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Considerations regarding the changes of body composition parameters by applying individualized kinetoprophylactic programmes in young obese people

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Abstract. The aim of this study is to establish the changes in body composition in young obese people after modifying their lifestyle by applying individualized training programmes and nutrition counselling. The study was made on a group of 72 students (21.2±3.58 years) from our university, with BMI over 30kg/sqm (31.63±7.05kg/m^2); the study group participates in nutrition counseling sessions and to individualized training programmes for 12 months; the assessment protocol was composed of: somatometry, body composition analysis (with an bioimpedancy device – InBody720), analysis of the glicemic and lipidic profiles, ergospirometric analysis, life quality and cardio-metabolic risk assessments; the subject are evaluated on a quarterly basis. The training schedule was based and individualized with ergospirometric analysis, so that the heart rate intervals demanded in required physical activities were those in which lipids are predominantly consumed; the diet was based on a hypocaloric and hypolipidic regime and was individualized too. After 12 months, body compostion analysis revealed that the parameters involved in the development of cardio-metabolic complications of obesity were significantly changed, so there have been important improvements in body mass index, the percentage of body fat. These values were highly correlated with lipid and glucose levels, blood pressure values and the quality of life taken of study subjects. In conclusion, we reached the final goal of our study - reduction and maintenance of the selected subjects' body weight and composition at levels closer to the optimum, the diminution of cardio-metabolic risk, the improvement of the eating habits and physical activity related behaviour with an important impact on their quality of life**.**
Key words: *body composition, obesity, physical activity*.

Introduction

Overweight and obesity is ever increasing and becomes a common disease, but its treatment is still a debate in therapeutic community, involving a complex effort and multidisciplinary approach from many specialists (nutritionists, physical therapists, psychologists, endocrinologists and surgeons). Obesity is more common than cardiovascular, diabetes and cancer diseases together and is also an etiological factor of these 3 types of pathologies (1). The incidence of type 2 diabetes mellitus is twice more common in obese people. The studies showed that the prevalence of type 2 diabetes mellitus is strong related with the prevalence of obesity and both are increasing; 85-90% from kids and teenagers with type 2 diabetes mellitus are obese (2). Recent studies showed that the active people with a good cardio-respiratory fitness level have less chances to suffer from a cardiovascular disease comparing with the sedentary one; if they still get the disease, they will have it in an older age and less severe than the others (3). The effort capacity is a more important marker for the cardiovascular morbidity risk and all cause mortality than the already known risk factors (hypertension, smoking, obesity, diabetes) (4). Despite this evidence, in the European Union the data shows that less than 50% of people are doing aerobic physical activities; more than this is noticed an increasing of obesity as a consequence of sedentary life style (5). The sedentary life style noticed in the young generations in Europe has a major impact in increasing cardio-metabolic diseases in the near future – in present is noticed a decrease with almost 600 kcal per day of energy consumption through physical activity in the present young generation comparing to the young generation from 50 years ago (6).

Prospective epidemiological studies has shown doubling the risk of premature death and an increasing in cardio-metabolic risk at the persons that adopts a sedentary lifestyle (7, 8).

Increasing physical activity in adults is following by rising of life expectancy and delay of the onset of cardio-metabolic diseases. Even a moderate level of physical activity may decrease mortality and nonfatal coronary artery events (9). To estimate the level of physical activity we can use subjective or objective methods. The subjective methods used are: questionnaires or diaries for tracking the physical activities or using specialized training software.

This study is a part of a bigger project entitled "Optimizing the somatometric and cardiometabolic parameters at young obeses by modifying the lifestyle and implementation of individualized kinetoprophylactic programmes" (Project of Exploratory Research – Ideas, code 2330/2008); the aim of this project was the validation of a protocol for testing and monitoring the physical effort based on the use of some advanced methods with a high degree of sensitivity and specificity that has established as objective the development of physical therapy programmes destined to enhance the lifestyle and to diminish the cardio-metabolic risk at young obese persons (10).

A study made in West University of Timisoara in 2008 has shown that 38% of the students are overweight and obese (11).

