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Thesis title- OPTIMIZING FUNCTIONAL AND MOTOR CAPACITY IN STUDENTS BY IMPLEMENTING FUNCTIONAL TRAINING PROGRAMS THAT USE FITNESS EQUIPMENT AND MODERN TECHNOLOGIES

SUMMARY

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INTRODUCTION

Physical education represents a fundamental component in the higher education system, with a significant impact on the physical, mental and cognitive components of students.

This research falls within the field of physical education and sports and aims to analyze in detail the effects and impact of a functional training program conducted over a period of 14 weeks, with fitness equipment and modern technologies, on functional and motor parameters in medical students.

The goal of university physical education is to ensure the optimal functioning of the student body, to improve the cognitive processes necessary in the academic process, to ensure good psycho-emotional balance, and to train students in the constant practice of physical exercise.

In the current context, a significant number of students from non-profile specializations devote a long period to academic tasks. This statement reflects a low level of physical fitness, which has a negative impact on the quality of life. Improving the physical fitness of students is necessary, because physical exercise provides a number of benefits on the physical, mental and cognitive components. The means of optimizing physical fitness are varied, including both the university physical education lesson and physical activities that can be practiced in free time by students.

The physical education lesson represents a fundamental framework for improving physical fitness and disconnecting from academic tasks, through various types of training and sports activities.

The university physical education lesson in Romania is carried out in the form of practical work, carried out once or twice a week depending on the specialization and the university strategy, during which a total of 120 minutes are allocated for practicing physical exercises, under the guidance of specialized teachers.

The physical education lesson is structured in three parts, comprising the preparation of the body for physical exertion, the fundamental part and the recovery of the body after exertion. The fundamental part of the lesson varies in duration and structure, depending on the type of training implemented by the teachers, but also on the students' option to practice sports activities such as football, basketball or volleyball. In contrast, the preparation of the body and recovery after exertion include high-amplitude dynamic exercises and static stretching exercises, each lasting approximately 15 minutes.

Currently, the impact of technology and fitness is major, which causes the physical education lesson to adopt a trend of modernization due to the modern training programs that can be implemented and the equipment that contributes to diversifying exercises and optimizing the motor and functional capacity of students.

Fitness is a multidimensional concept that can be defined as an integrated component of physical exercises that can be practiced with body weight, specific apparatus or various sports equipment, with the aim of improving and maintaining a good state of health. Due to the fact that it is a multidimensional concept, fitness integrates several dimensions, such as physical fitness.

We believe that physical fitness represents the dimension with the greatest impact on students' health, as it comprises 11 components aimed at improving general health and optimizing motor capacity. Thus, components such as cardiorespiratory endurance, muscular endurance, muscular strength, flexibility and body composition can be developed through specific exercises, with the aim of maintaining students' optimal health, with a significant impact especially in their daily activities. In

contrast, components such as coordination, muscular strength, agility, balance and reaction time must be optimized, as they determine beneficial effects in supporting students' cognitive processes and a significant impact in leisure activities.

These components can be developed through a variety of bodyweight exercises, sports equipment, and can be integrated into various training programs.

A training program that includes varied exercises, aimed at improving functional and motor parameters is functional training. Functional training integrates multiplanar, complex exercises, similar to those in everyday life, with the main goal of improving everyday tasks. These are the main characteristics that differentiate functional training from traditional training methods.

This type of program has a versatile character, due to the way of organization, the diversity of exercises adapted to the particularities of the students and the modern equipment that can be used. A set of modern equipment is a bag, kettlebell, inflatable ball, but also a pair of dumbbells made of a solid material. A varied amount of water can be added to this equipment, depending on the physical preparation of the students.

The functional training program, together with Aqua fitness equipment, represents the novelty and originality of this research, by approaching a modern method and the impact on the functional and motor component in students from non-profile specializations.

This research is systematized into two parts, the theoretical foundation part and the own contributions.

The theoretical foundation focuses on general aspects of the concept of fitness, theoretical perspectives of physical fitness in students, conceptual and methodological delimitations of functional training, the approach to Aqua fitness equipment in the functional training program, the physical education lesson for students, modern approaches to the physical education lesson, as well as the development of conclusions.

The own contributions of the research aim at establishing and choosing the fundamental methods for developing and implementing the functional training program with Aqua fitness equipment for students. The contributions include formulating the hypotheses, purpose, objectives, establishing the work tasks, samples, place and period of the experimental program, respectively the periodization of the functional training program.

The entire methodological approach contributed to the development of the discussions and conclusions of the research, as well as to the identification of future research directions in order to capitalize on the results obtained.

ARGUMENTATION FOR THE CHOICE OF THE TOPIC

The choice of the research topic is determined primarily by the personal interest resulting from the professional activity in the field of physical education and university sports. Over the years, we have observed a trend of decreasing student participation in physical education classes determined by the academic tasks of the students, but also by some variables specific to the university physical education lesson. This aspect reflects the prevalence of sedentary lifestyle among a significant number of students and the need to modernize the lesson by approaching modern training methods. Considering the impact of fitness in the last decade on society and the continuous modernization of fitness equipment, we considered it necessary to implement a modern training program in the

university physical education lesson, in order to optimize the physical condition of students from non-profile specializations, to increase their motivation towards the physical education lesson and to form in students the habit of practicing physical activities in the long term.

Fitness, due to its multidimensional nature, is addressed in the physical education lesson due to the variety of physical exercises and equipment available. However, it is most often approached from a traditional perspective, through the use of specific equipment, which limits the integrated development of functional and motor capacity. Thus, the traditional training methods addressed in the physical education lesson represented another criterion for choosing the research topic.

Functional training is a modern method of the fitness concept, characterized by its adaptable nature that can allow the optimization of the motor and functional capacity of students, through the complex engagement of all muscle groups and the efficient transfer to the activities of daily life. In order to improve the efficiency of the exercises and increase the motivation towards this training program, it is necessary to introduce innovative equipment that allows the performance of functional exercises that target both the functional and motor components.

Inflatable equipment consisting of a bag, ball, kettlebell, and dumbbells made of durable material represents a modern interpretation of traditional equipment used in the fitness room.

Following the analysis of the specialized literature and studies in the field, we found that Aqua fitness equipment was not integrated into university physical education lessons or functional training programs addressed to students, which was the defining element in choosing the topic. Another relevant aspect regarding the choice of this topic is the opportunity to research their efficiency in the process of optimizing functional and motor capacity.

Detailed analysis of the studies highlighted that functional training programs integrated traditional equipment such as bosu balls, agility ladders, dumbbells or other sports equipment to improve the fitness level of physically active people or performance athletes.

Regarding Aqua fitness equipment, it was highlighted that the inflatable bag and ball were used in training programs to optimize muscle strength or in programs that aimed at comparative analysis between traditional and inflatable equipment. The results of these studies indicated a superior efficiency of inflatable equipment compared to traditional equipment. Consequently, there is an important limitation regarding the use of Aqua fitness equipment in training programs, which requires investigating their impact on the physical condition of the non-athletic and athletic population.

The versatile nature of the functional training program and Aqua fitness equipment was an important criterion for this research topic. Functional training, through complex, multi-joint exercises, similar to those in everyday life, together with the adjustable resistance of Aqua fitness equipment can contribute to significantly improving the functional and motor capacity of students, thus determining a positive impact on the overall health of students.

We also believe that this complex training program can provide a series of benefits to the psycho-emotional component of students, as well as a positive impact on the cognitive processes necessary for the academic journey.

High applicability in practice is another criterion for choosing the topic. This type of program can be easily integrated into the physical education lesson, contributing to the improvement of the instructional-educational process and the diversification of the lesson contents, through the complexity of the exercises that can be applied. The complex nature of the exercises reflects the fact

that a functional exercise is made up of several movements, simultaneously integrating several motor components. Also, depending on the level of difficulty of the exercises, functional training can be organized for beginner, intermediate and advanced students. For example, functional training can be organized in the form of workstations, being ideal for including sports equipment, where the working technique of the students can be observed by the teachers, favoring the individualized correction of the exercises. In contrast, functional training organized in the form of a circuit aims to perform several series of the same exercise, with a usually shorter break duration, being especially recommended for intermediate or advanced students.

