Medicina Sportiva (2011), vol VII, no 4, 1712 - 1716
Romanian Sports Medicine Society

Exercise training effect on cardiometabolic risk factors and quality of life in young obese patients

Rusu Alexandra Mihaela[1], Avram Claudiu[2], Almajan-Guta Bogdan[3], Cocaina Andreea[2], Mihaescu Adelina[1], Gaita Dan Ion[1]

[1]*Victor Babes University of Medicine and Pharmacy, Timisoara, Romania,*
[2]*West University of Timisoara, Physical Education and Sport Faculty, Timisoara, Romania*
[3]*Politehnica University from Timisoara*

Abstract. The aim of this study is to demonstrate the benefit of a supervised weight loss management programme based on general dietary recommendations and interval exercise training (IET) on cardiometabolic risk factors and quality of life in young obese patients. *Material and Methods*: We conduct a 9 months interventional study on 28 young obese patients (mean age 21.3±3.1 years) with a mean BMI of 30.94±6.68. All patients were evaluated through a cardiopulmonary exercise testing (CPET) in order to provide optimal recommendation for exercise intensity. We also evaluate weight, body mass index, and visceral fat area (VFA); heart rate (HR); systolic blood pressure (SBP); diastolic blood pressure (DBP); fasting blood glucose (FGL); HDL cholesterol; explosive muscular power of lower body (P) and quality of life (using SF_36 questionnaire). The patients benefit from an intensive IET program, supervised and guided by a physical therapist. IET consisted in 50 minutes sessions, 3 times per week, at intensive endurance training zone (in the range of anaerobic threshold), completed by 1 minute interval in the range between anaerobic threshold and respiratory compensation point, for every 5 minutes of training. *Results*: After 9 months of intervention we acquired a significant decrease of weight, BMI, VFA, SBP, FBG, HR and an increase of HDL. *Conclusions*: Nine months of exercise based weight management program can reduce cardiometabolic risk factors in obese patients, and significantly improve quality of life in young obese patients.
Key words: *exercise training, cardiometabolic risk, quality of life, obese patients.*

Introduction

Obesity is a complex disease influenced by genetic, metabolic, social, behavioral, and cultural factors (1). On the other hand obesity has a big influence on health and quality of life.
It is well known that obesity is highly correlated with cardiometabolic disease including diabetes, hypertension and dyslipidemia (2). Visceral fat area is an indicator of body fat distribution. Excessive abdominal fat is known to be associated with a high risk of insulin resistance and cardiometabolic disease (3). Various public health agencies and medical societies (American Heart Association, American Medical Association, American Academy of Family Physicians) recommend exercise training as one of the most important element in weight loss management.
For clinical population exercise training is correlated with health-related quality of life (HRQL). But does this relationship between physical training and HRQL still exists for young obese apparently healthy population?
There is a study that conclude that healthy older adults who regularly participated in physical activity of at least moderate intensity for more than one hour per week had higher HRQL measures in both physical and mental domains than those who were less physically active.(4)
We hypothesized that a 9 months weight-loss program based on general dietary recommendation, combined with individually prescribed interval exercise training (IET) programs, would have a positive influence on body composition, fasting blood glucose (FBG), blood lipids, blood pressure and quality of life of the obese patients. The aim of the present study is to demonstrate the benefit of a supervised weight loss management programme based on general dietary recommendations and interval exercise training (IET) on cardiometabolic risk factors and quality of life in young obese patients.

Material and Methods

We conduct a 9 months interventional study on 28 voluntary obese patients (mean age 21.3±3.1 years) with a mean body mass index (BMI) of 30.94±6.68 kg/m^2. From total participants to the study, one patient was excluded for low availability to participate in training sessions.

All patients were evaluated through a cardiopulmonary exercise testing (CPET) at inclusion, after 3 months of intervention and at the end of the study (after 9 months). The CPET results were used to provide optimal recommendation for exercise intensity. A multi-frequency bioelectrical impedance analysis method was used to evaluate the patients' weight, body mass index, and visceral fat area (VFA). The patients underwent measurements of explosive power of the lower limbs by performing the Counter movement jump test (using Myotest system, Switzerland). We also evaluated heart rate (HR), fasting blood glucose (FGL), systolic blood pressure (SBP); diastolic blood pressure (DBP) and HDL cholesterol values. Quality of life questionnaire (SF_36) was used for the assessment of mental (MCS) and physical (PCS) quality of life.

