Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 3 (Spl issue IV) 2014: 50--56

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.533
Universal Impact Factor 0.9804

The effect of a period of selective aerobic exercise on serum level of VO_2Max, BMI and Leptin in fat students in elementary school

Nematallah Nemati, SeyedMozafar Moosavi
Department of Physical Education, College of Humanities Sciences, Damghan Branch , Islamic Azad University, Damghan, Iran
E-mail: nnemati258@gmail.com

ABSTRACT
The problem under study consideration is investigating the effect of aerobic training on vo_2 max, BMI and Leptin serum of fat students in elementary school. The variables of research include: maximum of consumed oxygen, body mass index and training program includes swimming with the intensity of 60 to 70% HRR max 60 minutes in 3 days in a week and during 8 weeks. The method of research is semi – empiricical and 27 subjects were selected from a statistical population of 4500 people and divided in two group of control (13 subjects) and study group (14 subjects) personal information and physical characteristics were measured and recorded in pre – test5 phase and after that blood tests were performed then study group didn't perform exercise programs. Previous measurements and blood tests were repeated in post-test phase and the data were calculated according to independent T test and SPSS – v/5 software was used for data analysis results were obtained: (1)Selected aerobic training program affected subject's leptin serum, (2) Selected aerobic training program affected subject's vo_2 max, (3) Selected aerobic training program didn't affect subject BMI. Probably, if the intensity and duration of activities were higher than their present levels, significant results would be obtained and would highly affect the discussed indexes. In addition, a high volume of samples may help the validity of the results.
Keywords: *Body mass index, maximum consumed oxygen, fat mass, Leptin*

INTRODUCTION

Leptin acts on the central nervous system, in particular the hypothalamus, suppressing food take and stimulating energy expenditure [1]. Leptin can also be affected by nutritional supplementation. [2] Suggested that zinc-deficiency exerts a negative influence on leptin concentrations and that zinc-supplementation has the opposite effect. Leptin is produced by differentiated adipocytes, although production has been demonstrated in other tissues, such as the fund us of the stomach, skeletal muscle, liver, placenta [3], heart [4], in granulose and cumulus oophorus cells in the human ovaries [5], in human mammary gland [6] and in gastric epithelium [7]. Additionally, leptin is known to be positively correlated with indices of adiposity such as body fat mass and body mass index (BMI) [8]. It has been shown that obesity is related to the decrease in growth hormone and testosterone levels in men and increase in testosterone level and decrease in progesterone levels in females [9]. Regular physical activities are accompanied by increase in the energy requirement and body composition changes which can affect plasma leptin concentration [10]. Moreover, it has been reported that exercising leads to the increase in testosterone and cortisol secretion [11]; however, there is no complete agreement on this finding. Some authors have demonstrated that, although exercising increases the level of serum testosterone [12], it does not affect cortisol secretion [13]. Thus, the aim of this study was to investigate the effect of aerobic raining on VO_2Max, BMI and leptin, on fat students in elementary school.

METHODOLOGY

Participants

A cross-sectional study was quasi-experimental method to analyze the effect of aerobic exercise on serum leptin, BMIandVo_2Max levels in fat students in elementary school. In this regard, pre-test and post-test research design was used. Over 4500 elementary school students obese period of 7 to 10 years of age grain areas in Tehran which their BMI over k/m2 25 formed the study sample.
In a quasi-experimental trial, 27 volunteer obese students were randomly selected for participation in a training program. A pretest and a posttest were done on experimental (n=14) and control (n=13) groups.

The entry condition to the study was the age domain between 7 and 10 years old, body mass index of higher than 25 kg.m-2, no history of regular exercise and lack of specific diseases.

Designing the Experiment

The participants attended the laboratory from 8 to 10 a.m. while being fast in order to measure their body composition. Body weight, height, body mass index, fat percent and fat-free body mass were measured, too. To omit individual error, all the measurements were done by one person. After that, the participants were taken to a gym in order to get familiar with the training program and sports equipment. They started activities after 10 min of special warm up in order to estimate their maximum oxygen consumption (VO_2max). Three days after determining the above-mentioned tests for doing physical activities, the participants came to the laboratory at8 a.m. while being fast and their blood factors were measured. After blood sampling, they had equal types of breakfast and, after one hour, they started performing their physical activities. This training program continued for 8 weeks, three sessions per week. Principle of overload was designed so that, after every two weeks of training, the considered intensity could be regulated. After the 8th week, the participants came to the laboratory and their blood factors were determined and their body composition was measured.