Aqua fitness equipment is versatile, which means it can be integrated into both functional programs and various sports activities within the physical education lesson. Due to the adjustment of the amount of water, it can be used in recreational games, contributing to increasing motivation towards physical exercise and the psychological well-being of students.

An additional criterion for using Aqua fitness equipment compared to traditional ones is the materials used in their manufacture. Compared to the medicine ball, kettlebell, sandbag and traditional dumbbells, Aqua fitness equipment, with the exception of dumbbells, is made of a flexible, lightweight material, which helps prevent injuries during the exercises. This feature is of particular importance, since a significant number of students have a low level of physical fitness.

The complexity of functional exercises together with the versatility of Aqua fitness equipment can contribute to optimizing the physical condition of students and improving their daily and recreational activities. Moreover, they favor the continuous diversification of lesson contents, thus contributing to the improvement of the instructional-educational process.

CHAPTER V. CONCLUSIONS OF THE THEORETICAL BASIS

5.1 General theoretical conclusions

The physical education lesson at the university level is going through a period of profound transformation, marked by the integration of digital technologies such as performance monitoring applications, wearable devices and virtual training platforms that allow the personalization of physical activity according to the biological parameters of each student.

Modernization trends aim to move from the traditional model centered on standardized sports performance, towards holistic approaches focused on health, well-being and education for a long-term active lifestyle, with an emphasis on student autonomy in choosing forms of movement.

The technologization of the university physical education lesson also involves the use of augmented reality, gamification, and immediate feedback through motion sensors, creating an interactive learning environment that increases intrinsic motivation and adherence to regular physical exercise.

Another significant aspect of the modernization is the diversification of fitness - specific equipment and exercise materials , by introducing innovative resources such as Aqua fitness equipment that enrich the motor offer, stimulate neuromuscular coordination in conditions of instability and give the lesson an attractive, playful and accessible character for a wide category of students, regardless of the level of physical training.

This chapter highlighted the multidimensional nature of the fitness concept, approached from a general perspective reflecting the beneficial effects on students' health, preventing sedentary lifestyle, maintaining psycho-emotional balance and facilitating students' social integration. The

methodological aspects highlighted the way to organize a fitness training program, the principles necessary for conducting an effective program, but also the subjective and objective methods by which the level of students' physical condition can be assessed.

The literature has defined fitness as a fundamental component in students' lives that contributes to the development of long-term healthy habits. Studies have also provided us with a clear picture of the fact that general fitness can be systematized into several categories, each dimension reflecting positive effects on the physical and mental health of students. Through a detailed analysis of these dimensions of fitness, we found that physical fitness has a significant impact on students' lives, as it includes a series of components that target students' health and motor skills.

5.2. Specific theoretical conclusions

The detailed presentation of all the components of physical fitness highlighted the fact that the exercises specific to each component determine a series of beneficial effects on students, on a physical, mental and cognitive level. We also found that some components of physical fitness such as cardiorespiratory endurance, flexibility, muscle strength, coordination and balance represent the foundation of functional training. Also, the remaining components can be integrated into functional programs due to the variety of exercises.

This research aims to assess the impact of the functional training program on students from non-profile specializations, which required a detailed analysis of the conceptual and methodological delimitations.

Given the approach of Aqua fitness equipment in this research, we considered it necessary to provide a detailed description of how they can be used in the physical education lesson. In this subchapter, we expressed our ideas regarding the use of equipment in the three fundamental stages of the physical education lesson, as well as their use in the context of functional programs. These equipment are differentiated from traditional ones due to the fact that a quantity of water can be added depending on the particularities of the students, which determines a degree of instability. This aspect reflects the fact that the body's muscles, especially the trunk, are required during static or dynamic physical exercises, which can contribute to significantly improving balance and coordination. Also, due to the possibility of adding a large amount of water, they allow the development of muscle strength movements or explosive movements, contributing to the development of muscle strength and muscle power. These pieces of equipment vary in size, the smallest being dumbbells, which can be easily used in fast, repetitive movements or movements that involve changing direction, specific to those for developing speed and agility.

These equipments allow for the addition of a varying amount of water, which makes them suitable for muscle flexibility movements and for use in various activities within the lesson.

Physical activities are varied, and they should be practiced regularly by students, regardless of the specialization studied, as they maintain an optimal state of health and contribute to the formation of healthy habits that can be maintained in the long term. Studies have highlighted the fact that practicing activities that require the cardiovascular system has positive effects on overall health, while racquet sports significantly improve the relevant processes.

These activities can be practiced both in physical education lessons and in students' free time. Physical education is a fundamental discipline in the university environment that contributes to the harmonious physical development of students. This aspect led us to approach the physical education

lesson at the national and international level and to identify the positive and less positive aspects regarding the educational process.

The physical education lesson requires a modernization at the national level in order to adapt the teaching contents to the current trends of society. Following the analysis of the specialized literature, we found that sports facilities must be multifunctional to allow the development of various sports activities. We also concluded that the exercises performed and the traditional equipment used must have a modern approach to increase students' motivation and their active participation in physical education classes.

In this way, it is necessary to approach functional training programs for students, because it can integrate varied, natural exercises, similar to those in everyday life that can be used with modern equipment. We believe that performing functional training with Aqua fitness equipment can have a significant impact on students, by improving physical condition and developing the ability to independently practice physical exercises.

The physical education lesson represents a framework where modern training such as functional training can be addressed, as well as other sports activities that have a recreational and social role. Although fitness is practiced by students, we believe that this complex activity must be modernized in terms of equipment. Therefore, we have addressed several modernization trends regarding modern equipment and technologies. These trends aim to introduce modern equipment and devices that allow for muscle strength movements, but also cardiovascular equipment that allows for activities such as running, walking or pedaling.

Swimming is of interest among students in physical education lessons, considering that it is necessary to introduce modern equipment to enhance the recreational part. Thus, we presented a series of equipment that allows the development of muscle strength, balance, flexibility movements above water, but also equipment that allows the execution of exercises in the aquatic environment.

The approach to functional training in this research required a detailed presentation of Aqua fitness equipment but also of some functional equipment that can be approached by students during the lesson. The equipment has different shapes, and from this point of view they allow filling with water in different quantities. They ensure the movement of flexion-extension, abduction-adduction and rotation of some exercises of muscle strength, coordination, flexibility, muscle power and balance. At the same time, they can be used on land, in the aquatic environment or on unstable surfaces.

The impact of functional training, as a method included in the university physical education lesson, is significant and multidimensional, representing a modern and effective alternative to the classic forms of physical exercise practiced in the academic environment.

Functional training, through its complex exercises that involve entire muscle chains and simulate natural body movements, contributes to the development of the student's strength, stability, coordination and balance, preparing him not only for sports performance, but also for the physical demands of everyday life and future professional activities.

Integrating this method into university physical education lessons generates a positive impact on posture and injury prevention, an aspect that is particularly relevant in the context in which students spend long hours in a sedentary position, in front of computers or on amphitheatre benches, accumulating muscle imbalances that can affect long-term health.

The motor impact of functional training is manifested in a visible improvement in the student's basic and combined motor skills. reaction speed, explosive strength, joint mobility, agility and

intersegmental coordination Functional exercises simultaneously demanding the nervous system and the locomotor apparatus in complex, multi-articular movement patterns that optimize neuromuscular control and the biomechanical efficiency of the motor gesture as a whole.

On functional capacity , functional training exerts a profound and measurable impact, improving cardiorespiratory parameters, maximal oxygen consumption, resting heart rate and post-exercise recovery, as well as metabolic capacity and local muscular endurance, leading to an overall increase in the body's efficiency in the face of sustained physical effort, with direct benefits on the student's health and academic performance.

Part II. OWN CONTRIBUTIONS

CHAPTER VI. RESEARCH METHODOLOGY OF STUDY I

6.1 Study premises I

In the current context, the fitness level of young adults is a frequently analyzed topic in the specialized literature. In students, the period of university studies determines a series of lifestyle changes due to the allocation of a long time to academic tasks. Sedentary lifestyle, metabolic disorders and postural imbalances are some of the negative effects caused by the lack of regular physical exercise.

