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Abstract

During the implementation of the tasks of experimental work we developed model of pedagogical system for teaching students motor actions in powerlifting, which includes the purpose, tasks, stages, methodological support, as well as principles, patterns, pedagogical conditions required for formation of special skills and abilities. The model was based on the structure of physical education with the teaching, educational and health-improving functions. The developed model is based on the principles of environmental compliance, consciousness and activity, regularity and gradualness, repetition and clarity, as a necessary condition for successful learning. Introduction of a model of pedagogical system of learning motor actions in powerlifting in physical education process contributes to the acquisition of special knowledge, skills and abilities by students.

Keywords: methodical, model, powerlifting, students, physical fitness, physical education.

1. Introduction

The problem of preserving and strengthening the health of the younger generation has always attracted the attention of public figures such as: sports coaches, scientists, cultural figures, educators. The practical significance of its solution is related to the implementation of the provisions of following legal documents: «Concepts of physical education in the education system of Ukraine», Target comprehensive program «Physical education is the health of the nation», which are designed to carry out propaganda work on the involvement of children and youth in active forms and methods of physical training, achieving sports results. In today's conditions, the urgency of this problem is due to socio-cultural, scientific, pedagogical, organizational and managerial factors.

Modern lifestyle encourages young people to physical perfection. Healthy lifestyle, the formation of a beautiful athletic physique is relevant to modern youth. Encouragement to this are the standards of beauty of ancient Greece, for instance: Hercules, Pythagoras, Platon and modern handsome athletes: V. Virastyuk, A. Krymov, V. Naleykin, O. Solovyov, O. Shepel. Classes in the gym, under the guidance of a coach allow you to become strong. They led to creation of a separate sport namely the powerlifting. Powerlifting (from eng. powerlifting: «power» – strength, power and «lifting» – raise, pick up, elevate) it is a relatively young sport, the essence of which is to overcome the maximum weight during the performance of three exercises: squats with a barbell on shoulders (squat); barbell press lying on a horizontal bench (bench press), and barbell lifting while standing (deadlift). The amount of points scored for the exercises determines the qualification of the athlete. This sport is gaining more and more popularity every year, as evidenced by the dynamics of participation of athletes in competitions. Participation in trainings and competitions of not only men, but also women is considered to be an indicator of the development of power triathlon. It has also recently become popular to hold competitions using a single exercise namely the bench press, which is recognized both among amateurs and among professional athletes [17, 18, 19, 22, 23, 28, 29, 30].

Analysis of data from scientific and methodological and special literature shows that, that the problem of forming special skills and abilities of students in the process of powerlifting classes is studied in the



following main areas: development of methods for training highly qualified athletes in powerlifting; research of features of youth sports in powerlifting; identification of means and methods of recovery during powerlifting classes; use of powerlifting in physical education process; improving the technique of competitive exercises in powerlifting; substantiation of features of women's powerlifting.

2. Materials and Methods

The aim of the study is to develop and experimentally test the model of pedagogical system of training students of motor actions in powerlifting in physical education process.

General scientific and special research methods were used to achieve the set goal and solve the problems, interconnected and consistently applied throughout the study: *theoretical (for the formation of theoretical and methodological foundations of the study)*: analysis and generalization of philosophical, sociological, psychological, pedagogical, valeological literature; study of educational programs; regulatory and legislative documents; methodical recommendations and textbooks on psychological and pedagogical disciplines; study of the experience of physical education departments in the development of powerlifting in higher education institutions; *empirical (to determine the general health of students)*: methods of collecting information (questionnaires, surveys, pedagogical testing and observation of students' educational and training activities), analysis of learning outcomes, interviews, methods of expert assessments, self-assessment, generalization of independent characteristics; *experimental (for the analysis of the basic ways of research of complex indicators)*: ascertaining, formative, control stages of pedagogical experiment using the Diary of physical self-improvement in powerlifting, visual aids; *statistical (to assess the statistical significance of differences in the status and dynamics of changes in health indices)*: descriptive statistics, determination of statistical significance of differences between groups by the Student's method and correlation analysis by the Pearson method.