The aim of this study is to demonstrate that the application of an individualized physical training programme and nutrition counselling can improve the body composition, the somatometric and cardio-metabolic parameters related to it, at young obese and, in consequence, could increase their state of health (10, 12).

Material and Methods

We conduct a randomized prospective study on a group of 72 voluntary obese students of our university; this study was made between January 2010 and December 2010 and the study group was selected from the students of West University of Timişoara which respect the including criteria: age between 18 and 25 years (21.2 ± 3.58 years), body mass index over 30 kg/sqm (31.37 ± 7.05 kg/m^2) and a signed agreement by these subjects (after they were informed concerning the project objectives, the achievement methods for that); the excluding criteria were: the presence of any pathology that would contradict physical effort and/or a hygieno-diet regime, disproval towards the mentioned agreement, expressed desire to finish the program.

The study group was initially formed by 90 students of West University of Timisoara, selected among those 3500 students who participate at Physical Education and Medical Gymnastics classes. From the initial group of 90 selected students, were taken into account the results for 72 of them (17 students left the program for various reasons).

The evaluation protocol consisted in: somatometric examination, ergospirometric analysis, analysis of body composition through bioimpedancy (with an InBody 720 device), assessment of cardio-metabolic risk (by analysing the glicemic and lipids profiles, blood pressue values, the arm-brachial index, the risk for diabetus mellitus type II – FINDRISC score and for cardiovascular major events – SCORE) and the subjects´ quality of life (WHOQOL quesstionnaire). The assessment of the subjects relies upon the testing of their effort capacity as well as upon the nutritional analysis performed by means of ergospirometrics (CPX).

The kinetoprophylactic individualized programmes were based on a process of carefully monitored and quantified increase of the physical activity level in addition to a specific diet. In consistency with the protocol, both components (physical training and diet) were adapted to the personal particularities of the subjects involved in the study.

In order to rich our purpose regarding the body composition and cardio-metabolic risk of the study group, the subjects benefit by a nutrition counseling and an individualized training programme; a physician specialized in nutrition and metabolic diseases has recommended a diet that induce a 500-1000 calories/day caloric deficit and with a macroelements content which will reduce the cardiometabolic risk. The subjects were informed about elementary notions about caloric necessary, daily ratio, division on meels; the consumption of more fruits, vegetables, integral cereals, diet fat free or light products, fish, bird meet and low calories meels were recommended; the consumption of nutriments with high concentration in saturated fats, saturated fatty acids and cholesterol were limited. The diets were personalized, will be used techniques for increasing the adhesion of subjects to the diet such us making the diet after subject food preferences, lyfestyle and health stage.

We also established the particularities of an individualized physical training program based on nutritional analysis, therefore the physical effort was done mostly in the corresponding area for maximum consumption of lipids (preponderent, it used an intervals training programme). we prescribed and monitored the daily physical activity based on a walking programme (monitored with pedometers) and on a physical training programme wich was made for 3-4 times on a week and had the following phases: the first one, consisted in warming-up (for 5-10 minutes), followed by stretching and fast walking on a treadmill; the following phase is the properly training programme (for 35-40 minutes) consisting of endurance effort on treadmill, stepper, elliptical bycicle, ergometric bycicle; each effort phase was followed by a recovery period.

The effort intensity and duration was monitored with pulsmeters. The re-evaluation of each subject was made quarterly.

Body composition analysis was made for the study group with an InBody720 device which analyzes body composition based on the electrical conductive properties of biological tissues called Bioelectrical Impedance Analysis (BIA). Regarding the parameters that are assessed with this device, we mention the most important ones for our study: body composition, muscle-fat diagnosis, obesity diagnosis, BMI, percentage of body fat, waist-hip ratio (WHR), segmental lean mass, segmental oedema, visceral fat analysis, nutritional evaluation, bone mineral content, weight control, basal metabolic rate (BMR).