Given the varying levels of physical fitness among students, it is necessary to apply qualitative and quantitative methods to accurately identify the level of fitness. The methods determine both the students' perception of the frequency of physical exercise and the obtaining of objective data on functional and motor parameters. Qualitative methods suggest the implementation of a questionnaire, while quantitative methods reflect the application of standardized or adapted tests.

The questionnaire consists of a series of items formulated to highlight the components of motor and functional capacity. The responses to each item were formulated based on a 5-point Likert scale. In contrast, standardized tests provide objective data, due to the application of modern assessment equipment and technologies.

Functional training is a modern approach to fitness, thanks to natural, multi-joint movements, specific to those in everyday life. Within a functional training program, exercises aimed at developing functional capacity with body weight, traditional or modern equipment, can be integrated. We believe that Aqua fitness equipment offers the functional training program a more modern character and adapted to the current requirements of university physical education. The equipment includes bags, balls, kettlebells and dumbbells that can be filled with a quantity of water, thus providing a degree of stability to students during the exercises.

6.2 Methodological approach of the study I

The methodological approach represents the development of methodological stages in order to carry out scientific research. The present study was structured in several stages in order to ensure the validity of the methodological approach. The study aimed at developing and applying a questionnaire consisting of 8 items, in order to determine the self-perception of the experimental group regarding physical condition and the implementation of a functional training program using Aqua fitness equipment, in order to optimize the functional parameters of the students.

- In the first stage, the research purpose, objectives, and hypotheses were formulated that coordinated the entire methodological process.
- The second stage was the implementation of the questionnaire in order to obtain fundamental information from the experimental group. This contributed to the collection of subjective data from the students regarding their self-perception regarding their fitness level, while the use of standardized assessment tests provided objective data that could be processed and compared in the statistical analysis program.
- The third stage consisted of assessing the initial level of functional capacity of the experimental group. The tests were carried out in a rigorous framework, according to a standardized protocol, with the aim of identifying the aerobic capacity of the students. In turn, to determine the anaerobic capacity, a test adapted to the experimental group was applied.
- The fourth stage of the methodological approach was the organization and implementation of the functional training program with Aqua fitness equipment during the 14 weeks. The experimental program was adapted to the students' particularities, and the organization and implementation of the experimental program was in accordance with the specific principles of functional training.
- The fifth stage consisted of the application of the final evaluation tests of the experimental group, carried out under conditions identical to those of the initial evaluation.
- The sixth stage was the introduction of the results of the initial and final tests into the SPSS statistical analysis program, to highlight the efficiency of the experimental program.
- The seventh stage consisted of drawing up the conclusions of this study to highlight whether the hypotheses formulated are confirmed, as well as to synthesize the most important results obtained.

6.3 Study hypotheses I

General hypothesis: It is assumed that students' self-perception of physical fitness is associated with objective assessment through standardized tests, and the implementation of the functional training program will significantly contribute to the optimization of the functional parameters of the experimental group.

Hypothesis 1: By applying a questionnaire, we will identify the experimental group's self-perception regarding physical condition.

Hypothesis 2: By implementing standardized and adapted tests, we will identify the level of functional parameters of the experimental group.

Hypothesis 3: By implementing a functional training program with Aqua fitness equipment, we will significantly improve the functional parameters of the experimental group.

6.4 Purpose of the study I

The main goal of the study I - aims to investigate the experimental group's self-perception regarding their own physical condition

The secondary goal of the study I - aims to evaluate the impact of applying an experimental functional training program using Aqua-fitness equipment on the functional parameters of students in the experimental group.

6.5 Study objectives I

O1: Develop and implement a questionnaire to identify the physical condition of the experimental group.
O2: Application of standardized and adapted tests to identify the initial level of functional parameters of the experimental group.
O3: Develop and implement a functional training program using Aqua-fitness equipment in the experimental group.
O4: Application of standardized and adapted tests (designed by us) to identify the final level of functional parameters of the experimental group.
O5: Statistical analysis and data interpretation.

6.6 Study Tasks I

- establishing the period and sample;
- establishing evaluation tools;
- establishing research methods;
- conducting initial assessments;
- establishing the experimental training program;
- conducting final evaluations;
- processing and interpretation of results;
- drawing conclusions.

6.7 Study sample I

Study I was conducted on a sample of 40 students, consisting of 20 (50%) male and 20 (50%) female students, from the Faculty of Medicine, within the UMFST "GE Palade", in Târgu Mureș, who constituted the experimental group of study I (GE).

Inclusion criteria:

- students aged between 18 and 25 years;
- without medical conditions that would prevent the intervention program from being carried out;
- available to participate in the experimental program throughout its implementation;
- signed the consent to participate in the assessment tests and the intervention program;

We note that due to time and financial resource limitations , the research was conducted only on the experimental group. The costs of evaluating functional capacity are very high, and the UMFST management only facilitated access to a single group within the Advanced Medical and Pharmaceutical Research Center .
The functional tests were performed in the Functional Explorations Laboratory, within the Advanced Medical and Pharmaceutical Research Center, UMFST "GE Palade" in Târgu Mureș . The study was conducted in accordance with the principles of the Declaration of Helsinki, and participants included in the study signed informed consent.

6.8 Organization and phasing of the study I

The organization and conduct of study I was carried out according to the structure of the 2023-2024 academic year of UMFST "GE Palade" in Târgu-Mureș. The academic year is structured into 4

modules of 7 weeks each, each followed by a 2-week exam session. Study I was conducted during module III and IV, and the subjects of the experimental group were asked and gave their consent to continue the experimental program during the 2-week session to ensure the continuity of the study.
Study I was conducted over a period of 16 weeks and included: initial testing, implementation of the functional training program, and final testing.
In the first week of module II of the academic year, more precisely during the period January 8-12, 2024, we applied to the experimental group, the questionnaire of self-perception of students on physical condition. The questionnaire was developed by us and included 8 items, of which 7 were with Likert-type scalar responses, evaluated from 1 to 5, and one binary item of YES/NO type. In parallel, the experimental group carried out during this period, the initial testing by performing the functional tests selected for study I.
Between January 15, 2024 and May 31, 2024, the functional training program using Aqua-fitness equipment was implemented, with two weekly sessions, in accordance with the structure of the academic year.
In the last week of module IV, June 3-7, 2024, after completing the functional intervention program, the experimental group performed the final testing of the functional capacity targeted in study I.

6.9 Study location I

The functional tests applied to the experimental group of study I were performed in the Functional Explorations Laboratory, within the Advanced Medical and Pharmaceutical Research Center, UMFST "GE Palade" in Târgu Mureș.
The functional training program was practiced in the Dr. Anton Pongracz gym, the functional training room and the Multipurpose room within the "GE Palade" UMFST in Târgu Mureș.

6.10 Research methods

Research methods are a fundamental element in the scientific research process. They allowed the development of theoretical foundations, as well as the collection and analysis of data in an objective manner. The application of study I methods contributed significantly to the formulation of hypotheses and general conclusions.

6.10.1 Bibliographic method

The bibliographic method represents an essential stage in achieving the theoretical foundation of this scientific research, which provides a solid theoretical framework for the development of the experimental program. Through the bibliographic method, we have compiled essential information regarding the theories and practices of fitness, functional training, the impact of training on functional capacity, as well as the use of Aqua fitness equipment in this type of training.

6.10.2 Questionnaire survey method

In study I, we applied the questionnaire called " *Physical Fitness Knowledge Perception Questionnaire* " to the experimental group, consisting of 40 students from the Medical specializations, with the aim of identifying their self-perception regarding the motor and functional component, by developing items that targeted the level of physical condition, body mass index in relation to weight and height,

frequency of practicing physical activities involving aerobic effort, muscle strength, muscle flexibility, coordination, agility and practicing a functional training program. The questionnaire was designed by us and discussed with the guidance committee. The questionnaire was distributed in physical format to students in the experimental group, during the period January 8-12, 2024, ensuring the confidentiality of information and the anonymity of the participants.