The pedagogical experiment was carried out on the basis of Poltava National Pedagogical University named after V. G. Korolenko, which was attended by twelve study groups of students (a total of 294 people, including 161 – boys and 133 – girls) from historical, natural, psychological-pedagogical, physical-mathematical and philological faculties. All students were divided into control and experimental groups by the method of even distribution of groups. According to the schedule, physical education classes in all groups were held once or twice a week in the morning. Students of control groups were engaged in the curriculum for higher education institutions [14]. Students of experimental groups were engaged in the developed author's technique of formation of special abilities and skills in powerlifting. Training sessions, as part of compulsory and independent classes, were held three times a week in powerlifting and two classes, which included running and swimming. The duration of training sessions in groups was 90 minutes. The effectiveness of the proposed method was evaluated by the results of control tests. At the beginning of the school year (September), physical training tests were conducted and the level of special physical training in powerlifting in control and experimental groups was assessed. Control tests were conducted at the end of the school year (May-June). Students who dropped out of the experimental and control groups during their studies were not included in the statistical processing and were not replaced by others.

3. Results and Discussion

In the course of realization of tasks of experimental work, the model of pedagogical system of training of motor actions in powerlifting was developed, which includes the purpose, tasks, stages, methodological support, as well as principles, regularities, pedagogical conditions of formation of special abilities and skills. The introduction of this model in physical education process will help students to acquire special knowledge, skills and abilities (Fig. 1).

The model of the educational process is a reference idea of student learning, its construction in the conditions of specific educational institutions. It determines the purpose, basics of organization and conduct of the educational process. Its main components should be following components: target, stimulating and motivational, semantic, procedural, control and regulating, evaluative and effective and subject to subject components [1, 13, 14, 22, 24, 27].

The model is an image of the system of formation of special knowledge, motor skills and abilities of students in the process of powerlifting classes. According to D.S. Mazokha, the purpose of learning is the



expected end result of purposeful activity of the teacher and cognitive activity of students. It is an intermediate path to the harmonious spiritual development of the individual [7]. The objectives of the training sessions are mastering the system of scientific knowledge, formation of special skills, worldview, moral views and beliefs, ideals, needs, values, behaviors and activities, selection of loads of different orientation depending on the volume and intensity of physical activity [5, 10, 21, 26].