Aerobic Training Program

The training program applied in this study lasted for 8 weeks, three sessions of aerobic training per week. Each session consists of 45 minutes of stretching exercises, swimming, exercise and stretching, running, playing with a ball (water polo, field hands) and swim for 15 minutes each session, the game minimized and the swimming time was increased. To control the intensity of each session Svtyn stethoscope was used to waterproof. Stability as well as the carotid artery pulse counting exercise intensity was controlled. The exercise was to determine the severity beats by (60 to 70% of maximum heart rate) is preserved. Exercises independent variable and leptin levels, body mass index (BMI) and maximal oxygen consumption (Vo_2Max) are dependent variables. Instruments, measuring methods include: Personal information and medical history to the physician certification exercise, Measurement of serum leptin kit, Device used to measure body mass index (Body composition Analyzer), Swimming pool, Japanese Svtyn measure heart rate to measure heart rate during exercise, Japanese chronometer to measure time-tested one mile (1600 m).In order to measure the height of one meter height and weight without shoes on stands (Weigh Scale German Company Seca Model 220 with an accuracy of 0.1kg rod that is well calibrated height gauge). While the weight evenly distributed on both feet, and at a level parallel to the horizon. After a normal expiration, as measured by a ruler placed horizontally on one end of the ruler to calibrate the bar height will determine the amount of height. To measure the body weight of subjects Tzavy Skamdl 220 Weigh accurately 1/0 kg were used. Subjects without shoes and sports Balb as on the scale were identical and each kg of weight was measured. In order to measure maximal oxygen uptake from submaximal testing of a mile (1600 meters) was used as a positive walking distance of a mile in which subjects could walking as rapidly as. Time during the course of a person's heart rate was recorded after completion. With the added weight, age, these factors Vo_2Max were calculated by the following equation:

Vo_2 Max = 6965.2 + 20.02 (Body weight in kg) –25.7× (Age per year) + 595/5×(1) -224/00 × (Test time in minutes) -11/5 (Heart beats per minute)/ (Body weight in kg)

Heart rate at rest and during exercise was measured by stethoscope Plar. This section of the sensor device is placed on the subject's chest discomfort and inconvenience to the extent that the respondents were not drawn. Stethoscope transmitter automatically start when placed on the skin worked. And watch for signs to be posted. Simultaneously, the heart rate was recorded in the form regularly. Blood sampling was performed in the laboratory of Tehran University of Medical Sciences. Before going to the lab for testing blood samples were collected before and after 8 weeks of exercise (swimming), The main points about the necessary nutrition and physical activity disease and a guide to the subjects was announced. All subjects at the same time of day (9 am) to go to the lab and it were while all people were fasting for 14 hours. In the laboratory, 20 ml of blood from a vein in the arm of each subject were taken from the venous blood was poured into a test tube. After a while, the blood clot will balance revenue with another pipe.And the device was then centrifuged and the serum obtained from clot was removed Htych. Serum leptin and sent to the lab for testing in the Endocrine Center martyr Beheshti University were frozen. Planning and coordination of the subject's blood samples were taken pre-test. Then, according to program and control subjects in the two groups were present at Ghaem Hospital, height, weight, BMI, percent body fat was measured by Analizer Body Composition. And to determine maximal oxygen uptake, one-mile walk was Rakpvrt individual measurements were recorded on special forms. The experimental group was given a date and time to start the selective aerobic exercise (swimming) and a frequency of 3 sessions per week for 8 weeks, 60 minutes per session in the swimming pool turned. The training intensity of 60 to 70 percent of maximum heart rate for the experimental group was carried out at the pool. Upon completion of training, re height, weight, body mass index and percent body fat and maximal oxygen consumption in subjects

such as pre-test, post-test was also calculated. Blood tests are also repeated earlier deadline in the laboratory and in the pre-test and post-test serum was frozen and sent to the laboratory for analysis of changes in leptin levels. Raw data from the analysis of blood samples and test data before and after 8 weeks were used for statistical analysis. And for describing data, descriptive statistics, including charts, tables and standard deviations were used. And according to the research objectives, hypothesis testing, inferential statistics were independent of T student. Orientation calculates and analyzes data in SPSS with significance level of 0.5> P was considered.

RESULTS

The data collected is analyzed in terms of descriptive and inferential. The descriptive data in tables and graphs are considered. Then based on the research project will analyze the data collected and will test the desired hypothesis.

Table1. Statistics of central tendency and dispersion to separate age groups

Statistics	Groups	Central Tendency		Orientation Distribution	
			Standard deviation	min	max
Control		9	0.56	7	11
Experimental		8.85	0.94	7	10

The mean age in the control group: 9±0.56 and experimental group: 8.85±0.94

Table2. Statistics of central tendency and dispersion to separate height groups

Statistics	Groups	Central Tendency		Orientation Distribution	
			Standard deviation	min	max
Control		137.84	4.59	130	144
Experimental		137.35	2.64	133	143

The mean height in the control group: 137.84±4.59 and experimental group: 137.35±2.64.