The questionnaire included 8 items, 7 with Likert scale responses and one item with a binary YES/NO response, these constituting an essential criterion for developing the functional training program.

The Likert scale included five responses, where the responses were systematized as follows:

- 1 means very poorly or never
- 2 means weak or rare
- 3 means average or 1-2 times a week
- 4 means good or 3-5 times a week
- 5 means very good or daily

For the first item regarding students' body composition, the responses were systematized as follows:

- 1 means underweight;
- 2 signifies normal weight;
- 3 means overweight;
- 4 means obese;
- 5 means "not sure"

6.10.3 Test method

The test method is an essential method for carrying out the experimental program, with the aim of obtaining objective and comparable data from the experimental sample involved in the research.

In the present study, we applied a standardized test and an adapted test targeting functional capacity. The tests were conducted according to scientific protocols and included the measurement of functional parameters.

The test for assessing aerobic capacity included seven parameters, while the test for assessing anaerobic capacity targeted nine parameters.

We quantified a series of parameters for each test in order to detail the efficiency of the cardio-respiratory and metabolic system under different conditions of physical exertion in students in the experimental group.

The tests were conducted under standardized and specific conditions of the Functional Explorations Laboratory, within the Advanced Medical and Pharmaceutical Research Center, UMFST "GE Palade" in Târgu Mureș, and were coordinated by a specialized staff from the Center.

To perform the functional explorations, specific equipment was used that required the students to wear a respiratory analysis mask and a heart rate monitoring belt. At the same time, the tests were performed exclusively on a treadmill, and the equipment used was of high performance, thanks to advanced physiological parameter analysis systems.

We note that we applied initial tests to identify the initial level of functional capacity of the experimental group, which were conducted over a period of 5 days, between January 8-12, 2024. After completing the intervention program, we applied the final tests, conducted under the same conditions and targeting the same functional parameters

6.10.4 Observation method

The observation method was used to directly analyze student behavior and other variables during the initial and final evaluation tests and throughout the experimental program.

6.10.5 Experimental method

The experimental method represents the method with a significant impact in this research, as it highlights the way to develop and organize the functional training program, with the aim of achieving progress from the experimental group.

The experimental program was implemented over 14 weeks, from January 15 to May 31, 2024, on a sample of 40 students from medical specializations, preceded by a one-week period for initial testing and followed by a week for final testing. The experimental program was organized according to the structure of the academic year at "UMFST GE Palade" in Târgul Mureș. The structure includes four modules of seven weeks each, taking into account that the experimental program should be carried out during modules three and four. At the same time, the program was carried out in two gyms within the university.

In order to develop the experimental program, we took into account the data obtained from the evaluation tests that targeted the functional capacity reflecting the similar level of the students in terms of the aerobic and anaerobic component. At the same time, we took into account the fundamental notions of functional training and applied all the specific principles to ensure the efficiency of the program.

The program included an aerobic and anaerobic effort, due to the duration of the work time and the breaks between exercises. The exercises were performed with Aqua fitness equipment to highlight an effective adaptation of the students' cardio-respiratory system.

Functional training sessions were organized in the form of workstations, and the exercises were arranged to alternate aerobic and anaerobic capacity. During the 14 weeks of the experiment, the training sessions were held in two weekly sessions, more precisely on Tuesdays and Thursdays, and the participants were monitored throughout the experiment.

The functional exercises were in accordance with the principle of gradual adaptation, being characterized by a progressive level of complexity. Also, in the first weeks of training, a small amount of water was introduced into the equipment, for the body's adaptation to the effort, this being subsequently progressively increased.

The equipment consists of a bag, ball, kettlebell and dumbbells that allow for easy performance of functional exercises. We note that for the performance of cardiovascular functional exercises, dumbbells, ball and kettlebell were used in particular, allowing for more efficient use due to their smaller size.

6.10.6 Statistical-mathematical method

The statistical-mathematical method had the role of processing and analyzing the data obtained, as well as determining the significance of functional capacity.

For data analysis, we used IBM SPSS which is a statistical analysis program offering a variety of tools for data processing and interpretation. In this research, we applied descriptive statistics which

generated the following parameters: minimum, maximum, arithmetic mean, standard deviation , coefficient of variation.

To determine the internal consistency of the questionnaire items, the experimental group's responses were entered into the SPSS statistical analysis program, where we applied the Cronbach's Alpha coefficient.

To highlight the asymmetry of the distribution of values relative to the mean in the experimental group, we applied the Skewness parameter within the descriptive statistics. Furthermore, we applied the Kurtosis parameter to highlight the sharpness of the distribution of values.

To identify the differences between the initial and final testing of the experimental group, we applied the paired samples t-test. The mean difference is a fundamental parameter, as it signifies the progress of the experimental group following the experimental program applied, while also taking into account the other variables of the test. The parameters used in this test are: mean difference, standard deviation, standard error of the mean of the differences, t-value, degrees of freedom (df), upper and lower 95% confidence interval and significance threshold (p).

Regarding the significance threshold, if $p<0.05$, then the results are statistically significant, and the null hypothesis is rejected.

Within the paired samples t-test, we calculated the value of the Cohen's d coefficient, which represents the effect size. It reflects how much the participants' results changed following the implemented training program.

6.11 Assessment tools used in study I

The instruments were used to identify the experimental group's perception of the level of physical condition, but also to objectively evaluate functional parameters.

6.11.1 Questionnaire called - Physical Fitness Knowledge Perception Questionnaire **,** *is* a tool for collecting data on students' functional capacity, providing essential information that cannot be obtained through direct measurements.

The questionnaire was proposed by the author and included 8 items, of which 7 are Likert-type items with scalar responses, rated from 1 to 5, and one binary YES/NO item.

Item no. 1: " *Where do you think your BMI falls, in relation to your weight and height?"* reflects the students' level of self-assessment regarding their own body mass index.

Item No. 2: " *What is your general physical condition?"* reflects students' self-perception of their general fitness level.

Item No. 3: " *How often do you perform exercises that involve aerobic effort* ?" highlights the frequency of practicing endurance physical activities.

Item no. 4: " *How often do you include muscle strength exercises in your weekly routine* ?" highlights the frequency of practicing activities aimed at developing muscle strength.

Item no. 5: " *How do you rate your general level of muscle flexibility?"* indicates students' self-perception regarding their ability to perform large-amplitude movements.

Item no. 6: " *How do you rate your ability to perform movements that require coordination between different body segments?"* , reflects the students' level of self-assessment regarding the ability to coordinate effectively during physical activities.

Item no. 7: *"How do you evaluate your ability to execute rapid movements?"* , targets the level of students' self-assessment regarding the ability to perform rapid movements, rapid changes of direction, but also the ability to respond effectively to external stimuli.

Item no. 8: " *Have you ever practiced functional training* ?" highlights the students' experience with practicing natural, multi-joint exercises, similar to those in everyday life.

The answers to the 7 items of the questionnaire are Likert-type and we have systematized them as follows:

- 1 means very weak/never;
- 2 means weak/rare;
- 3 means average / 1-2 times a week;
- 4 means good/ 3-5 times a week;
- 5 means very good/daily.

6.11.2 Functional tests

The functional tests were performed in the Functional Explorations Laboratory, part of the Advanced Medical and Pharmaceutical Research Center, within the UMFST "GE Palade "in Târgu Mureș.

a) *Aerobic capacity assessment test*

Test protocol description:

The test included anthropometric measurements, such as body weight, height, fat mass, skeletal muscle mass, performed using the Tanita MC-240MA body analyzer and thalimeter.

Heart rate measurement was performed by attaching a belt, with a textile surface and a rubber portion. Its positioning was performed at the chest level using a fixed clamping system. Data transmission was performed in real time on the PC via a wireless system. Before starting the testing, the students performed a warm-up part to prepare the body for the effort and to prevent physical injuries. The part of preparing the body for the effort lasted approximately five minutes and included joint mobility exercises. After the warm-up, the subjects were attached to a respiratory analysis mask using adjustable straps that covered the mouth and nose, ensuring a proper fit for the effective measurement of respiratory gases. The respiratory mask was attached to the Cortex Metalyzer 3B system through a flow sensor, allowing the analysis of oxygen and carbon dioxide concentrations, as well as the amount of air inhaled and exhaled.