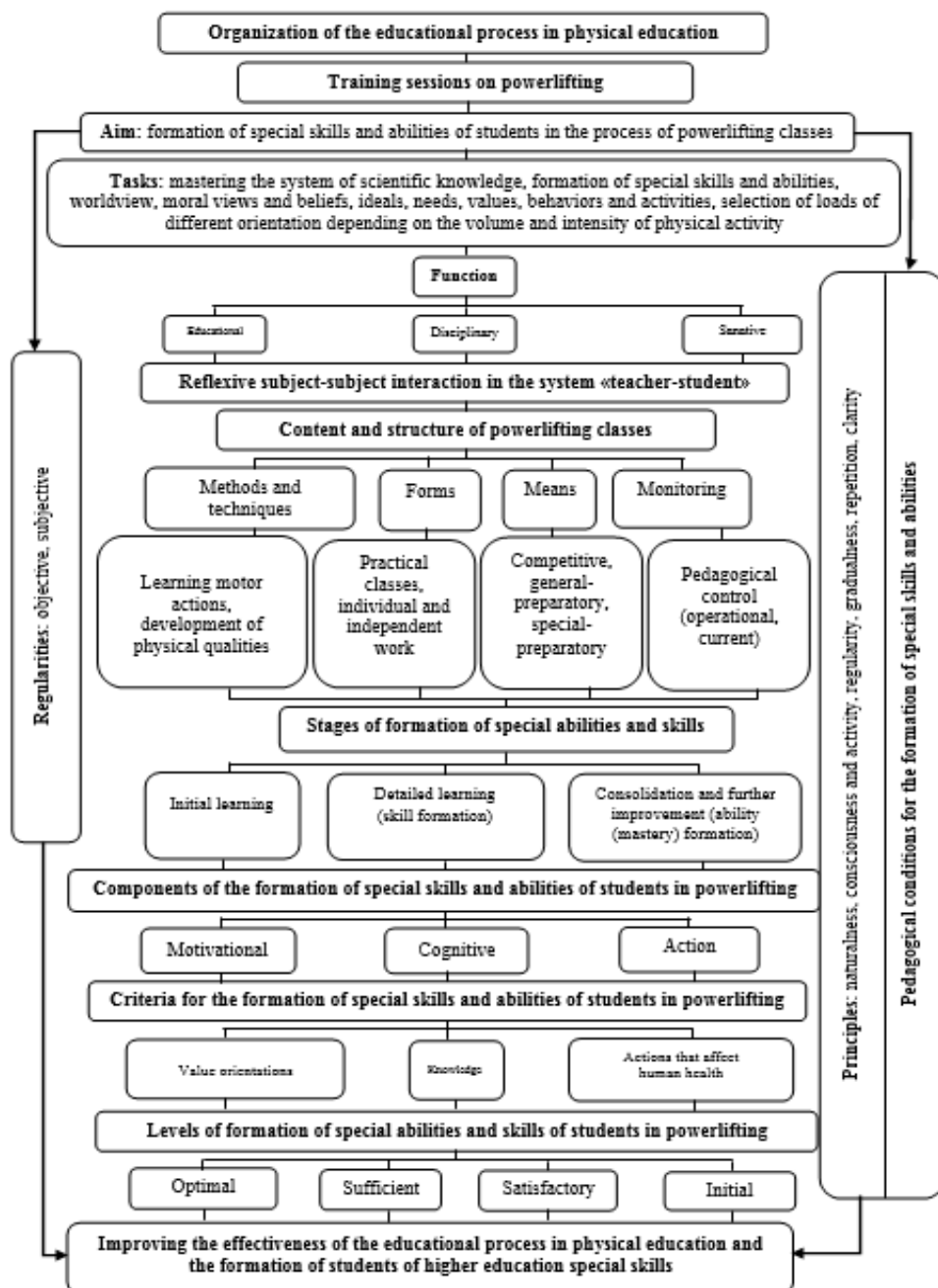


Fig. 1. Model of pedagogical system of training students of motor actions in powerlifting

The model was based on the structure of physical education with the solution of educational, upbringing and health functions. All three functions are interconnected, and this is provided by the specifics of training sessions, the content of training, the use of methods, forms and means of training, control and

analysis of results. The principles of teaching are guiding provisions, normative requirements for the organization and conduct of the didactic process, which have the form of general instructions, rules and norms and follow from its laws, which are sustainable pedagogical phenomena based on the recurrence of facts, educational activities and is the theoretical basis of the principles of learning. Among them there are objective and subjective patterns of learning. The first are inherent in the learning process in its essence. The latter are dependent on the teacher and his activities [2, 4, 6, 20, 25].

The objective laws used in the process of powerlifting include: 1) educational and developmental nature of powerlifting training sessions; 2) conditionality of training by social needs and interests of students; 3) interdependence of efficiency of training sessions on powerlifting on pedagogical conditions; 4) interdependence of education on age, sex and individual characteristics of students; 5) the interdependence of the effectiveness of powerlifting classes on the level of physical fitness of students; 6) purposeful interaction of the trainer-teacher and the student.

Subjective patterns are: 1) concepts can be mastered only when the educational and training activities of students are properly organized; 2) skills are formed only under the condition of organizing the reproduction of operations and actions underlying them; 3) mastering of the content of educational material is facilitated by systematic repetition of this content and its introduction into the system of already mastered content; 4) mastering complex ways of performing the exercise depends on mastering the previous simple ways; 5) use of varied tasks by the trainer-teacher, involving the application of acquired knowledge during powerlifting classes, transfer of acquired knowledge and related actions to a new situation; 6) interdependence of methods, means and forms of education on its content and tasks; 7) the interconnection of the components of learning ensures effective learning outcomes, education and development.

The developed model is based on the principles of conformity to nature (naturalness), consciousness and activity, regularity and gradualness, repetition and clarity, as a necessary condition for successful learning.

