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PHYSICAL EXERCISES PROGRAMS FOR OBESITY PREVENTION

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Abstract. *The aim of the research is to develop physical exercise programs to prevent obesity, recover and increase quality of life in patients diagnosed with overweight / obesity. The results of the study have proven the effectiveness of the exercise program to the cyclogergometer (Beldiman Program) in recovering this pathology by weight loss, abdominal circumference reduction, abdominal fissure index, increased exercise capacity that improves the quality of life.*
Keywords:

Introduction

Obesity has an ever-increasing global incidence in all age groups [1] and is one of the greatest challenges and serious public health problems of this century [2]. Its spectacular evolution has determined the World Health Organization to declare obesity as having the character of a global epidemic [3].

Obesity, with many co-morbidities that develop over time, has a significant impact on the health of the population. It is considered the fifth cause of death: 2.8 million adults die each year because of the weight that exceeds normal limits. Studies have shown that every 16 years, the mortality rate in women with grade I obesity doubles [4]. The higher the degree of obesity increases, the longer life expectancy is reduced by 6-7 years [5]. Thus, if in a patient with grade I obesity (BMI = 30-34.9kg / m2) life expectancy decreases by 2-4 years, to a grade 4 obesity by 10 years [6].

Reducing weight and maintaining it is done through a two-factor collaboration: exercise and diet. Physical exercise is the second predictor of decrease but also of maintaining normal body weight after diet, alone produces a moderate reduction in immediate body weight even if not associated with a diet.

Regular exercise programs improve the cardiovascular risk of overweight and obese and increase cardiorespiratory fitness. Thus, there have been studies that have shown that people with a weighted, but trained surplus have reduced their cardiovascular risk compared to those with the same weight or even normal weight, but sedentary. These programs prevent the weight increase associated with older aging [7].

Objectives of the study. The study aimed primarily at establishing the effectiveness of exercise programs on the cyclogergometer (Beldiman Program) in the treatment of obesity in the middle-aged persons.

Secondary Goals:

- Effectiveness of exercise programs on cyclogergometer in achieving a weight loss.
- Effectiveness of exercise programs on cyclogergometer in reducing abdominal circumference.
- Effectiveness of exercise programs on cycloergometer in amelioration of abdominal and buttock index.

Material and methods

Type of study. In order to achieve the aimed objectives, we conducted a case-control study, from 1 January 2017 to 31 December 2017, analysing the effects of exercise programs on the cyclogergometer (Beldiman Program), applied to obese second-age patients compared to subjects who only followed drug therapy.

Population studied. This study included 20 obesity patients admitted to the Cardiovascular Recovery Medical Clinic of the Iasi Recovery Hospital.

Study group formation - Patients with group I (control) and group II (experimental) obese patients were chosen after age and gender in order to be similar. The ages were between 40-50 years

old, with equal representation of both genders in both groups.

Selection criteria for study group formation are detailed in Table 1.

Table 1. Selection criteria for study group formation

Inclusion criteria
• Patients diagnosed with obesity according to the criteria, aged 40-60 years from Iasi
• Have signed the patient's informed consent to the use of personal data
Exclusion criteria
• Patients who are not diagnosed with obesity, aged different from those proposed in research, from rural areas
• Patients with uncontrolled hypertension, insulin-dependent diabetes mellitus, acute myocardial infarction, aortic coronary by-pass and PTCA in recovery phase 1, decompensated heart failure, severe functional impotence. • Persons who refused to participate in the study or those who did not sign the informed consent

Study protocol

After signing the informed consent to participate in the clinical trial, each patient followed the steps outlined in the following protocol, indicated in Figure 1:

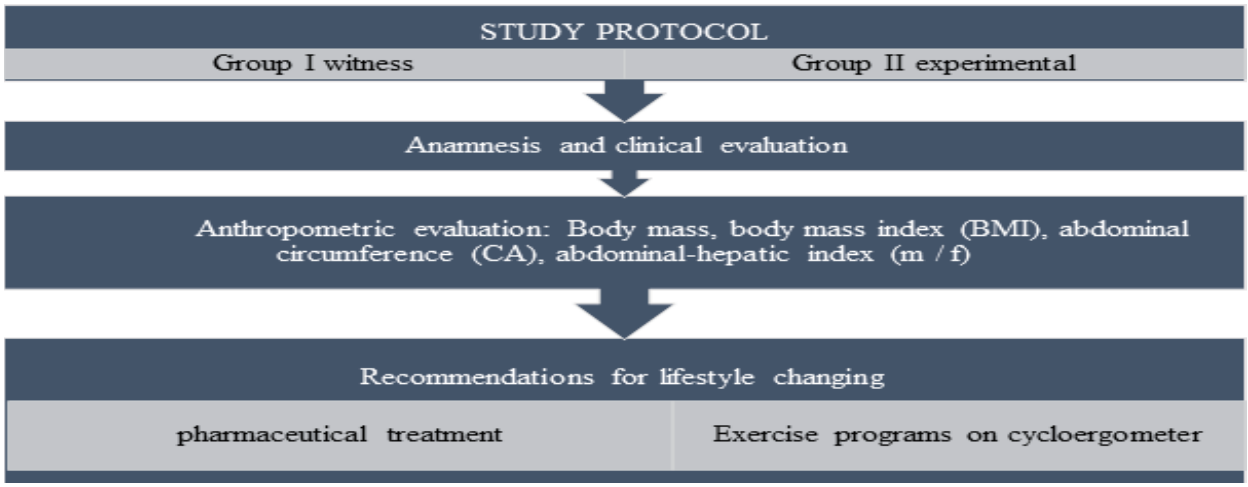

Fig. 1. Study protocol

The aim of the research is to develop exercise programs for the cycloergometer, to prevent and treat obesity and to increase the patients' life quality.

Hypothesis - we propose to verify the hypothesis that well-structured exercise cycles, properly applied, respecting the principles of progressive effort and individualization of treatment, lead to good results in obesity improvement.

Research Methods

Between 1 January 2017 and 31 December 2017, a total of 20 patients diagnosed with obesity of varying degrees were enrolled in the clinical trial and addressed to the Cardiovascular Recovery Medical Clinic of the Iasi Clinical Recovery Hospital for evaluation and inclusion in a recovery program. The enrolled patients were equally divided by gender, 10 men and 10 women, with an average age of 52.6 years.

They were divided into two groups: control and experiment. In Group I - control, conssisting of 10 subjects, 5 men and 5 women from urban areas were included. The mean age of the batch was 52.3 years, ranging from 45 to 59 years. The

experimental group II had the same number of subjects and the same structure, and the mean age was 50.4 years, ranging from 38 to 58 years.

The anthropometric measurements, evaluations, and investigations selected in the research were not random, but carefully selected based on medical guidelines drafted by European or international fora for obesity and cardiovascular disease.

Anamnesis and clinical examination

Anamnesis was an important source of valuable information - identity data, age, gender, background, profession, heredo-collateral and personal, physiological and pathological history, living and working conditions, behaviors - eating, drinking, smoking. The Cardiovascular Disease Prevention Guide highlights the role of anamnesis in identifying the presence of cardiovascular disease at younger age in relatives of grade I as class 1C. It becomes an effective and preventive tool for identifying risk groups. [8]

We noticed that most of the anamneses lack data on the level of physical activity that the patient claims, although sedentarism is a known and declared risk factor.

Anthropometric evaluation

• *Body Mass Index* (BMI) is the ratio between weight (kg) and square height (m^2). It was calculated by measuring height and determining body mass by weighing with a standardized scale for each participant in the study. Based on WHO (World Health Organization) criteria and the International Obesity Task Force, people with BMI between 18.5 and 24.9 kg /m^2 are considered normoponder; overweight when the BMI is between 25 and 29.9 kg /m^2; obesity of grade I - BMI between 30 and 34.9 kg / m^2; grade II obesity - BMI between 35 and 39.9 kg / m^2; grade III obesity (extreme, morbid) - BMI greater than or equal to 40 kg / m^2. [9] organizatia mond a sanatataii

• *Abdominal circumference* (AC) was measured with the metric band in a horizontal plane, passing through the middle of the distance between the lower edge of the ribs and the iliac, umbilical crest, as recommended by ADI(abdomen-hip-index). It correlates with the intraabdominal fat mass. Its values ≥102 cm by men and ≥88 cm by women are considered an increased risk for cardiovascular morbidity and mortality. Indice abdomeno fesier

• *The abdomen-hip index* - is the ratio of the abdominal circumference mentioned above to the femoral perimeter obtained by measurement using the metric band.