The Cortex Metalyzer 3 B system was calibrated with a concentration of 15% oxygen and 5% carbon dioxide. The subject breathed for approximately one minute to acclimatize to the equipment.

The protocol was triangular, starting with a speed of 4.5 km/h, and at a one-minute interval, the speed increased by 0.4-0.6 k /h, until the oxygen consumption peaked. The post-exercise recovery consisted of a one-minute easy run at a speed of 4 km/h. The parameters evaluated were VO_2 (L/min), VO_2 (ml/min/kg), VE (L/min), VE-VO_2, VE-VCO_2 (L /min), RER and BF (cycles/minute). The evaluation consisted of recording the individual maximum value for each parameter.

Test objective : assessment of aerobic capacity

Evaluation equipment : X Trend treadmill ergometer, Cortex MetaLyzer 3 B ergospirometry system.

c) Anaerobic capacity assessment test

Test protocol description:

The student training procedure was similar to that described for the aerobic capacity assessment test. After anthropometric measurements were taken, the subjects were attached to the respiratory analysis mask that was connected to the Cortex Metalyzer 3B system via a flow sensor. The system was calibrated using the calibration gas, with an oxygen concentration of 15% and carbon dioxide of 5%. The subjects performed the warm-up part that consisted of joint mobility exercises for 10 minutes, then they performed an easy run for 4-5 minutes at a speed of 6 km/h. The treadmill was inclined at 10%, and the time was 30 seconds, where the subject ran at the maximum speed reached in protocol one. The post-strength recovery was carried out for one minute at a speed of 6.5 km/h and two minutes at a speed of 4.5 km/h. The evaluation consisted of recording the individual maximum value for each parameter.

Test objective : Anaerobic capacity assessment

Evaluation equipment: X Trend treadmill ergometer, Cortex MetaLyzer 3 ergospirometry system.

6.12 Assessment equipment used in study I

6.12.1 Tanita DC-240MA scale represents a body analyzer used to assess the body composition of students. The device is equipped with low-intensity electrical currents to accurately analyze the percentage of fat mass, the percentage of skeletal muscle mass and body weight. The transfer of the obtained data was carried out in real time by connecting the analyzer to the computer.

6.12.2 The X trend treadmill is a piece of equipment that allows walking or running in a controlled space. It is equipped with a treadmill , where the speed and incline can be adjusted. Furthermore, the ergometer has sensors that allow heart rate measurement.

6.12.3 Cortex Metalyzer 3B spiroergometry system is an advanced system used to measure physiological parameters of students during running. The equipment is made up of several components such as: central unit, respiratory mask, flow sensor, sampling line, telemetry system, software (Metasoft studio) and calibration system.

The central unit includes oxygen and carbon dioxide sensors, in order to analyze in real time the amount of air received from the subject.

The breathing mask has the role of collecting the air exhaled by the student during the test. The gas analyzer measures the concentration of oxygen and carbon dioxide in the exhaled air. The flow sensor measures the volume of air inhaled and exhaled by the subject. The sampling line is a tube with the purpose of transporting the gases from the breathing mask to the central unit, while the telemetry system allows the transmission of data to the software. The Metasoft software is a computer program that analyzes the physiological parameters during the test. The calibration system includes a cylinder with gas concentrations specific to the applied test.

With the help of this equipment, we determined the following parameters, which we later analyzed: volume of oxygen consumed per minute (VO_2 L/min), volume of oxygen consumed per minute per kilogram of body mass (VO_2 /kg, ml/min/kg), RER (respiratory exchange rate), respiratory rate, (BF cycles/minute), percentage of normal volume of oxygen consumed (VO_2 normal %), percentage of maximum volume of oxygen consumed (VO_2 peak %).

Parameter description:

The volume of oxygen consumed per minute ($VO2_{L}$ /min) represents the amount of oxygen used by the body in one minute, expressed in L/min.

The volume of oxygen consumed per minute per kilogram of body mass ($VO2_{ml}$ /min/kg) represents the body weight-corrected oxygen consumption expressed in milliliters per minute per kilogram of body mass.

RER represents the respiratory exchange rate, more precisely, the ratio between oxygen and carbon dioxide.

BF (cycles/minute), represents the respiratory rate. The number of breaths (cycles) taken in one minute, expressed in cycles per minute.

VO_2 normal % is the percentage of the normal volume of oxygen consumed. This parameter compares the volume of oxygen consumed under test conditions with the volume of oxygen considered normal, expressed as a percentage.

VO_2 peak% is the percentage of maximum oxygen consumption. This parameter compares the volume of oxygen consumed during an exercise test to the maximum volume of oxygen consumed, expressed as a percentage.

6.13 Training equipment used in study I

The equipment used was:

- inflatable bag ;
- inflatable ball ;
- Inflatable kettlebell ;
- dumbbells .

6.1 4 Intervention program for Study I

The experimental program was implemented over a period of 14 weeks, more precisely between January 15 and May 31, during physical education lessons for medical students, non-athletic profiles who also formed the experimental group for this first study. The experimental group, made up of 40 students, participated in two functional training sessions conducted weekly, on Tuesdays and Thursdays.

As part of the implemented experimental functional training program, the subjects performed exercises with Aqua fitness equipment, but also with other sports equipment: agility ladder, plyometric fitness boxes, bosu ball, Blazpod devices, to increase the attractiveness and efficiency of the exercises.

The functional trainings were developed according to the physical characteristics, including exercises that simultaneously require several muscle groups, through natural, multi-joint movements. Each training included three stages: the stage of preparing the body for the effort, the fundamental stage and the stage of recovering the body after the effort. The exercises with the Aqua fitness equipment were performed only in the fundamental part, while in the warm-up and closing part, simple, dynamic exercises as well as static stretching exercises were performed.

CHAPTER VIII. CONCLUSIONS OF THE STUDY I

The results of Study I highlight the fact that the research hypotheses were confirmed as follows:
The general hypothesis was confirmed, with students' self-perception of physical fitness being associated with objective assessment through standardized tests, and the implementation of the functional training program significantly contributed to the optimization of the functional parameters of the experimental group.
The research results of Study I highlight that the research hypotheses were confirmed as follows:
Hypothesis 1 was confirmed, namely that by applying a questionnaire, we will identify students' self-perception regarding physical condition.
The development and distribution of the questionnaire allowed the identification of students' perception of their level of physical fitness. On the first item of the questionnaire, a significant number of students self-assessed themselves as having a normal body weight. At the same time, it was highlighted that a considerable number of students have a low level of components such as muscle flexibility, general coordination, agility and muscle strength. Regarding the practice of activities that include an aerobic effort, the students self-assessed themselves as having a good level. On the last item of the questionnaire, the answers highlighted the fact that more than half of the experimental group did not practice a functional training program.
Hypothesis 2 was confirmed, namely that by implementing standardized and adapted tests, we will identify the level of functional parameters of the experimental group.
The standardized test and the adapted test determined the objective evaluation of the level of functional parameters of the experimental group. The analysis of the results of the initial tests indicated that in the aerobic exercise test, in all parameters, the students recorded good values. In the anaerobic exercise test, the experimental group recorded normal values, which signifies an adequate anaerobic capacity for their age and gender.
Hypothesis 3 was confirmed, namely that by implementing a functional training program with Aqua fitness equipment, we will significantly improve the functional parameters of the experimental group.
Functional training and the use of Aqua fitness equipment had a positive impact on the functional parameters of the experimental group. The results of the final tests demonstrated that for all parameters of the aerobic test, the students recorded higher values compared to those obtained in the initial testing, thus reflecting the effectiveness of the intervention program .
The greatest progress was recorded in oxygen consumption / minute / kilogram of body mass, with a value of $\Delta = 3.732$ reflecting the effective adaptation of the cardiorespiratory and muscular systems to the functional training program.
In the anaerobic exercise test, the most relevant progress was recorded in the VO2 peak% parameter , with a value of $\Delta = 3.687$, followed by the VE (L/min) parameter, with a similar value of $\Delta = 3.643$, reflecting the visible progress following the training program and an increased resistance of the experimental group to intense and short - term effort.
In conclusion, the general hypothesis supported by the specific ones is confirmed due to the significant progress of the experimental group on the functional parameters of the experimental group, as a result of the implementation of the functional training program.