The principle of conformity to nature is aimed at conducting powerlifting classes taking into account age, gender and individual characteristics, level of physical development and physical fitness, compliance of physical activities with the strength and capabilities of students. Without accounting of age, gender and individual characteristics, level of physical development and physical fitness, it is impossible to determine the load or identify the most effective means of training, improve technical skills. Assessment of students' functional capabilities, their relationship with model characteristics and development on this basis of the program of development of physical qualities of youth by means of powerlifting or complexes of training influence is done through the implementation of the principle of naturalness.

The principle of consciousness and activity involves educating students in a positive attitude to powerlifting classes, understanding the purpose of these classes and specific tasks on the way to achieving it, development of a lasting interest in systematic and purposeful physical improvement. It also requires a thoughtful attitude to learning, understanding the material being studied, assessment of their strengths and capabilities, critical attitude to their actions during the training process. The student's ability to self-analyze basic powerlifting exercises is important, as well as ability to choose rational exercises for training, determining the optimal physical activity.

Research shows that the conscious attitude of students to work not only improves its quality, but also effectively affects performance. With a high level of motivation, students are able to withstand much greater stress on the psyche and vegetative system of the body than in the case of a passive attitude to classes [12].

The implementation of student activity depends on the organizational forms of training and methods of forming special skills and abilities. If there are elements of competitions, a variety of exercises, the staffing of the group with equal students by their strength, then the effectiveness of the training process increases. The activity of those involved in training is related to understanding the social essence of sports, its importance as a means of promoting health, harmonious and spiritual development.

The principle of regularity and gradualness stands for the regularity and regularity of powerlifting classes, gradual and consistent study of methods, options and types of athletic exercises, thereby providing the necessary link between the various aspects of the training process and its content. It provides for compliance with three main rules: from simple to complex; from easy to difficult; from the known to the

unknown. The implementation of this principle involves a sequence of learning exercises that provides the formation of special skills and abilities.

The principle of repetition is based on the physiological position of the need for repeated effects for the formation of conditioned reflex connections, for the emergence of appropriate changes in the organs and systems of the body of students in order to improve their functionality. Only repetition of the exercise for many times allows to form and consolidate special knowledge, skills and abilities and to increase sports results.

The principle of clarity involves the use of tools and techniques of training, which provide an understanding of the essence of the exercise being studied, and helps to create a correct idea of the technique of its implementation. It is implemented through the use of technical teaching aids with visual and auditory indications. The use of these tools in the training process of powerlifting is especially important for improving the technique of performing exercises. An important factor for the full implementation of the principle of clarity is attending competitions and training sessions of outstanding athletes in powerlifting.

Increasing the level of formation of special skills and abilities of students in the process of powerlifting classes is achieved in the case of compliance with such pedagogical conditions: development of students' positive attitude and motivation for powerlifting classes; clear awareness of the purpose and objectives of training sessions; selection of optimal training means and methods of development of strength qualities taking into account individual psychophysiological capabilities of the body of students; conscious desire for self-improvement; providing the necessary technical equipment and sports equipment; intensification of independent work of students and taking into account the sensitive period of development of their strength qualities; ability to self-esteem, self-analysis and self-control.

In the process of powerlifting classes, three periods were identified, which had the appropriate stages. At the first period there was an initial study of motor action. On the second period in-depth detailed learning was carried out. This corresponded to the period of mastering motor action at the skill level. At the third stage there was a consolidation and further improvement of motor action. This corresponded to the stage of mastering motor action at the ability (mastery) level.

Optimization of physical education was implemented using a system of pedagogical actions presented according to the logic of the developed model. Its structural units were humanistic and professional actions of the trainer-teacher by means of the corresponding methods and methodical receptions, means and forms of organization of educational classes.