Table3. Statistics of central tendency and dispersion to separate weight groups

Statistics	Groups	Central Tendency		Orientation Distribution	
			Standard deviation	min	max
Control		47.16	3.85	43	55.9
Experimental		50.65	7.86	41	67.9

The mean height in the control group: 50.65±7.86 and experimental group: 47.16±3.85.
Variables are: Serum leptin, Vo_2 Max and body mass index, That is specified in the following tables.

Table4. Central tendency and dispersion statistics for serum leptin

Statistics	Groups	phase	Central Tendency		Orientation Distribution	
				Standard deviation	min	max
Control		Pre-test	10.04	4.06	3.5	20
		Post-test	10.01	3.22	3.9	14.7
Experimental		Pre-test	12.71	3.73	6.4	18.7
		Post-test	11.64	2.87	5.8	16.4

Table5. Central tendency and dispersion statistics for VO_2Max

Statistics	Groups	phase	Central Tendency		Orientation Distribution	
				Standard deviation	min	max
Control		Pre-test	39.53	4.09	35	47
		Post-test	39.61	3.22	34	45
Experimental		Pre-test	38.64	3.56	32	44
		Post-test	41.78	3.78	34	46

Table6. Central tendency and dispersion statistics for BMI

Statistics	Groups	phase	Central Tendency		Orientation Distribution	
				Standard deviation	min	max
Control		Pre-test	26.6	1.71	25	30.7

	Post-test	26.23	1.8	24.3	29.9
Experimental	Pre-test	27.48	1.9	25.2	30.1
	Post-test	27.13	2.06	24.5	31.3

serum leptin

According to the table 7 is observed between experimental and control groups, the pre-test with t=1.87 and Probability of acceptance p=0.07, there is no significant difference of serum leptin. As a result, two groups are homogeneous and comparable to the post-test.

Table7.Leptin is homogeneous in the two group's pre-test data

Statistics	Groups	number	Standard deviation + ave	t	Probability of acceptance	significant
Control		13	4.06 ±10.04	1.87	0.07	*
Experimental		14	3.73 ±12.71			

The first hypothesis: Selected aerobic training on serum leptin levels did not influence the subjects.

According to the results of the statistical software SPSS is observed between experimental and control groups, the pre-test with t=3.12 and Probability of acceptance p=0.003, there is significant difference, Therefore reject the hypothesis H0. This means that after 8 weeks of aerobic training on serum leptin levels in subjects impacted.

Table7. Serum leptin variable t test between control and experimental groups

Statistics	Groups	phase	Central Tendency		Orientation Distribution	
				Standard deviation	min	max
Control		Pre-test	39.53	4.09	35	47
		Post-test	39.61	3.22	34	45
Experimental		Pre-test	38.64	3.56	32	44
		Post-test	41.78	3.78	34	46

Table8. Serum leptinAsytvdnt variable t test between control and experimental groups

Statistics	Groups	number	phase	Standard deviation + ave	The mean pre-and post-test+ Standard deviation	t	Probability of acceptance	significant
Control		13	Pre-test	4.06±10.04	1.44 ± 4.25	3.2	0.003	*
			Post-test	8.06 ± 3.22				
Experimental		14	Pre-test	12.71 ± 3.73	1.07 ± 3.31			
			Post-test	11.64 ± 2.78				

2.VO_2Max

According to the table 9 is observed between experimental and control groups, the pre-test with t=0.598 and Probability of acceptance p=0.561, there is no significant difference of VO_2Max. As a result, two groups are homogeneous and comparable to the post-test.

Table9.Homogeneous in both groups pre-test data VO_2Max

Statistics	Groups	number	Standard deviation + ave	t	Probability of acceptance	significant
Control		13	4.09 ±35.53	0.598	0.561	*
Experimental		14	3.56 ±38.64			

The second hypothesis: Selected aerobic exercise on maximal oxygen consumption does not affect the subjects. According to the results of the statistical software SPSS is observed between experimental and control groups,the pre-test with t=2.178 and Probability of acceptance p=0.04, there is significant difference, Therefore reject the hypothesis H0. This means that after 8 weeks of aerobic training on VO_2Max levels in subjects impacted.