After these evaluations, the patients were divided into two groups: Group I - control and Group II - experimental, according to the study protocol.

The initial comparative analysis of the two study groups highlighted the following aspects regarding the following criteria:

Patient distribution based on heredo-collateral history

In control *group I*: obesity was present in 7 of the mothers and 2 of the fathers, and Diabetes was present in a one mother of a subject. Regarding cardiovascular pathology, 4 subjects stated that the mother was known for this pathology, 6 stated the same about the fathers, and 3 say that both parents had AHT.

The situation in the *Group II-Experiment* is the following: Most of the mothers' patients in the experiment group were overweight / obese, three fathers had abdominal obesity, and three patients had both obese parents. Regarding cardiovascular pathology, five subjects stated that their mothers were hypertensive, three of the subjects said that both parents had cardiovascular pathology, but did not specify it, and only by five of the subjects only fathers were carachterized with the mentioned pathology. Diabetes was present in two women and one man (Table 2).

Table 2. Distribution of patients according to their heredo-collateral history

Pathology	Group I - control			Group II- experimental		
	Mother	Father	Both parents	Mother	Father	Both parents
Obesity	7	2	2	7	3	3
CVD	4	8	3	5	5	3
Diabetes	1	0	0	2	1	1

Distribution based on personal history

The most important comorbidities highlighted by the 20 patients included in the study are: cardiovascular disease 49.3%, of which coronary diseases 14%, AHT 12.8%, other cardiovascular diseases 22.4%, obesity 12.8%, dyslipidemia 11.5%, liver steatosis 9.61%, vertebral pathology 8.97%, decrease in glucose tolerance 5%, gonarthroses 4.48%. In the two groups, the most important co-morbidities were: myocardial infarction, chronic electrical stage (7 cases), percutaneous angioplasty with stend (4 cases), aortic ateromatosis (6 cases), cardiac failure (5 cases), chronic ischemic heart disease (5 cases), rhythm disorders (7 cases), angina pectoris (4 cases), venous insufficiency (9 cases), liver steatosis (17 cases), vertebral pathology (15 cases), gonarthrosis (7 cases). They were equaly representated in both genders.

Distribution by behavior: *sedentary, smoking, alcohol.*

Comparing the patients in the two groups, there were no active smokers at the time of the study, but 8 of them were former smokers, 17 of them were sedentary and did not practice physical activity at work or in leisure time, and consumed alcohol occasionally (Table 3).

Table 3. Distribution by behavior: sedentary, smoking

Behaviour	Group I		Group II	
	Men	Women	Men	Women
Sedentary	5	2	4	5
Smokers	4	1	3	0

The results of the initial anthropometric evaluations, comparatively presented for the two groups:

Body mass - the mean body mass is 106 ± 12.06 kg in group I and in group II has an average value of 99.8 ± 11.32 kg, where P= 0.14, which indicates that, in the two groups, there are no statistically significant differences in the indicator according to Table 4.

The abdominal perimeter evaluated in comparison for the two groups, shows the homogeneity of the them with P = 0.47 the mean value of this parameter in group I is 111.5 ± 7.57cm and in the experiment group is 115.3 ± 9.43cm with P=0.47, with similar values between the two genders.

Abdomen-gluteal index. The mean value of this index in group I is 1.15 ± 0.11 cm, and in group II, 1.16 ± 0.11 cm, where P=0.66, without gender differences.

Table 4. Average values of the initial anthropometric evaluations of the two groups

Mean Value	Group I - control		Group II - experimental	
Sex	Men	Women	Men	Women
Body mass (kg)	102,8	97,2	106,8	106,8
The degree of obesity (BMI) kg/cm	35,8 ±4,0		33,4 ±3,7	
Abdominal perimeter (cm)	113	110	114,6	116
Abdomen-fesier index	1,14	1.12	1,14	1,19

The degree of obesity assessed by the mean values of BMI in the two groups does not indicate statistically significant differences, P = 0.18; In group I, the mean BMI is 35.8 ± 4.0 kg/cm and in the control 33.4 ± 3.7 kg/cm in Table 5.