Learning optimization is the selection of the best options for specific conditions in order to obtain the best results [9, 16]. In the course of training, we used mainly practical methods of teaching in all its forms. By definition, S.I. Prisyazhnyuk, teaching methods are forms of mutual practical activity of a student and a teacher, aimed at solving health, educational and training tasks using the means of physical culture and sports [11]. Here are the most commonly used training methods in powerlifting. *The method of using the word.* It is impossible to conduct a training session without explaining the exercise by a coach or teacher, without a verbal remark on the elimination of errors in the technique of its implementation. *Method of using visual aids.* Showing movies, demonstration of memorized exercises for high-class athletes, use of visual aids. *Method of exercise disassembly.* The exercise is divided into components or phases. Athletes master each of them separately and only then they master the whole exercise. The method is used not only in the learning process, but also in training, when you need to correct or improve the details of the exercise. *The method of holistic exercise.* This method can be used when teaching simple exercises and exercises similar to those previously studied. Also used to train athletes with good coordination. *Combined method.* This is the most effective method, which combines the method of exercise disassembly and the method of holistic exercise. *Method of repeating the exercise.* Repeated exercises with a barbell, weights, dumbbells, exercise machines and exercises in other sports. *Method of programmed learning.* Teaching students the optimal training program. Use of monthly, weekly training plans. *Method of using technical means.* Mostly three types of information are used: visual, sound, tactile. *Game method.* Carrying out of games for increase of emotionality of educational employment, for rest, physical development. *Method of testing knowledge, skills and abilities.* Used in the process of estimates, competitions, tests, daily observations [12].

In each of the above methods of workload, the duration of work and rest corresponded to the state of health and type of disease of students. The method of determining individual limits of physical activity

intensity has gained considerable use during powerlifting training sessions, according to the energy capabilities of the student's body.

The main methods of formation of motor skills included a holistic and disassembly method. The first was used in the study of relatively simple movements, as well as at the final stage (consolidation) of mastering complex movement. The purpose of its application is to teach the student to perform the exercise completely, sometimes after explanation and demonstration by the teacher. The disassembly method was used during the study of all complex movements. The peculiarity of this method of teaching is the division of the exercise into separate elements or phases, which were studied in parts. Students study and master each of them separately, and then after combining them together, perform the exercise as a whole.

The development of each physical quality was carried out through such *methods*.

Strength: 1) maximum effort method – lifting the heaviest load; 2) method of repeated efforts – repeated lifting the load «to refusal» at a slow pace; 3) method of dynamic efforts – repeated strength exercises with maximum speed.

Endurance: 1) method of long, continuous, uniform exercise – running at a moderate speed for at least 10 minutes; 2) variable method – running with small accelerations (100–200 m); 3) method of interval training – run of segments of 150–600 m with submaximal (heart rate – 165–180 beats/min) speed with rest intervals between loads sufficient to reduce the heart rate to 120 beats/min; 4) «circular training» method – strength exercises for the development of major muscle groups, performed sequentially (in a circle) at specially equipped «stations».

Speed: 1) method of repeated exercises – repeated run of short (up to 30 m) segments with the maximum speed; 2) method of repeated-progressive exercise – gradual increase in speed in each run with the maximum result; 3) method of alternating exercise – running a short distance with varying speeds from low to high.

Flexibility: 1) method of slow movements – slow turns, inclines, diversion with limited amplitude without load and with load; 2) method of swinging movements – performing movements with a large amplitude; 3) method of elastic movements – performing jerky movements with incomplete amplitude (spring forward tilts); 4) method of forced muscle stretching – performing movements with maximum amplitude with the help of a partner or with a load.

Agility: 1) method of repeated exercise – formation of motor skills by repeated repetition of its elements until the emergence of automatism in performance; 2) method of alternating exercise – application of the formed motor skill in unusual conditions.

The main means of learning used to develop motor skills included various types of exercise. Physical exercises are motor actions that are performed consciously, in accordance with the laws of physical education [3]:

- general preparatory exercises were used to increase general physical fitness, improving the motor and functional capabilities of the body, improving efficiency, development of basic physical qualities of students;

- special preparatory exercises – for the predominant development of those muscle groups and physical qualities that are crucial for mastering specific motor skills, as well as to learn technical and tactical techniques. The impact of special exercises depends on the conditions of their implementation (identity to competitive needs, intensity, duration, emotional background);

- approaching exercises – motor actions, close in structure to the movement studied.

Teaching aids allowed students not only to supplement the deficit of physical activity, providing additional physical activity, but also to relieve fatigue, were a means of the most complete rest. Teaching aids are sources or special devices that help teachers to carry out the educational process [8].