All patients benefit from an intensive IET program. For this program we used ergometer bicycles, elliptical bicycles, steppers, treadmills). IET was supervised and guided by a physical therapist. Exercise training consisted in 50 minutes sessions, 3 times per week, at intensive endurance training zone (in the range of anaerobic threshold), completed by 1 minute interval in the range between anaerobic threshold (AT) and respiratory compensation point (RCP), for every 5 minutes of training.

For monitoring exercise intensity and caloric consumption we used Polar RS 800 heart rate monitors. Pedometers were also used in order to achieve 6000 steps/day, in those days in which they also participated in exercise training, and 10000 in days without exercise training.

We also provide general dietary recommendations to the patients in order to improve their nutritional habits.

After the intermediary evaluation (after the first 3 months) we adjust the training programs parameters according the exercise test results.

*Statistical Analysis.*Data were compared using ANOVA single factor test with the help of a statistical program (graphPad Prism v.5). Linear regression test were used in order to find correlation between numerical parameters.

Results

After 9 months of intervention we acquired a significant decrease of weight (from 83.61±21.04 to 79.70±20.13, p=0.001) and BMI (from 30.94±6.68 to 29,55±6,74, p=0.001). TAD evolution was not statistical significant maybe because of the short period of the intervention (9 months) but SBP decrease significant (p<0.001) from 132.8±9.95 to 119.6±8.43. We also notice a significant improvement of HR and FGL, evolution that can be seen in the table below. (Table I, Figure 1,2)

Table I. Parameters evolution after 3 and 9 months from baseline*.

Parameter	Baseline	3 months	9 months	P value
W (kg)	83.61±21.04	81.52±20.23	79.70±20.13	0.001
BMI (kg/m^2)	30.94±6.68	30.28±6.76	29.55±6.74	0.001
SBP (mm/Hg)	132.8±9.95	125.9±5.38	119.6±8.43	< 0.001
DBP (mm/Hg)	84.41±6.64	83.37±3.71	83.52±4.96	0.571
HR (b/min)	77.04±11.89	74.89±10.23	70.52±10.60	0.001
FGL (mg/dL)	94.85±14.79	88.56±11.61	78.70±8.579	< 0.001
HDL (mg/dL)	31.52±12.27	33.63±12.40	36,26±13,35	0.002
PCS	47.89±6.78	50.39±5.70	51.34±6.09	0.003
MCS	48.19±7.23	52.18±5.38	53.47±6.16	0.001

*Values are presented as mean ± standard deviation. W: weight; BMI: body mass index; SBP: systolic blood pressure; DBP: diastolic blood pressure; HR: heart rate; FGL: fasting blood glucose; HDL: HDL – cholesterol; PCS: physical score; MCS: mental score.

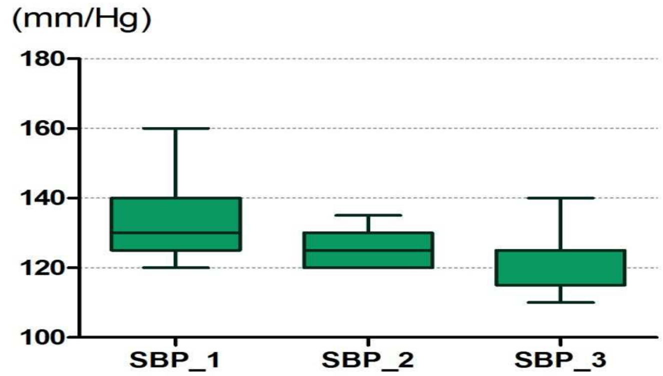

Figure 1. Trend of Systolic Blood Pressure after 3 and 9 months of exercise training*

*Values are presented as median with minimum-maximum whiskers. SBP_1: systolic blood pressure at baseline; SBP_2: systolic blood pressure after 3 months of training; SBP_3: systolic blood pressure after 9 months of training.