As a result of this study, we found that it is necessary to investigate the level of body composition and motor parameters of the experimental group. Optimization of motor parameters in students is necessary, due to the positive impact on the daily and recreational activities of students, as well as the benefits on the physical and mental component. Considering the fact that physical fitness includes a series of components, we consider it necessary to introduce a control group to highlight the differences between the participants.

CHAPTER IX. METHODOLOGY OF THE STUDY II

9.1 Study premises II

A type of modern equipment insufficiently addressed in specialized studies is Aqua fitness equipment such as ball, bag, kettlebell or dumbbells made of a resistant material. To identify the initial level of body composition and motor parameters, it is essential to select and apply standardized and adapted tests that determine objective data regarding the experimental group.

In the present study, a control group was introduced in order to highlight the differences resulting from the intervention. The control group performed the initial and final tests to evaluate body composition and motor parameters without participating in the functional training program.

We believe that the inclusion of Aqua fitness equipment in a functional training program can stimulate each component of motor capacity. At the same time, due to the variety of exercises performed with a varying amount of water, they can determine positive effects on the body composition of the experimental group.

9.2 Methodological approach of the study II

The methodological approach of study II was systematized in several stages to ensure a coherent and rigorous conduct of the research.

- In the first stage, the purpose, objectives, and hypotheses of the research were formulated, which coordinated the entire methodological path.
- Stage II aimed at applying initial standardized body composition tests to the experimental and control groups.
- Stage III represented the organization of the functional training program that was presented in study one. Functional exercises were performed with Aqua fitness equipment for components such as muscle strength, muscle power, flexibility, coordination and balance. Regarding agility, exercises were performed both with Aqua fitness equipment and using an agility ladder. At the same time, speed and reaction time exercises were used with modern Blazepod devices.
- The fourth stage represented the evaluation of body composition and motor parameters of the two groups by applying the final tests that were carried out under the same organizational conditions as the initial tests.
- Stage V consisted of collecting data and entering it into the SPSS statistical analysis program.
- Stage VI consisted of developing the conclusions of study II to identify whether the hypotheses formulated were confirmed, as well as to highlight the most important progress achieved by the experimental group, as a result of the implementation of the experimental functional training program.

9.3 Study Hypotheses II

General hypothesis: It is assumed that the implementation of an experimental functional training program using Aqua fitness equipment will improve body composition and motor parameters of the experimental group.

In establishing the specific hypotheses, we started from the assumption that:

Hypothesis 1: By applying standardized anthropometric measurements, we will identify the body composition level of the experimental and control groups, and the results will fall within the normal weight limits related to the subjects' age.

Hypothesis 2: By applying standardized and adapted motor tests, we will identify the initial and final level of motor parameters of the experimental and control groups.

Hypothesis 3: The implementation of an experimental functional training program with Aqua fitness equipment in the experimental group will determine significantly greater progress in body composition and motor parameters compared to the progress of the control group practicing classical physical education methods.

9.4 Purpose of the study II

The purpose of study II is to investigate the effectiveness of an experimental functional training program using Aqua fitness equipment on body composition and motor parameters in the experimental group made up of students from non-profile faculties and to compare these results with those recorded by the control group practicing classical physical education content.

10.5 Study objectives II

O1: Application of standardized body composition measurements to identify the body composition level of the experimental and control groups

O2: Application of standardized and adapted tests to identify the level of motor parameters of the experimental and control groups

O3: Development and implementation of an experimental functional training program using Aqua Fitness equipment aimed at improving the motor parameters and body composition of the subjects in the experimental group and comparing them with the results recorded by the control group practicing classic physical education content.

9.6 Study Tasks II

- establishing the period and samples of study II;
- establishing evaluation tools;
- establishing research methods;
- conducting initial assessments;
- establishing the experimental training program;
- conducting final evaluations;
- processing and interpreting the results;
- drawing conclusions.

9.7 Study sample II

85 subjects participated in study II, structured as follows:

- the experimental group made up of 40 students (20 male and 20 female students)
- the control group consisted of 45 students (23 male and 22 female students).

All participants are students at the Faculty of Medicine at UMFST "GE Palade", in Târgu Mureș.
During study II, the experimental group practiced the functional training program using Aqua fitness equipment and the control group participated in classic physical education lessons.
Inclusion criteria:

- students aged between 18 and 25 years;
- students with the same level of physical fitness;
- without medical conditions that would prevent the intervention program from being carried out;
- the experimental group, available to participate in the experimental program throughout its implementation;
- attendance at physical education lessons of over 90% of the subjects in the experimental group;
- ensuring 90% attendance of the control group at physical education lessons;
- participation of both groups in the initial and final tests.

9.8 Organization and phasing of the study II

The organization and conduct of the II study was carried out according to the structure of the 2023-2024 academic year of the UMFST "GE Palade" in Târgu-Mureș. The academic year is structured in 4 modules, with a 2-week session at the end of each module. For the II study, we opted to conduct it in modules III and IV.
Study II was conducted over a 16-week period that included one week of initial testing, 14 weeks of actual training, and one week for final testing.
In the first week of module II of the academic year (January 8-12, 2024), we applied standardized and adapted evaluation tests on body composition and motor capacity to the experimental and control groups.
The functional training program was implemented in the experimental group between 15.01.2024 and 31.05.2024. In the last week of module IV (3-7 June 2024), the experimental and control groups performed the final body composition and motor capacity tests.
The Gantt chart for study II is the same as that presented in the previous study.

9.9 Study location II

The initial and final anthropometric measurements were carried out in the "Dr. Anton Pongracz" gym, and the initial and final tests for motor capacity assessment were carried out both in the gym and on the outdoor field within the "GE Palade" UMFST in Târgu Mureș.

9.10 Research methods

9.10.1 Bibliographic method

The specialized literature has highlighted the fact that the inclusion of equipment in functional training programs contributes to the improvement of motor capacity, because they allow for the diversification of training stimuli and the activation of the neuromuscular system. Thus, the bibliographic method has significantly contributed to the formation of a theoretical basis, the delimitation of basic concepts and the implementation of the experimental approach.

9.10.2 Test method

The test method played an essential role in the present study, aiming to obtain objective data regarding the level of body composition and motor parameters of the experimental and control groups.
Body composition tests aimed to evaluate the percentage of skeletal muscle mass and the percentage of fat mass.
To assess students' motor ability, we applied 11 standardized tests according to scientific protocols and 3 tests adapted using Blazpods technology.
Adapted tests aimed at assessing agility, speed and reaction time performed on the upper and lower limbs. These were performed with Blazpod technology, as it uses high-precision sensors to assess the response to stimuli.

9.10.3. Observation method

We used the observation method directly and continuously throughout the 16 weeks, so as to obtain a holistic understanding of how each student responds to the assessment and exercises within the functional program.

9.10.4 Experimental method

The experimental method was used to evaluate the effectiveness and impact of the functional training program on the body composition and motor capacity of the experimental group. This method allowed the application of a structured functional training program with Aqua fitness equipment in order to provide objective and comparable data between the experimental and control groups.
The program included aerobic and anaerobic effort, due to functional exercises specific to each motor component. For example, functional exercises that targeted coordination, muscular endurance, cardiorespiratory endurance usually involved aerobic effort, while explosive and fast exercises involved anaerobic effort. Alternating the two types of effort contributes to determining positive effects on body composition in the experimental group. In addition, the exercises were performed with Aqua fitness equipment to contribute to an effective adaptation of the neuromuscular system.
Over the weeks, functional training was in accordance with the principle of gradual adaptation, being characterized by a progressive level of complexity.

9.10.5 Statistical-mathematical method

For data analysis, we used the IBM SPSS program, where we applied descriptive statistics to the two groups. The parameters used in both the initial and final testing were identical to those used in study I. At the same time, we applied the t-test for paired samples between the initial and final testing of the experimental group and the control group.