Figure 1. Body composition analysis with InBody720 device

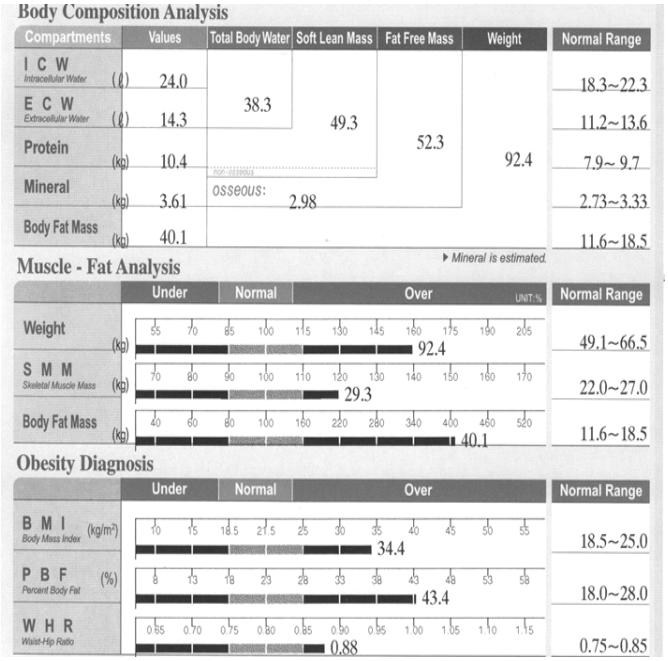

Figure 2. Body composition analysis, muscle-fat analysis and obesity diagnosis

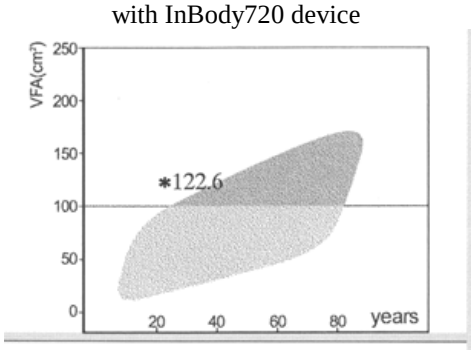

Figure 3. Visceral Fat Area representation

Results

After 12 months of physical training and diet, the body composition assessment revealed some important changes of studied parameters, espeacilly of those related to cardio-metabolic risk.

In figures 4-7 are presented the evolution of those parameters (means, standard deviations and p values after paired t test application) (the graphs and the statistical analysis was made with GraphPad Prism 5 software).

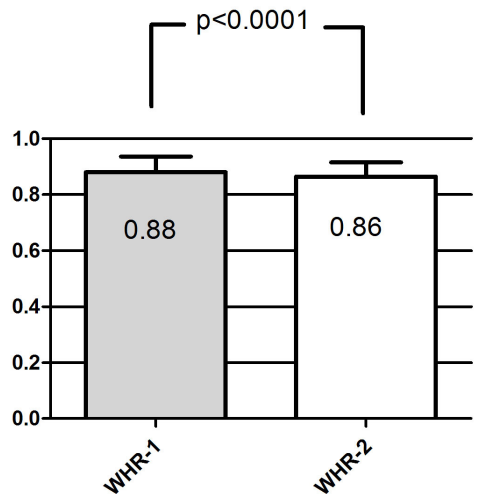

Figure 3. Waist-Hip Ratio (WHR) evolution (WHR–1: baseline value; WHR–2: final value)

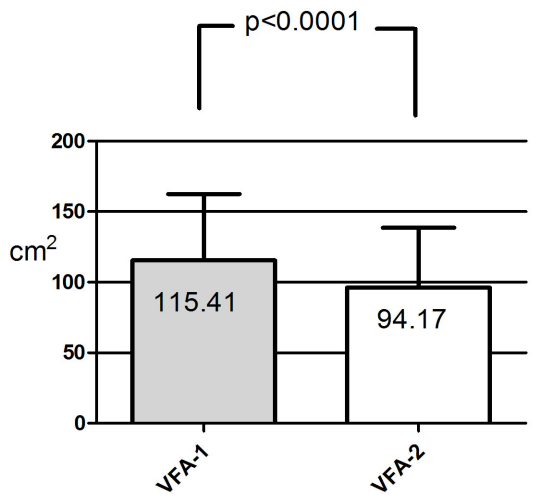

Figure 4. Visceral Fat Area (VFA) evolution (VFA–1: baseline value; VFA–2: final value)