The main forms of physical education classes were practical powerlifting classes as part of the physical education curriculum, as well as individual and independent powerlifting classes, which allowed to implement all the tools and methods of the developed model. The most specific feature of this form of training is that the powerlifting classes were led by a trainer-teacher. In the system of classes used educational, education-training and training variants. The training was aimed at learning new material, techniques of exercises, means of physical fitness. The education-training variant was aimed at learning new

material, as well as repeating what has already been learned. The training was aimed at improving the technique of exercises as a whole or separately.

Powerlifting classes consisted of preparatory, main and final parts and were determined by changes in the functional state of the body of students during exercise. The main parameters of physical activity (frequency and duration of classes, capacity and nature of the means used) were determined according to the level of health and physical fitness of students.

In the preparatory part of training sessions in powerlifting the tasks of optimal preparation of students for the main task were solved. The purpose is to increase the activity of the main functional systems of the body of students. The task was to organize those involved, mobilize attention, explain the content of the lesson, prepare the body for the next job. The means, used at this stage, included drill exercises and general developmental exercises.

The preparatory part of the lesson is important for students. The preparatory part, or warm-up, provided warming up of an organism, its preparation for the basic physical activity. Exercises in this part of the training provided a gradual increase in heart rate, increase in body temperature, preparation of the musculoskeletal system for gradual physical activity and increased blood circulation in the muscles, increased mobility in the joints. To achieve this, slow running and gymnastic exercises were performed for all muscle groups and all parts of the body.

A special part of the warm-up was aimed at improving coordination skills, creating an energy basis, preparing the body to perform the following complex movements and more intense training load. The selection of warm-up exercises according to the coordination mechanism corresponded to the peculiarities of the main part of powerlifting training sessions. For this purpose, the inclusion of approaching exercises was provided. The duration of the preparatory part of the lesson ranged from 25 minutes to 10–20 % of the total lesson time.

The main part involved solving the main tasks of the lesson. The work performed improved the level of special physical fitness of students, study and improvement of motor actions. In the main part of training sessions on powerlifting tasks which were directed on development of the basic functional systems (cardiovascular, respiratory, muscular) of an organism, physical, motor qualities, study or improvement of exercise techniques, formation of special skills and abilities were solved. Depending on the conditions, place and time of the training session, several types of sports training could be decided. In the case of a difficult (complex) purpose of the training session, the planned sequence of physical exercises was used. Particular attention was paid to the dynamics of physical activity and the nature of the complexity of physical exercises. In this part of the exercise, the exercise helped to increase the heart rate to the level of the «target zone», which was aimed at developing special functional training.

The main part of the lesson mainly implements the pedagogical principles of individualization, accessibility, consistency, dynamism [3]. Means used at this stage included: general and special training exercises with weights (barbells, dumbbells, exercise machines). Exercises in other sports (gymnastics, athletics, moving games). The means of the main part of the lesson during powerlifting classes varied in content, volume of intensity, depending on the level of preparation of students, the period of study or training. The duration of the main part of the lesson was 50 minutes.

In the final part of training sessions on powerlifting the tasks directed on switching of an organism to a restorative mode of functioning and creating conditions for the deployment of recovery processes were solved. This was achieved by gradually reducing the intensity of the exercises performed, reducing the heart rate to a level close to the one observed at the beginning of the lesson, switching to actions that give the effect of active recreation, using relaxation, breathing and other exercises that helped to intensify the recovery process. The task here was to achieve gradual reduction of training load, analysis of the work done by students, summarizing the lesson, homework.

The complex ended with exercises for breathing, relaxation, flexibility, performed at a slow pace. Flexibility exercises alternated with relaxation exercises. They contributed to the rapid recovery of the body and prepare it for further activities. Means for achieving this effect included slow running, walking, breathing exercises, relaxation exercises, various heights. The duration of the final part of the lesson was 15 minutes. At the end of each final part, we performed an analysis of the performed training work,

connected it with the performance of tasks at this stage of training, determined the content of powerlifting classes for each student.