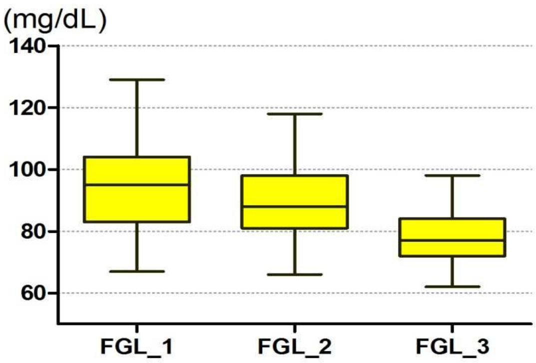

Figure 2. Trend of fasting blood glucose after 3 and 9 months of exercise training*

*Values are presented as median with minimum-maximum whiskers. FGL_1: fasting blood glucose at baseline; FGL_2: fasting blood glucose after 3 months of training; FGL_3: fasting blood glucose after 9 months of training.

We found a direct correlation between PCS at the end of the study and explosive power of the lower limbs at baseline (r^2=0.56, p<0.001), and also between TAS after 9 months of study and VFA at baseline (r^2=0.42, p=0.001). (Figure 3 and 4)

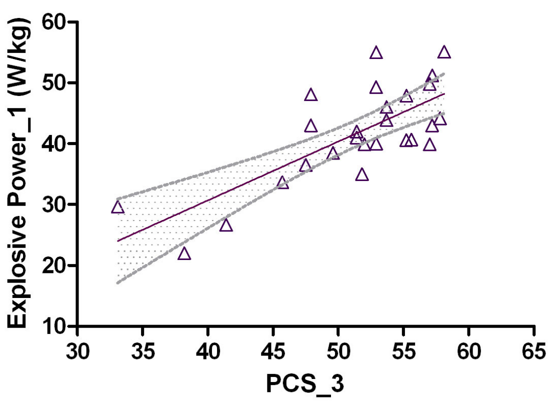

Figure 3. Correlation between PCS at the end of the study and explosive power of the lower limbs at baseline.

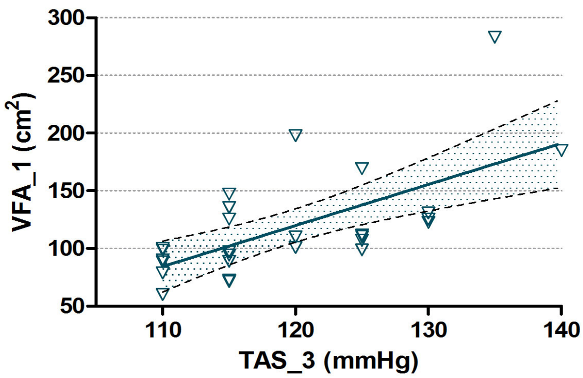

Figure 4. Correlation between TAS after 9 months of study and VFA at baseline

Discussions

We all know the famous Latin quotation “Mens sana in corpore sano” (a healthy mind in a healthy body). This quotation it often refers to the healthy balance in one’s mode of life, to the reality that only a healthy body can sustain a healthy mind (5). So, is well known the good influence that exercise training has on general health (including heart health) but also on mental health. In our study, evolution of MCS is in strong relationship with health improvement and the increase of explosive power have also a positive influence on PCS. High levels of quality of life are reported for peoples who involve themselves in physical activities that they enjoy but as we known, for obese people physical activity is usually reduced and not an activity that they especially enjoy (6). Still, our study conclude that after 9 months of supervised exercise training program quality of life of the young obese patients is significantly improved.

Previous studies (2,7) also found correlations of weight loss with blood pressure and glucose levels reduction. Weight loss based on calorie restriction seems to have independent benefic effect on glycemic control and insulin sensitivity. (8) The effect of physical training, on blood pressure seems to be of a transitory nature, with no persistent improvement after 8 years (9).
Our study in consents with previous studies, found that VFA is positively correlated with systolic blood pressure level.(10) We found a direct correlation between initial VFA and final SBP, which means that the amount of SBP decrease depends by the initial value of VFA.
Capacity in reducing weight and cardiometabolic risk factors of the IET programs was proved in several studies. A recent meta-analysis, of a limited number of studies and with a small sample sizes, conclude that high-intensity aerobic interval training with active recovery and continuous moderate-intensity exercise have similar effects on metabolic risk factors.(11) Other studies demonstrated that high-intensity (relative to the individual's maximal oxygen uptake) IET, compared to continuous moderate-intensity exercise can bring benefits even in elderly patients with chronic heart failure and severely impaired cardiovascular function. (12,13)