Table 5. Distribution of obesity by level I and II

Obesity	Group I - control		Group II - experimental	
	Men	Women	Men	Women
level I	1	0	3	1
level II	4	4	2	1
level III	0	1	0	3

In conclusion, we can say that the two groups are equal in terms of the distribution of patients on all evaluation criteria: age, gender, personal and heredo-collateral history, anthropometric parameters. We have tried to make the selection very rigorous, with the smallest variations in all parameters due to the most accurate results, starting from the small number of patients included in the study, which limits the results from this point of view.

After evaluation, Group I and Group II patients received indications regarding the needed changes that were to be made in terms of lifestyle and drug therapy for multiple comorbidities, and group II patients were included in recovery programs, where (Beldiman Program), with periodic anthropometric assessments at 3, 6, 12 months.

The exercise programs we designed in the research (the Beldiman Program) were grouped in two successive phases with different objectives and methods, but respecting the principles of progressive effort and individualization of treatment. It should be noted that we have not found in the literature any model of exercise program for cyclogergometer adapted for this pathology.

After a year from the initiation of the research, the last evaluation of the patients in the two groups was performed and statistically significant differences in the mean values of the parameters studied were observed.

The final comparative analysis of the results registered in the two study groups highlighted the following aspects regarding the criteria:

a. Anthropometric evaluation

The analysis of the parameters included in the final anthropometric evaluation shows a different evolution of the two groups, with a significant improvement in the 2nd group of experiments, which regularly practiced the exercise programs in the cycloergometer (Table 6).

Table 6. Final average values of the anthropometric parameters of the two groups

Nr.	Parameter	Mean Value Group I	Mean value Group II	P
1.	Body mass (kg)	94.30 ± 8.654	104.20 ± 10.443	0.003
2.	IMC (kg/m^2)	31.360 ± 3.4651	35.350 ± 3.5002	0,002
3.	Abdominal parameter (cm)	104.90 ± 7.549	118.40 ± 8.822	0,002
4.	Abdomen-gluteal index	1.0120 ±.12227	1.2070 ± .12338	0,002

• **Body Mass:** at this parameter, it is found that the mean value is statistically significantly lower in the experimental group, where the patients performed exercise programs in the cycloergometer, compared to the mean value of the witness group. Thus, it is demonstrated the effectiveness of these exercise programs applied to the decrease in body mass value. Any decrease in

body mass is important in patients with obesity, as it also results in a tightening of the tension profile, **a** weight loss of 1 kg produces a reduction in blood pressure values of 1.6-1.3 mmHg [10]. And a decrease of 5.1kg results in an improvement in systolic blood pressure by 4.4 mmHg and diastolic by 3.47 mmHg. [11] If a weight loss of 10 kg is obtained, it will be accompanied by a reduction in TAS and TAD by 10 mmHg [12].

The distribution of body mass parameters, BMI, abdominal perimeter, abdominal-hepatic index, in the final evaluation of the two study groups is shown comparatively in Figure 2.

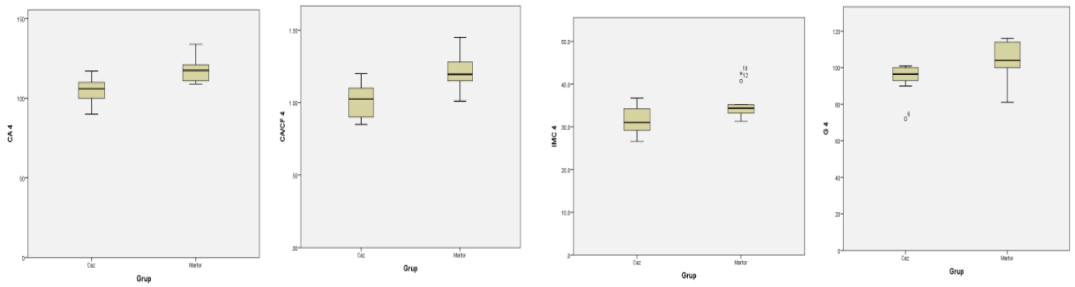

Fig. 2. Distribution of anthropometric parameters in the final evaluation - of the two groups

In **conclusion**, we can state that the physical exercise programs elaborated and implemented in this research have proved their effectiveness in all established anthropometric parameters, they have been well tolerated by the patients, they have a simple and clear methodology of implementation and can be applied in any service of recovery.

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