Clear, competent, methodologically and scientifically sound organization of the process of physical education determined its result. The effectiveness of the whole process depended on the effectiveness of each of its components. The main component of each part of the lesson was the right music. Music is an emotional stimulus to movements, an active component of exercise. Musical rhythm was an important and indispensable means of developing the rhythm of the movements of the exercise studied.

When planning physical activity, we used a well-known classification of loads, which consists of five zones of intensity [11]:

1. Low intensity zone (20–30 %). In this area, the work is performed for a long period of time. Physiological functions of the body are not stressed, heart rate does not exceed 100–120 beats/min.

2. Moderate intensity zone (50 % of maximum physical activity). In this mode the general endurance, flexibility, coordination of movements develops. Heart rate during exercise reaches 130–160 beats/min. Exercise in this area helps to establish the interaction between the functions of the cardiovascular, respiratory and musculoskeletal systems.

3. The zone of high intensity (about 70 % of the maximum physical activity) contributes to the greatest stress of physiological functions. The use of high-intensity exercise in combination with moderate intensity promotes the development of fast and overall endurance. Heart rate reaches 150–170 beats/min. Exercise in this zone contributes to the development of aerobic and anaerobic capacity of the body of students.

4. Zone of submaximal intensity (80 % of maximum physical activity). It corresponds to the mode of exercise, in which the work of the heart muscles and other physiological systems is provided by anaerobic energy sources. Duration of physical activity for 50 s, and for more trained students up to 60–80 minutes.

5. Zone of maximum intensity (100 % of maximum physical activity) corresponds to the performance of physical exercises with maximum speed, maximum pace and effort. Exercise in the zone of maximum intensity is used in the absence of painful changes in the body, which may be contraindications to their implementation.

An important role in the formation of special skills and abilities belonged to pedagogical control. Pedagogical control was considered as a means of diagnosis, correction of educational activities, which allowed to objectively assess the level of health, general and special physical fitness of students, the technique of performing various physical exercises. According to T. Yu. Krutsevykh, pedagogical control in teaching physical exercises is the activity of a teacher and those involved, aimed at obtaining information in the process of developing motor skills and skills that can be used to manage the learning process [7].

Pedagogical control allowed to check the effectiveness of powerlifting classes, which was determined by the components of the expected end result: improving the level of physical health, general and special physical and functional fitness, level of formation of special abilities and skills, correction of indicators of a physical condition of an organism of students. The teacher exercised direct pedagogical influence on the student through the use of appropriate methods, means and forms of organizing and conducting training sessions on powerlifting.

4. Conclusions

Development and implementation of a model for teaching students motor actions in powerlifting to solve educational, training and health-improvement functions are appropriate for the following reasons: a) powerlifting, weightlifting, athletics are the most popular power sports among students of higher educational institutions; b) the nature of training places high demands on the development of functional systems and functions of the body of students, which allows for regular training sessions to get a positive training effect; c) training classes in power sports contribute to the formation of students' special skills and abilities, needs for normal motor mode, habits for a healthy lifestyle.

Based on the study of issues related to improving the effectiveness of physical education process and the formation of special skills and abilities of students, it was found that:

1) Conducting training sessions on powerlifting, it is necessary to adhere to the basic didactic and methodological provisions of psychological and pedagogical science, namely principles and patterns of learning motor actions in powerlifting.



2) It is necessary to use the organizational and methodological support of powerlifting classes, taking into account the age, gender and individual personalities of students.

3) Exercise should be dosed to suit physical health, physical development, general and special physical fitness of students, and should take into account the importance of the basic technical elements in each powerlifting exercise.

4) It is promising to monitor the quality of education on the basis of a modular rating system for assessing students' knowledge, which should be a prerequisite for learning activities in higher educational institutions.

5) It is beneficial to use pedagogical control tools to work on the technique of performing exercises during powerlifting classes, one of which can be «diary of physical self-improvement in powerlifting».

6) Teachers should form a clear positive motivation for powerlifting classes in students.

These theoretical and methodological provisions and the model of the pedagogical system of teaching students motor actions in powerlifting formed the basis of developed methods of forming special skills and abilities of students of higher educational institutions in the process of powerlifting classes.

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