

**MINISTRY OF EDUCATION, RESEARCH, YOUTH AND SPORTS
NATIONAL UNIVERSITY OF PHYSICAL EDUCATION AND SPORTS**

POPESCU I. VIORELA-ELENA

ABSTRACT

DOCTORAL THESIS

***INFLUENCE OF PHYSICAL EXERCISE ON THE BODY
COMPOSITION OF OVERWEIGHT AND OBESE FEMALE
STUDENTS IN THE ECONOMIC HIGHER EDUCATION***

Scientific advisor:

Prof. PhD. *SILVIA TEODORESCU*

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The thesis **Influence of physical exercise on the body composition of overweight and obese female students in the economic higher education** is structured on three parts, containing 14 chapters and a bibliography that reunites Romanian and foreign publications.

Through this scientific approach, we wanted to emphasize the role of physical exercise in combating overweight and obesity in female students from the Bucharest Academy of Economic Studies, with ages comprised between 18 and 25 years. To this purpose, we drew up and applied in the physical education lessons some creative programs of combined physical exercises (cardio, toning, muscle elasticity and joint mobility), meant to determine the modification of body composition, with a beneficial effect on the muscular mass maintaining; the programs conceived by us complied with the basic scheme, alternating the effort type, and were individualized depending on the somatic particularities of each female student.

As a final goal, we aimed to change the young girls' lifestyle that can be reflected in their health status, which is seen as a set of correlated factors ensuring "a state of complete physical, mental and social well-being" (WHO).

The first part of the thesis is called *Theoretical, methodological and conceptual framework of the topic addressed* and includes five chapters. Their content was suggested by the alarming statistics on the health status and by the increased incidence of chronic diseases in Romania, where there are currently more than 4 million non-treated obese people, out of whom 20.7% clinically obese and 16.3% overweight persons. This state of facts imposes a change in the lifestyle, which includes a systematically performed physical effort, with effects on the gross body functions, the energy stores or the psychic resources.

In the first chapter, *Physical education in higher education - contemporary approaches*, there are analysed the modern conceptions concerning physical education and are presented the forms of development, the content and role of this academic discipline within the Romanian higher education system, in general, and the economic field, in particular. Physical education, an indispensable part of education, has major influences on the man's biological sphere, aiming to harmoniously develop the body, consolidate the health, strengthen the body, develop and improve some physical qualities necessary to the work and sports activities, as well as to form some moral qualities.

A particular attention is paid, within this chapter, to the specificity of Physical education and sports discipline designed for students at the Bucharest Academy of Economic Studies, who benefit, in the curricula of all faculties, by one lesson a week, with a length of 60 minutes, being a compulsory discipline in the 1st and 2nd years of study - Bachelor cycle.

The second chapter, *Studentship age (18-25 years) - bio-psycho-social aspects*, treats about the somatic-functional and psychosocial particularities of this age, characterized by the complete maturation of body on all planes: somatic (morphological and functional), psychic and intellectual ones. The continuation of studies in higher education institutions enables the young people to become autonomous persons, an activity based on a permanent motivation and supported by an intense feeling of social responsibility. Also in this period, the social-professional groups are constituted, which supposes a direct interpersonal communication system, cooperation, moral and spiritual cohesion relationships.

The chapter *Overweight and obesity - conceptual delimitations* is entirely dedicated to the clarification of the following terms: overweight, obesity, fat mass, non-fat mass, body mass index, body weight and constitutional types.

One of the most serious problems affecting the contemporary man's health is obesity, a nutrition-related disease defined by an increase in the body weight due to the adipose tissue, while overweight expresses the individual's condition supposing a body weight beyond the average limit admitted, taking into account the height and possibly the age. Determining the body composition is important, because it allows a correct assessment of the nutritional status. During a diet, it is worth knowing that the active cell mass, made up of water, proteins and minerals, should not decrease, because it is a great energy-consumer. When the quantity of food ingested exceeds the energetic expenditure, the surplus of nutrients is stored by the body under the form of fats, these ones forming deposits in the adipose tissue, which increases the body mass, and it is thus that obesity appears. Besides the genetic factors, in 95% of cases, obesity is the result of an irrational diet and the lack of movement or sedentariness. Consequently, the body composition can be modified through a regular physical effort and a healthy diet - which means a balance between the caloric intake and the energetic consumption.

The chapter *Physical exercise - a means for improving physical fitness and body aesthetics* presents the different movement forms recommended (fitness, Pilates, stretching, agile walk and jogging), some general aspects regarding the programs of physical exercises, the structure of work programs and the relation between physical and psychic spheres within the motor activities.