9.11 Assessment tools used in study II

The instruments used in study II aimed to apply measurements to objectively evaluate weight, height, percentage of skeletal muscle mass and fat mass, as well as identify the body composition value of the experimental and control groups.

The instruments for evaluating the motor parameters of the two groups aimed at applying standardized tests adapted by us.

Anthropometric measurements are a standardized method of assessing the proportions and components of the human body.

Body composition

Objectives: evaluation of fat mass percentage, skeletal muscle mass percentage and weight.

Body composition parameters evaluated in study II:

- fat mass (%)
- skeletal muscle mass (%)
- waist (cm)
- weight (kg)

Evaluation equipment: Tanita DC-240MA body analyzer.

To identify the body mass index of the experimental and control groups, it was necessary to assess total body weight and height.

BMI = weight (kg)/height ^{2} (m ^{2})

Height was measured using a thalimeter.

9.11.2 Motor tests were used to evaluate motor components.

Manual dynamometry assessment test

Test objective: evaluation of manual strength

Evaluation equipment: hand dynamometer.

Sit and Reach Test

Test objective: assessing flexibility

Evaluation equipment: gymnastics mat, gymnastics bench.

The Burpee Test

Objective of the test: assessment of muscular endurance

Sit up test (trunk raises)

Test objective: assessment of muscular endurance

Evaluation equipment: gymnastics mat.

Trunk extension test

Test objective: muscle strength assessment

Evaluation equipment: gymnastics mat.

Balance board test

Test objective: balance assessment

Evaluation equipment: balance board.

Quick Feet Test

Test objective: agility assessment

Assessment equipment: agility ladder.

Adapted T-test with Blazepod

Test objective: assessment of reactive agility

Evaluation equipment: Blazepod

The Matorin Test

Test objective *:* assessment of general coordination.

The adapted reaction test with Blazepod

Test objective: evaluation of reaction time

Evaluation equipment: Blazepod

Reaction test performed on the bosu ball

Objective of the test: evaluation of reaction time, coordination and balance.

Evaluation equipment *:* Blazepod

Squat jump test

Test objective: evaluation of contact time, flight time, height and muscle strength.

Evaluation equipment: Microgate Optojump Next

Drop jump test

Objective of the test: evaluation of contact time, flight time, height and muscle strength.

Evaluation equipment: Microgate Optojump Next

30 Second Jump Test

Test objective: evaluation of contact time, flight time, height and muscle strength

Evaluation equipment: Microgate Optojump Next

9.12 Evaluation equipment used in study II

- Tanita DC-240MA scale ;
- the thalimeter ;
- hand dynamometer ;
- bosu ball (60 cm) **;**
- plyometric fitness boxes (length: 50 cm, width: 60 cm);
- balance plate u;
- agility ladder ;
- Blazepods equipment ;
- the Microgate Optojump Next equipment .

9.13 Training equipment used in study II

The training equipment consisted of a bag, ball, inflatable kettlebells, and dumbbells that allow filling with water, presented in study I.

CHAPTER XI. CONCLUSIONS OF THE STUDY II

The results of study II highlight that the research hypotheses were confirmed.

The general hypothesis was confirmed, the results of the study reveal that the implementation of an experimental functional training program using Aqua fitness equipment will lead to improvements in body composition and motor parameters of students in the experimental group.

Hypothesis 1 was confirmed, namely that by applying standardized anthropometric measurements, we will identify the body composition level of the experimental and control groups, and the results will fall within the normal weight limits related to the subjects' age.

The application of anthropometric measurements determined the objective evaluation of body mass, height, body composition of the experimental and control groups. The Tanita body analyzer provided important information regarding the percentage of skeletal muscle mass and the percentage of fat mass. Based on the body mass index and body composition parameters, it was highlighted that the students in the experimental and control groups fall within the normal weight limits for their age.

Hypothesis 2 was confirmed, namely that by applying standardized and adapted motor tests, it will be possible to identify the initial and final level of motor parameters of the experimental and control groups.

The application of standardized and adapted motor tests objectively highlighted the level of motor parameters of the experimental and control groups. The test results highlight a low level of motor parameters of the experimental and control groups at the initial testing. Thus, in the Burpees test, the manual dynamometry test, the Sit & Reach muscle flexibility test, the balance board test, the muscle endurance test, the Quick feet agility test, the reactive agility test, the Blazepod reaction time test, the Squat Jump test, the Drop Jump test, the 30 seconds Jump test, there were small differences in the mean between the two groups. In contrast, in the Matorin coordination test and the Blazepod reaction time test, there were larger differences between the two groups. After the functional training by the experimental group, significant differences were highlighted between the two groups in all motor tests.

Hypothesis 3 was confirmed, the results of the study highlight that by implementing an experimental functional training program with Aqua fitness equipment, the experimental group will record significantly greater progress in motor parameters and body composition compared to the progress of the control group practicing classical physical education methods.

The functional training program integrated functional exercises specific to each motor component. The functional exercises were performed using Aqua fitness equipment, being adapted to the level of physical condition of the experimental group. For components such as speed and reaction time, the exercises were performed with Blazepod technology.

Analysis of the results in the IBM SPSS statistical program revealed significant improvements in body composition and motor capacity components of the experimental group compared to the control group.

The most relevant results of the experimental group in body composition measurements were recorded in the percentage of skeletal muscle mass, with a value of Δ= 3.290%, followed by the progress recorded in the percentage of fat mass, with a value of Δ=1.197%.

In the specific motor component tests, the most significant results were recorded in the Matorin general coordination test, in the left-turn jump, with a progress of Δ= 139.375° , followed by the manual dynamometry test, in the right hand with a progress of Δ= 7.325 kg.

The Sit & Reach muscle flexibility test showed a statistically significant improvement, with a value of Δ= 5,800 cm. A similar improvement was recorded in the muscular endurance test, in trunk lifts, with a value of Δ= 5,725 repetitions.

In agility tests, the greatest progress was recorded in the reactive agility test with Blazepod, the value being Δ= 1.190.

Regarding the students' reaction time, the greatest progress was recorded in the reaction time on the bosu ball with Blazepod technology, with a value of Δ= 4,150 strokes. In contrast, the complex Burpees test highlighted a progress of the students, with a value of Δ= 3,275 repetitions.

The students' balance improved significantly, with the greatest progress being in maintaining position on the balance board, on both lower limbs, with a value of Δ = 3.125 seconds.

Among the Squat Jump, Drop jump, 30 seconds jump tests, the greatest progress was recorded in the Drop jump test, in the height parameter, with a value of Δ =3.405 cm.

Comparing the results obtained by the experimental group with those of the control group revealed a significant difference in favor of the students who participated in the functional training program with the equipment. Aqua fitness, compared to the control group, whose values were statistically insignificant.

The results of study II demonstrate the efficiency of the implemented program, confirming that the use of Aqua fitness equipment contributes not only to improving body composition and motor parameters, but also to achieving superior results compared to the classical means applied in the control group, in university physical education lessons .

CHAPTER XII. DISCUSSIONS, GENERAL CONCLUSIONS, NOVELTY ASPECTS, RESEARCH LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

12.1 Discussions

This research reflects the analysis and interpretation of the data obtained in the research in relation to the hypotheses and objectives formulated and in the context of the specialized literature. The discussions are focused on the impact of the functional training program using Aqua fitness equipment on the functional and motor capacity of the experimental group as well as the differences between the experimental and control groups. The chapter also aims to integrate the results obtained, highlight the theoretical and practical contributions of the research and provide a perspective on the applicability of the results in physical education lessons for students.

Study I demonstrated significant improvements in the functional capacity of the experimental group by analyzing the data obtained at the initial and final tests. These improvements emphasize the effective adaptation of the cardiorespiratory system to the implemented intervention program. Analysis of the applied questionnaire determined a correlation between the self-perception of the experimental group and the objective data of the applied tests regarding body composition,

functional and motor capacity. These results are consistent with research conducted on the functional capacity and body composition of students as a result of the implemented functional training programs.