Table10. VO_2Max variable t test between control and experimental groups

Statistics	Groups	number	phase	Standard deviation + ave	The mean pre-and post-test+ Standard deviation	t	Probability of acceptance	significant
Control		13	Pre-test	4.09±39.53	0.076 ± 1.89	2.178	0.04	*
			Post-test	39.61± 3.22				
Experimental		14	Pre-test	38.64± 3.56	3.14±1.91-			
			Post-test	41.78±3.78				

BMI

According to the table 11 is observed between experimental and control groups, the pre-test with t=1.531 and Probability of acceptance p=0.152, there is no significant difference of BMI. As a result, two groups are homogeneous and comparable to the post-test.

Table11. Homogeneous in both groups pre-test data BMI

Statistics	Groups	number	Standard deviation + ave	t	Probability of acceptance	significant
Control		13	1.71 ±26.60	1.53	0.561	*
Experimental		14	1.90 ±27.48			

The third hypothesis: Aerobic exercise does not affect the choice of subjects by BMI levels.

According to the results of the statistical software SPSS is observed between experimental and control groups, the pre-test with t=1.312 and Probability of acceptance p=0.214, there is significant difference, Therefore no reject the hypothesis H0. This means that after 8 weeks of aerobic training on BMI levels in subjects no impacted.

Table12. BMI variable t test between control and experimental groups

Statistics	Groups	number	phase	Standard deviation + ave	The mean pre-and post-test+ Standard deviation	t	Probability of acceptance	significant
Control		13	Pre-test	1.71±26.6	0.2692 ± 0.5764	1.312	0.214	*
			Post-test	26.23±1.80				
Experimental		14	Pre-test	27.48±1.90	0.35 ± 0.57			
			Post-test	27.12±2.06				

DISCUSSION AND CONCLUSION

The purpose of this study was to investigate the effect of aerobic exercise swimming VO_2max, BMI and serum leptin in obese elementary school. Although many studies on serum leptin concentration and its relation to body mass index is done. However, due to factors such as intensity, time and type of exercise and physical condition of test subjects, sex and ages, ways to measure body mass index VO_2Max has created mixed reactions in the body.

- Selected 8 weeks of aerobic exercise decreases serum leptin (P<0.05).

The results of Hall et al 1999, Elias et al 2000, Fischer et al 2001, Kramer et al 2001, Karamouzis and colleagues in 2002, Nindl and colleagues in 2002, Ozcelik and colleagues in 2005 is in agreement. But Hickey and colleagues reported in 1997, Houmard and colleagues in 2000, welt man and colleagues (2000) is inconsistent with. It can be concluded that the burning of fats require more O2. The effect of aerobic exercise increases capillary density. The following activities maximized over the long term and the body more oxygen is available to meet the energy requirements of lipid metabolism uses. So because of the fat derived leptin is also reduced, thus reducing body fat and leptin levels. Katkvlanyha also an increase the amount of exercise varies inversely with leptin secretion and leptin has been brought down.

- 8 weeks of aerobic exercise does not cause changes in body mass index (P>0.05)

BMI changes with Hall and Associates in 1999, the thong in 2000, Bruce et al 2004, Ozcelik and colleagues in 2005, the year Zigman and colleagues in 2006, have been inconsistent. And Slater and colleagues report has been consistent. Weight loss is not fat free mass and fat, therefore, the composition of the diet and exercise program is a good approach. Increased physical activity is associated with decreased caloric sensible way that will prevent the loss of lean body mass. Long-term exercise increases fat free mass and reduce fat mass.

- Selected aerobic exercise for 8 weeks results in increased maximal oxygen consumption (P<0.05)

Changes in VO_2max with reports Hyky et al 1997, Howard et al 2000, Elias and colleagues in 2000, were consistent.

It appears that aerobic exercise increases the number of capillaries and muscle fibers of the muscle cross-sectional area of the muscle, which leads to better blood supply. The number and size of skeletal muscle mitochondrial oxidative metabolism increases and the possibility that this change improves muscle is a muscle aerobic capacity. In general, the findings of this study showed that selected aerobic training program affected subject's leptin serum, selected aerobic training program affected subject's vo_2 max and selected aerobic training program didn't affect subject BMI. These changes were associated with subjects' fitness level. Probably, if the intensity and duration of activities were higher than their present levels, significant results would be obtained and would highly affect the discussed indexes. In addition, a high volume of samples may help the validity of the results.