Among the multitude and diversity of means specific to physical education, we chose the FPS (fitness, Pilates, stretching) combination, considered by us as optimum, agreeable and easy to practice by the young overweight and obese female students, in order to obtain some visible results and to successfully meet the objectives proposed within a certain time interval. Some programs included exercises aiming to improve the muscle elasticity and the joint mobility, while others were meant to develop the muscle strength and the endurance in prolonged efforts.

The last chapter of the first part, the fifth, represents a synthesis of the conclusions drawn from this part of the thesis:

➤ Obesity, a chronic disease encountered more and more frequently in children, adolescents and youth, is caused by wrong dietary habits and the insufficiency of physical activities. Being a multifactorial disease, it supposes many interactions among the genetic, metabolic, behavioural, psychological, social factors and so on, which produce modifications of the energetic balance.

➤ The multiple influences exerted on the individual's personality make possible the passage from the physical education as a "study discipline" to the physical education as a "lifestyle", destined to ensure the human being's development in a balanced relation with the natural and social environments.

➤ The diversity of means specific to physical education allows the creation of programs adapted to the particularities of overweight and obese persons, in order to achieve some visible results as regards the physical and psychic status. The FPS-type programs determine the reduction of adipose tissue through cardio exercises, the maintaining of muscle mass and tone through strength exercises, and, through stretching exercises, a state of physical and psychic relaxation is induced, due to the reduction of muscle tensions and pains.

➤ The promotion of physical activities on a short and also a long term represents an advantageous individual and social investment, with an important contribution to maintaining the physical and psychic health, vital strength and endurance, as well as a successful psychosocial behaviour.

The second part of the thesis comprises three chapters and is dedicated, as shown by its title, *Preliminary research regarding the influence of physical exercise on the body composition of overweight and obese female students*, to the preliminary research in itself.

The chapter *General organization framework and design of the preliminary research* presents: the purpose and objectives (general and specific ones) of the approach and the intervention programs, the tasks of preliminary research, its hypotheses, the methods and the anthropometric measurements, the functional determinations, the tests used and the general motricity trials.

More exactly, the preliminary research aimed at the selection and application of some combined physical exercises - FPS to the experiment group, in order to validate their efficiency and the conditions for conducting subsequently the experimental research in itself. We wished thus to highlight the beneficial influence of the cardio-type exercises, but also those for the muscle toning, muscle elasticity and joint mobility, used in the physical education lesson on the improvement of body composition and psychophysical fitness in overweight and obese female students, future economists.

The main research methods used in the preliminary study were: bibliographic study method, pedagogic observation, questionnaire-based survey, measurement and assessment methods, experimental method, methods of data processing and

interpreting through the statistical-mathematical method, and the graphical, tabular method.

In the preliminary study, it was identified, through tests, measurements and motor trials, a number of 19 anthropometric dimensions, 3 for the physical and functional capacity, and 5 for the general motricity, tests and measurements which we considered representative for the topic debated.

Chapter 7, dedicated to the *Operational approach of the preliminary research*, reunites information about its organization and development, the subjects investigated, the stages of preliminary research, as well as the instruction planning and programming for the girl students in the 2012-2013 university year. A special attention was paid to the instructional design applied, with the presentation of operational objectives for the different FPS programs.

Preliminary research took place in the period October 2012 - June 2013, during 26 weeks, within the sports complex of the Bucharest Academy of Economic Studies. To conduct the study, we achieved a careful selection of the subjects, based on their body mass index. Under these conditions, the experiment group was made up of 25 young overweight and obese girl students (12 overweight and 13 obese), with ages comprised between 18 and 25, in the 1st and 2nd years of study, selected from the different faculties of the Academy.

Preliminary research was carried out during 75 lessons of physical preparation for the experiment group. There was a compliance with the basic structure of the academic year, the planning including both the holyday periods and the periods of knowledge evaluation, and in the period of exam session (June 2013), the girl students in the experiment group had the opportunity to participate, optionally, in two preparation lessons per week.

Before applying the experimental programs, in the month of October, the overweight and obese female students included in the experiment group were given two questionnaires: a personal opinion questionnaire and a personality questionnaire (presented, analysed and statistically processed within the experimental research).

The chapter *Processing and interpretation of the preliminary research results* presents the statistical data interpreting for the anthropometric measurements, the statistical indicators obtained after the functional determinations and the general motricity trials, as well as the analysis and interpretation of the results obtained from the personal opinion questionnaire, which had been applied prior to the experimental intervention.