Conclusions

Nine months of IET can reduce cardiometabolic risk factors in obese patients, reducing SBP, FBG, body weight and specially VFA and also improves quality of life. Nine months of exercise based weight management program can reduce cardiometabolic risk factors in obese patients, and significantly improve quality of life in young obese patients.
Our study results could be due to type of training we chose (IET) and the individualization of exercise intensity according to CPET results, one of the most efficient type of exercise training that influence cardiometabolic risk factors. We also think that the fact that IET was guided and followed by physical therapist, brought substantial benefits, influencing the results of the study.

Acknowledgement: This paper work was supported by a research grant from UEFISCDI Romania, code PD_382.

References

1. National Institute of Health (2000). *The Practical Guide: Identification, Evaluation, and Treatment of Overweight and Obesity in Adults*. Publication number 00–4084. National Institute of Health.
2. Ashley FW, Kannel WB. (1974). Relation of weight change to changes in atherogenic traits: the Framingham study. *J Chronic Dis.*; 27:103–114.
3. Banerji MA, Lebowitz J, Chaiken RL, et all (1997). Relationship of visceral adipose tissue and glucose disposal is independent of sex in black NIDDM subjects. *Am J Physiol.*;273 (2 Pt 1):E425-E432.
4. Acree LS**,** Longfors J**,** Fjeldstad AS**,** Fjeldstad C**,** Schank B**,** Nickel KJ**,** et.all (2006). Physical activity is related to quality of life in older adults.*Health and Quality of Life Outcomes*, 4:37 doi:10.1186/1477-7525-4-37.
5. http://en.wikipedia.org/wiki/Mens_sana_in_corpore_sano
6. Rejeski W. J and Mihalko S L. Physical Activity and Quality of Life in Older Adults. *Journals of Gerontology*. Vol. 56A (Special Issue II):23–35.
7. Wing RR.; Koeske Randi,. Epstein L H, Nowalk MP, Gooding W, Becker D (1987). Long-term Effects of Modest Weight Loss in Type II Diabetic Patients . *Arch Intern Med.* 147(10):1749-1753.
8. Wing R R, Blair E H, Bononi Patricia, Marcus M D, Watanabe R, Bergman RN (1994).Caloric Restriction Per Se Is a Significant Factor in Improvements in Glycemic Control and Insulin Sensitivity During Weight Loss in Obese NIDDM Patients. *Diabetes Care*. doi: 10.2337/diacare .17.1.30 vol. 17 no. 1, 30-36.
9. Sjöström D C, Peltonen M; Wedel H; Sjöström L (2000). Differentiated Long-Term Effects of Intentional Weight Loss on Diabetes and Hypertension. *Hypertension*. 36: 20-25 doi: 10.1161/01.HYP.36.1.20).
10. Nunes F A, Ribeiro FFF, Gouveia F S R, Zanella M T, (2002). Impact of Visceral Fat on Blood Pressure and Insulin Sensitivity in Hypertensive Obese Women. *Obesity research* Vol. 10 No. 12.
11. Hwang CL, Wu YT, Chou CH. (2011). Effect of Aerobic Interval Training on Exercise Capacity and Metabolic Risk Factors in People With Cardiometabolic Disorders: A META-ANALYSIS.J *Cardiopulm Rehabil Prev.* 31(6):378-85.
12. Tjønna A E, Lee S J,Rognmo O, Stoylen T, Bye A, Haram PM et. all.(2008). Aerobic interval training vs. continuous moderate exercise as a treatment for the metabolic syndrome - "A Pilot Study". *Circulation.* 118(4): 346–354.

13. Wisloff U, Stoylen A, Loennechen JP, Bruvold M, Rognmo O, Haram PM (2007). Superior Cardiovascular Effect of Aerobic Interval Training Versus Moderate Continuous Training in Heart Failure Patients. *Circulation*; 115: 3086-3094.

Corresponding author
Rusu Alexandra Mihaela
Victor Babes University of Medicine and Pharmacy, Timisoara, Romania
E-mail: ralexandra83@gmail.com

Received Article: August 2011
Accepted: November 2011