,08	0,17
RHR$_{(mmHg)}$	7,52±0,61	7,73±0, 43	0, 10	7,70±0,70	8,05±0, 74	0,00
HDL$_{(mg/dl)}$	48,00±8,03	53,76±7,31	0,00	38,91±7,16	36,70±7,12	0,00
LDL$_{(mg/dl)}$	102,10±30,19	89,29±20,96	0,01	102,47±12,93	107,10±12,88	0,00
Total Cholesterol $_{(mg/dl)}$	110,07±15,95	81,59±12,56	0,00	113,57±14,00	117,25±14,42	0,00
Triglycerides $_{(mg/dl)}$	149,48±33,11	129,43±30,26	0,00	155,46±20,57	148,25±46,65	0,53

P<0.05

fitness, body composition and serum C-reactive protein (CRP) and lipids levels. The results indicated that exercise training significantly improved lean muscle mass, body mass index, fitness, resting HR, systolic blood pressure and triglycerides in the exercise group. Similar results are also found in this present study.

In a study performed by Sothern *et al*. [16], safety, feasibility and efficacy of a resistance training program in preadolescent obese children were investigated. Nineteen treatment (10-week weight management program which included diet, behavior modification and aerobic and flexibility exercises) and forty-eight control subjects (7-12 years of age) participated in their study. They found that fat percent decreases significantly ($p<0.05$), whereas fat-free mass does not change significantly ($p>0.05$) in the treatment subjects.

In the study performed by DeStefano *et al*. [17] on fifteen obese boys (aged 9–12 yr with body mass index (BMI) 31.8±6.5 and average percent body fat (%BF) 41±4.2) underwent a supervised aerobic and resistance training program (12 wk, 2 days/wk for 30 min/session), to investigate the effects on weight and body composition. They found that total body fat decreased by 4.1±1.8 kg ($p<0.05$) but weight loss is not significant after 12 week exercise program. Moreover they concluded that vigorous supervised aerobic training in obese boys has beneficial effects on body composition. In our study, we found that aerobic exercise can reduce both body weight and total body fat. This may related with exercise duration.

The effects of a 12-week twice weekly additional exercise training, which comprised a combination of circuit-based resistance training and aerobic exercises, in additional to typical physical education sessions, on aerobic fitness, body composition and serum C-reactive protein (CRP) and lipids were analyzed in 13- to 14-year-old obese boys by Wong *et al*. [14]. In their study, exercise training significantly improved lean muscle mass, body mass index, fitness, resting HR, systolic blood pressure and triglycerides in exercise group which performed aerobic and resistance training. Similarly, in our study we found that regular exercise decreases triglyceride and increased physical fitness by reducing body fat.

Saygın, Polat and Karacabey (2005) studied the effect of 16 weeks movement training on physical fitness parameters in 10-12 aged total 202 boys. They found that

there were significant differences in Max VO_2 and body mass index ($p<0.05$) and hand grip strength. In our study, it was found that there were significant differences in Body Mass Index, handgrip strength and Max.VO_2 values between the exercise pre and post tests ($p<0,05$) [18]. There are many reasons for obesity in literature like pending time with inactivity (watching TV [19], etc.). In a study that was studied by Hashemi (2013) [20] found that the students' average leisure time was spent by watching television, working with computer, listening to music, hanging out with friends and lastly doing sport. In our study, we found aerobic exercises can affect the blood lipids. This result is also supported by Narayani and Sudhan Paul Raj [21] and Hamedinia *et al.* [22]. Siahkouhian *et al*. [23] investigated the relationships between fundamental movement skills and body mass index (BMI) of the 7-to-8 year-old children. They summarized that childhood obesity is growing up and there is a perceptual-motor deficit in obese children. In similar in our study, in control group there were decreases in physical fitness parameters while increasing BMI.

As a conclusion, it was determined that regular and long term aerobic exercises have positive effects on physical fitness values and blood lipids of obese boys. Moreover, further research is needed to understand the effects of exercise in detail and to struggle obesity in children.

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