The statistical indicators used to process the data collected within the preliminary experiment are shown in this chapter under the form of tables and graphs for each parameter measured and tested.

The last chapter of this section, *Conclusions of the preliminary research*, presents the main aspects noticed after applying the instruction programs, the

processing and analysis of data gathered in the initial and intermediate testing for the experiment group:

➤ Values of the anthropometric measurements emphasize significant differences between the initial and intermediate testing at the following somatic parameters: fat mass percent, non-fat mass percent, waist circumference, body density, thorax perimeter in expiration and thoracic elasticity; the p-value significance threshold is lower than 0.05, and thus ***the research hypothesis is confirmed***. As to the other indicators, the results obtained are not statistically significant.

➤ Results at the functional tests (vital capacity and Ruffier) within the two testing phases, the initial and intermediate ones, highlight statistically significant differences. This fact confirms the positive influences of instruction programs on the body's capacity of adaptation to effort and leads to ***accepting the research hypothesis***.

➤ Results at the general motricity trials indicate significant progresses in 4 of the 5 motor trials (trunk lifts from dorsal decubitus, trunk lifts from facial decubitus, upper limb strength, lower limb strength), which is confirmed by the value of arithmetic means in the two testing phases; as the p-value significance threshold is lower than 0.05, ***the research hypothesis is confirmed***. At the trial 5, for the coxofemoral mobility, positive evolutions have been recorded only in four cases.

After analysing the responses to the personal opinion questionnaire, one can identify the following main conclusions that ***confirm the second hypothesis of the preliminary research***:

♦ most of the female students questioned come from families in which at least one parent is overweight;

♦ the constant and independent practice of physical exercises is not part of the daily routines for the overweight and obese girl students, who prefer the static activities, which demonstrates that they are not aware of the beneficial effects of physical exercises on the obesity prophylaxis;

♦ the respondents mostly prefer the physical activities performed indoor, the outdoor movement being rarely practiced;

♦ the girls' diet is not healthy, the last meal being taken less than 2-3 hours before going to bed, in the case of about half of the sample questioned; insufficient hydration, inappropriate slimming diets, insufficient sleep hours and the occasional practice of physical exercises lead to an imbalance of the body, which determines the decrease of professional efficiency in the female students.

The third part of the thesis, named ***Experimental research regarding the influence of physical exercise on the somatic-functional and psychomotor aspects***, encompasses the last four chapters of the work and presents the research in itself, around which the whole material of the thesis is concentrated.

The scientific approach aimed to optimize the body composition of the overweight and obese female students in the economic higher education, by increasing their active mass to the detriment of adipose tissue, as an effect of applying some FPS programs of physical exercises in the physical education lessons. The beneficial influence of these programs on the body composition and the physical and psychic fitness of the young overweight and obese girl students represent the main argument for a change in their lifestyle.

The research took place over two university years, respectively 2012-2013 and 2013-2014, including physical preparation lessons for the experiment group and physical education and sports lessons for the control group. Activities were carried out in the aerobic gyms within the Sports Complex of Cihoschi Street and in the fitness gyms of the Bucharest Academy of Economic Studies. The tests and the preparation programs were developed in the same locations.

The study was conducted on a sample made up of 50 female students, divided in two groups: experiment group (EG) and control group (CG). Each group comprised 25 overweight and obese students (12 overweight and 13 obese), aged between 18 and 25 years.

The combined programs of FPS-type physical exercises were applied 3 times a week for the EG, with a length of 60 minutes per training session, unlike the CG, where it was used the normal program of the physical education and sports lesson, once a week, with the same duration of 60 minutes. We have opted for this type of exercises because the means are accessible, easy to practice and allow work modalities which are efficient, varied and attractive for the overweight and obese female students.

The chapter *Processing and interpretation of the experimental research results* provides an interpretation of statistical indicators for the anthropometric measurements, the functional determinations and those obtained at the general motricity trials.

The statistical data processing and interpreting were achieved in order to emphasize the efficiency of FPS programs, under the conditions in which the two groups (EG and CG) were submitted to a differentiated preparation process. At the same time, we monitored the dynamics of anthropometric, functional and motor parameters for both the EG and CG, as well as the differences between these parameters in the groups studied. The tables constructed are a proof in this sense. In the same chapter, there are illustrated, analysed and interpreted the results obtained at the ZKPQ personality questionnaire applied before and after the experimental intervention.