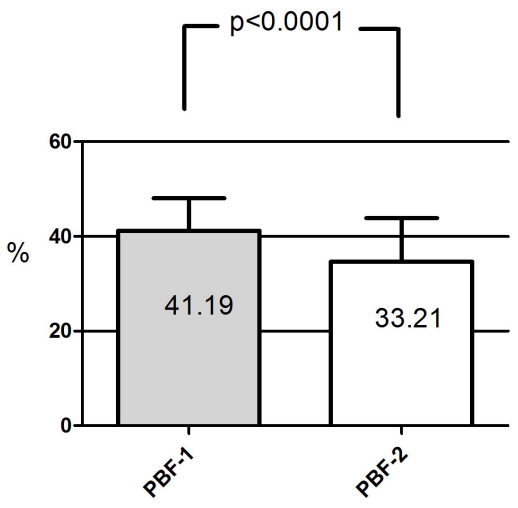

Figure 5. Percentage of body fat (PBF) evolution (PBF – 1: baseline value; PBF – 2: final value)

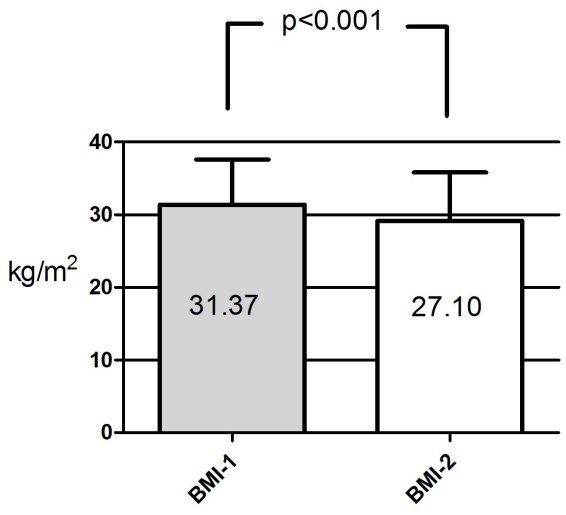

Figure 6. Body Mass Index evolution (BMI) evolution (BMI – 1: baseline value; BMI – 2: final value)

We find that BMI, VFA, PBF and WHR are strongly and directly corelated with other cardio-metabolic risk factors assessed in this study (dyastolic blood pressure, glicemic level and LDL-cholesterol levels) (Pearson coefficient, r, was in all cases > 0.7). Also, the BMI was highly and inversely correlated with WHOQOL score (r = -0.84).

Disscusion and conclusions

Body composition assessment with InBody720 provides high-precision data required to treat patients with overweight and obesity; it has high precision level for patients with special body figure (for example, obese people) so, it helps us to provide more appropriate evaluation and treatment of those subjects; it is safe, rapid and easy to perform, and requires a minimum training (13).

The diagnosis and the good management of cardio-metabolic risk at young obese subjects have an important impact on their health and on long term prognosis at this subjects category. Diabetus mellitus of type II and cardiovascular disease prevention is a priority for european level health systems; we can conclude that a body composition analysis can predict both a metabolic and cardiovascular risk, espeacilly when is completed with other measurements (presented in the project´s protocol) (10).

Knowing the increased interest of young people for modern technologies, the use of activmeters in guidance and monitoring of losing weight programs, the modern technologies used in assessment (CPX, BIA) had a great impact among them (14). The spontaneous and precisely quantified feedback that these modern devices gave to the subjects confered them support and motivation in accomplishing their personal objectives.

The final goal of our study regarding the reduction and maintenance of the selected subjects' body weight and composition at levels closer to the optimum, the diminution of cardio-metabolic risk, the improvement of the eating and physical activity related behaviour with an important impact on their quality of life was reached.

Acknowledgements

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