REFERENCES

1. Webber, J. (2003) Energy balance in obesity. The Proceedings of the Nutrition 62, 539-543.
2. Baltaci, A.K., Ozyurek, K., Mogulkoc, R., Kurtoglu, E.,Ozkan, Y. and Celik, I. (2003) Effects of zinc deficiency and supplementation on the glycogen contents of liver and plasma lactate and leptin levels of rats performing acute exercise. Biological Trace Element Research 96, 227-236.
3. Baratta, M. (2002) Leptin from a signal of adiposity to a hormone mediator in peripheral tissues.Medical Science Monitor 8, RA282-RA292. Available from URL: http://www.medscimonit.com/pub/vol_8/no_12/2990.pdf.
4. Green, E.D., Maffei, M. and Braden, V.V. (1995). The human obese gene: RNA expression pattern and mapping on the physical, cytogenetic and genetic of chromosome 7. Genome Research 5, 5-12.
5. Cioffi, J.A., Van Blerkom, J., Antczak, M., Shafer, A.,Wittmer, S. and Snodgrass, H.R. (1997) The expression of leptin and its receptors in preovulatory human follicles. Molecular Human Reproduction 3, 467-472.
6. Smith-Kirwin, S.M., O'Connor, D.M., De Johnston, J.,Lancey, E.D., Hassink, S.G. and Funanage, V.L.(1998) Leptin expression in human mammary epithelial cells and breast milk. The Journal of clinical Endocrinology & Metabolism 83, 1810-1813.
7. Buyse, M., Aparicio, T., Guilmeau, S., Goiot, H.,Sobhani, I. and Bado, A. (2004) Paracrine actions of the stomach-derived leptin. Medecine Sciences (Paris) 20, 183-188.
8. Unal, M., Unal, D.O., Salman, F., Baltaci, A.K. and Mogulkoc, R. (2004) The relation between serum leptin levels and max VO2 in male patients with type I diabetes and healthy sedentary males. Endocrine Research 30, 491-498.
9. Wadden TA, Stunkard AJ (eds): (2004). Handbook of Obesity Treatment, 1rd ed. New York:Guilford Press; 3 – 19.
10. Kraemer WJ, Hakkinen K, Newton RU, et al. (1999). J ApplPhysiol; 87: 982–992.
11. Kraemer RR, Acevedo E, Synovitz L, et al. (2001). Eur J ApplPhysiol; 86: 85–91.
12. Consitt LA, Copeland JL, (2001). Can J ApplPhysiol; 26: 574–87.
13. Milani RV, Lavie CJ, Barbee RW, Littman AB. (1995). Am J Med Sci; 310(6): 242–6.
14. Bruce CR ,kriketos AD . And : etal , Disassociation of muscle triglyceride content and Insulin sensevity after exercise in patients with type 2 diabetes Diabetologia 47 , 23 – 30 , 2004.
15. Elias An , paniahmr and et al , leptin and LGf – 1 levels in unconditioned male volunteers after short – term Exercise , psycnonero endocrinology , 25 : 543 – 481 , 2000
16. Nindl BC , kraemer WJ , ArcieroPy , samatales N , Leone CD , mayo M , Hafeman DL . Leptin concentrations experience a delayed reduction after resistance exercise in males – med sci sports Exerc34 : 608 – 613 , 2002.
17. D .Ozcelik , H . Dogan , H . Celik , A . Ayarl , S . serhatlioglu .H .kelestimur , Effects of Different weight loss protocols on serum Leptin Levels in obese females , phusiological research , 54 : 271 – 277 . 2005.
18. Hickey Ms ,considineRr and et al , Leptin is Releted to Body fat content im male Distance Runner , Am J physiol 271: Eq 38 – E 990 , 1997.

19. thongfsi , Hudson Rahd at al . plasmaLeptin in moderately obese moles Independent Effects of weight Loss and Aerobic Exercise AM ,] physiol . Endocrinol ,Metab 279 E 307 – E 313 , 2002.
20. Halle M , Berg A and et al , concurrent Reductions of serum Leptoin and Lipids Buring weight Loss males with type I Diabetes , Am J phsiolEndocrindmetab 271 : E2 77 – E 282 , 1999.
21. Karamouzis I , karamouzis M , vrabas Is , christoulas k , kyriazis N ; Giannoulis E , Mandroukas . K , the Effes of marathon swimming on serum leptin plasma Neuropeptide Y levels , clin chem. Lab med 40: 132 – 136 , 2002.
22. HoumardJa, Cox Jh and et al. Effect of short – term exercise traing in on Leptin and insulin Action , metabolism 49 : 858 – 861, 2000.
23. Welt man A, pritzlaffJand et al . In tensity of Acute Exercise Does Affect serum Leptin concentrations in young males, med sci sports Exerc 32: 1556 – 1561, 2000.
24. Zigman and et al , the influence of ecercise on obesity , Deutshezeitschrift for sport medzin , 2006 , 36 , p : 57 – 64.