Chapter 12 contains the **conclusions of the experimental research:**

➤ Results obtained after the anthropometric measurements show that, within the experiment group, significant differences have been recorded for almost all the somatic indicators between the initial and final testing, following the use of

FPS exercises applied 3 times a week, which ***confirms the first hypothesis of the research.***

➤ Data obtained at the functional tests (vital capacity, Ruffier and basal metabolism) show that the experiment group has recorded statistically significant differences between the two testing moments, which confirms the positive influences of instruction programs on the body's capacity of adaptation to effort and leads to ***accepting the research hypothesis.***

➤ As regards the physical fitness, the independent t-test values indicate significant progresses for the experiment group between the two testing moments in 4 of the 5 motor trials (trunk lifts from dorsal decubitus, trunk lifts from facial decubitus, upper limb strength, lower limb strength), $p < 0.05$, ***which confirms the research hypothesis.*** At the trial 5, for the coxofemoral mobility, positive evolutions have been recorded only in 10 of the 25 cases, a fact that ***has not confirmed the research hypothesis.***

➤ Following the application of some FPS programs within the preparation of female students in the experiment group, there has been an improvement not only of the physical component, but also of the psychic component, namely that related to personality, the girls being stimulated to participate more actively and consciously in the instructive-educative process, contributing to the positive results aforementioned.

➤ The personality profile of the overweight and obese female students in the experiment group proves that there are differences between the personality dimensions assessed initially (before applying the experimental programs) and the personality dimensions assessed at the end (after applying the experimental programs), which means that, if systematically practiced, the FPS-type physical exercises reduce the level of anxiety and depressive states and increase the confidence in one's own forces due to a better self-image, which ***confirms the second hypothesis of the research.***

➤ The girl students belonging to the control group are less confident in themselves, more worried about minor things, like better the solitary activities than the collective ones, do not have enough energy and desire less to practice physical activities at the study completion (in the absence of an experimental intervention), compared to the beginning period, ***which does not confirm the research hypothesis.*** This is due to the fact that only the physical education lesson performed once a week is not sufficient to modify the body composition and, implicitly, the body weight, which is confirmed by the increase in number of the female students who have put on weight, 21 students out of a total of 25.

➤ Following the data aforesaid, we can conclude that FPS - *fitness, Pilates and stretching* - have a positive influence on the negative psychic states, such as depression, anxiety, fatigue, bad mood, in the sense that these ones are reduced or eliminated and turned into a relaxation, good mood state.

Conclusions:

Romania is on the 3rd place in the European Union with regard to the number of obese persons: 64% of Romanians are overweight and a quarter are obese, which is translated by the decrease in the quality of life and the rise in morbidity and mortality due to cardiovascular, endocrine and digestive diseases, the most alarming fact being that these percentages are increasingly higher.

The socio-economic conditions have left their mark on the education system, by the reduction in number of the physical education lessons. The lack of motor stimulation, an unbalanced diet and sedentariness lead to a disorganised and unhealthy lifestyle, with severe consequences on the present and future generations.

A fast and efficient solution to remedy this global issue is the practice of a physical activity which removes the negative influences of the three destructive factors of modern civilisation: sedentariness, overstress and overeating.

The combined programs of FPS-type exercises, accessible and easy to apply to the young overweight and obese female students lead to a decrease in weight by the fat mass reduction, limiting the loss of muscular mass and, implicitly, the diminution of basal metabolism.

The consistent application of instruction programs based on FPS exercises has produced the following effects:

- at the somatic sphere level, the overweight and obese female students from the Bucharest Academy of Economic Studies register an improved body composition, a lessened adipose tissue, a reduced overweight, a better muscle elasticity and joint mobility, and a general toning of the body;
- values recorded at the functional tests confirm the positive influences of instruction programs also on the body's capacity of adaptation to effort;
- results obtained at the general motricity trials confirm: an increase of the strength manifestation indices at the level of different muscle groups; an increase of the general and specific endurance; an increase in the mobility of spinal column and scapulohumeral and coxofemoral joints;
- the personality profile of the overweight and obese girl students, revealed by their responses to the ZKPQ personality questionnaire (Sociability, Impulsive Sensation Seeking, Activity, Anxiety and Aggression), emphasizes the fact that FPS exercises have a positive influence on the negative psychic states, in the sense that these ones are eliminated or turned into relaxation, good mood states, simultaneously with an increase of the confidence in one's own forces due to a better self-image.

The optimistic results achieved by overweight and obese female students who have worked systematically during one and a half university years (three semesters) highlight the necessity to include physical exercises in each person's lifestyle, in order to preserve the health status on a long term and also to maintain an optimum physical and psychic fitness.