Research has investigated the effects of a functional training approach, specifically interval training, on a sample of 44 soccer players on maximal oxygen consumption. Following a six-week program, with a frequency of three weekly sessions, the results revealed significant improvements in this functional parameter (Nurhaiaty & Hasnawati, 2024).

To date, there are no studies on the integration of Aqua fitness equipment into a functional training program targeting the motor components of fitness, which underlines the original contribution of this research. However, a study by Wezenbeek et al. (2022), on a sample of 20 subjects, investigated the effects of three functional exercises performed with an inflatable water tube compared to a fitness bar. The results showed that the use of the inflatable water bag resulted in significantly greater activation of the stabilizing muscles of the trunk, as well as the muscles of the lower limbs.

Study II showed superior results of the experimental group compared to the control group in terms of body composition and motor capacity. The data obtained reflect the decrease in the percentage of fat mass, the increase in the percentage of muscle mass, but also the improvement of all components of the motor capacity of the experimental group due to the efficiency of the intervention program. In contrast, the results of the control group do not indicate improvements from a statistical point of view, due to participation in physical education lessons. The statements are in accordance with a comparative investigation carried out by (Li et al., 2025), between functional and traditional training carried out over 8 weeks, in a group of 20 male students. It showed significant improvements in components such as body composition, speed, muscle flexibility, endurance and muscle power.

12.2 General conclusions

The main focus of this research was the detailed analysis and optimization of functional and motor capacity in an experimental group consisting of 40 medical students, by developing and implementing an effective functional training program with Aqua fitness equipment with the aim of obtaining statistically significant results.

The research was systematized in the theoretical foundation and its own contributions systematized in two studies. Study I aimed at applying a designed questionnaire and optimizing the functional parameters of the experimental group through a functional training program with Aqua fitness equipment. Study II of the research aimed at optimizing the body composition and motor parameters of the experimental group and comparing the data obtained with the control group, consisting of 45 students from medical specializations.

In the first part of the research, we analyzed, through the bibliographic method, a series of national and international studies, fundamental notions and specialized journals regarding aspects of general fitness and physical fitness.

The in-depth analysis of the specialized literature showed that students from non-profile specializations represent a category exposed to the risk of sedentarism and health conditions, as a result of the lack of constant practice of physical exercises. Sedentarism is explained by the fact that students allocate a long period to academic activities, as a result of the high and continuous volume of tasks they have to perform. Physical exercises represent a fundamental means of combating sedentarism, preventing risk factors and maintaining an optimal state of health in the long term.

By deepening the specialized literature in the field, we found that the notion of fitness is approached from several perspectives, often being described as a complex activity that combines the constant practice of physical exercises with balanced nutrition and adequate rest. At the same time, many studies have highlighted the fact that fitness exercises have a significant impact on the mental component due to the variety of exercises. Also, an important aspect that we identified is the fact that fitness includes five components that target general health and six components that target physical fitness.

Following a review of the specialized literature, we concluded that a functional training program is an effective method to improve the physical condition of students, due to the complex impact it exerts on the body, both at a functional and motor level.

This training differs from traditional methods because it integrates multi-joint exercises that mimic fundamental movements similar to those in everyday life. These exercises can also be performed with various sports equipment, to promote the body's efficient adaptation to physical effort.

Due to the need for a trend to modernize traditional equipment, we considered that Aqua fitness equipment can be integrated into the functional training program due to the versatility it offers during physical exercise.

We addressed the questionnaire and functional capacity in the first study, because exercises that target aerobic and anaerobic effort favor maintaining the health of the cardiorespiratory and muscular systems, as well as stimulating the metabolism of students.

The questionnaire was developed to target the functional and motor capacity of students from a general perspective, by integrating items relevant to these dimensions. The students' responses to the questionnaire were approximately similar to the data provided following the initial assessment tests, which reflects a low level of physical condition for the students' age. In contrast, for the item regarding the practice of aerobic activities, the experimental group self-assessed themselves as having a good level, which was associated with the results of the initial testing.

After collecting data from the questionnaire, we implemented a standardized functional test, which objectively identified aerobic capacity, and an adapted functional test, regarding the anaerobic capacity of the students. The data obtained from the application of the tests represented the foundation for the development of the functional intervention program.

The results of the final evaluation tests reflected that the implemented program had a significant impact on the aerobic and anaerobic capacity of the experimental group, which results in the hypotheses of study I being confirmed.

In study II, we introduced a control group to highlight the impact of the intervention program on body composition and motor capacity in the experimental group. The control group, consisting of 45 medical students, did not participate in study one due to limited access to the Research Center, but also due to financial resources.

To identify the initial level of body composition and motor capacity, we applied a series of standardized and adapted tests to both the experimental and control groups. Even though the control group did not participate in the intervention program, the results of the initial and final assessment tests were analyzed and compared in the statistical analysis program to highlight the differences between the groups.

Thus, the hypotheses, purpose, and objectives were formulated that aimed to show that the functional training program using Aqua fitness equipment optimizes the components of motor capacity and body composition of the experimental group compared to the control group.

In study II, the entire experimental program was not mentioned, as it was presented in the previous study, which aimed at the detailed description of each functional exercise.

The results of the final tests demonstrated that the functional training program performed with Aqua fitness equipment had a statistically significant impact on the body composition and motor capacity of the experimental group compared to the control group, which results in the hypotheses of study II being confirmed.

In conclusion, this scientific research highlighted the efficiency of implementing the functional training program with Aqua fitness equipment in the experimental group, due to the statistically significant results obtained in the final evaluation tests.

The research highlights the need to address such programs within the university physical education lesson in order to maintain students' physical condition in optimal parameters, to increase motivation, active participation in classes, as well as to guide students in terms of constant practice of functional exercises.

Finally, it can be confirmed that the research objectives were achieved, the hypotheses were confirmed, supporting the applicative value of the functional training program with modern equipment in the field of physical education and sports.

12.3 Research Limitations

This research highlights a series of limitations that may influence to a certain extent the interpretation and synthesis of the results obtained. These must be correctly analyzed in the context of these constraints without diminishing the significance and applicability of the conclusions:

- sample size;
- duration of the intervention;
- limiting control over external factors;
- lack of long-term monitoring.

12.4 Future research directions

The results obtained in this research confirm the effectiveness of functional training programs using Aqua fitness equipment in optimizing the motor and functional capacity of students from non-profile specializations. However, the topic remains open to future directions for deepening and expanding:

- expanding the sample and their characteristics (age, professional specializations, etc.);
- extending the period of implementation of the intervention program;
- comparison with other functional training methods ;
- comparing Aqua fitness equipment with other traditional fitness equipment;
- integrating Aqua fitness equipment into various contexts.

In conclusion, the research directions highlight the adjustment of methodological aspects such as extending the duration and sample, but also the possibility of integrating Aqua fitness equipment into related fields or comparative research.

12.5 Aspects of novelty and originality of the research

The elements of novelty and originality constitute a defining aspect of this thesis, as they differentiate the research from previous studies and contribute to the development of the field of university physical education in non-sports higher education institutions. They allow the outline of future research directions, due to the theoretical aspects regarding Aqua fitness equipment, the development of a functional training program with modern equipment, the use of technologies in the evaluation of the experimental group.

Through a detailed analysis of the specialized literature, we found that there are no studies that target the integration of Aqua fitness equipment into a functional training program for students. In addition, it is necessary to implement a modern program that improves the general physical condition of students and stimulates cognitive processes, in order to prevent sedentarism and effectively support the learning process.

Among the novel aspects addressed in the thesis, we mention a few that we will detail below:

- the use of Aqua fitness equipment in a functional training and the adaptation of exercises to the motor characteristics of students from medical specializations, not sports-related
- development and implementation of a structured functional training program, carried out over 14 weeks, using Aqua-fitness equipment in combination with other modern fitness equipment
- applying a complex set of functional and motor tests, standardized and adapted to the specifics of the evaluated sample
- using modern equipment and technologies to monitor and evaluate the motor performance of study subjects
- complex assessment of physical fitness targeting the components: speed, muscular strength, cardiovascular endurance, flexibility, balance, agility, power
- investigating the level of self-perception of study II subjects on knowledge related to physical fitness.