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IMPROVEMENT OF STRENGTH QUALITIES OF HIGHER EDUCATION SEEKERS BY THE MEANS OF KETTLEBELL SPORTS AND CORRESPONDING EXERCISES

One of the means of physical education of higher education seekers, improvement of their health and preparation for future professional activities is exercises with weights and active participation in kettlebell sports. Due to the wide variety of specialized tools that make up its content, as well as its great educational, recreational, and applied value, kettlebell sports are included in the programs of sports competitions on a city, regional, all-Ukrainian, European and world scale. On the one hand, it is a means of comprehensive physical development available to everyone and an auxiliary means of developing physical qualities in other types of sports; on the other hand, kettlebell sports are a means of popularizing strength-oriented sports and promoting a healthy lifestyle among young people.¹

Exercises with weights and kettlebell sports contribute to the development of strength, endurance and stamina, flexibility, coordination of movements, increase in physical capacity, formation of moral values and willpower of students of higher education institutions. The strength training achieved by the students in the process of specialized preparation has a number of positive outcomes and contributes to the achievement of high results in professional activity, everyday life and other types of motor activity. At the same time, the variety of labor opera-

¹ Pichuhin M. F., Hryban H. P., Romanchuk V. M. [ta in.]. Hyrovyi sport: navch.-metod. posib. [Kettlebell sport: training manual]; za red. H. P. Hrybana. Zhytomyr, ZhVINAU, 2011. 880 s.

tions in various spheres of human activity requires a high level of development of strength qualities from specialists.²

As a result of systematic exercises with kettlebells, the volume of the heart muscle gradually increases, the network of blood vessels expands; changes also occur in the composition of the blood (the number of erythrocytes, hemoglobin increases); the girth of the chest increases, the vital capacity of the lungs expands; the activity of the central nervous system as well as its mental capacity improves; the intensity and concentration of attention improves.³

The martial law in Ukraine requires society and youth to quickly solve global socio-economic and educational tasks regarding integration into the world educational space. However, its implementation during the war is possible for specialists of the new generation, who meet European requirements. In addition to in-depth professional knowledge of the chosen specialty, each professional must be in corresponding physical condition, possess fitness and work capacity, professional motor skills, spirituality, and informal leadership qualities.⁴ At the same time, physical exercises should provide favorable conditions for the optimal functioning of the body. Choosing special exercises, dosing them, depending on the current physical condition, so the recipient can purposefully influence the body, change its certain functions, restore damaged systems. Under the influence of systematic physical exercises, changes occur in the body, which lead to positive reorganization of organs and systems as a result of the elimination of physiological disorders and the normalization of pathologically altered functions.⁵

Exercises with weights and kettlebell sports are among the leading incentives for students to systematically increase their physical activity.⁶ While exer-

- 2 Hryban H. P. Zhyttidiialnist ta rukhova aktyvnist studentiv [Students living and motor activity]: monohrafiia. Zhytomyr : Vyd-vo «Ruta» - monograph. Zhytomyr: "Ruta" publishing house, 2009. 593 s. http://eprints.zu.edu.ua/24476/1/%D0%96%D0%B8%D1%82%D1%82%D1%94%D0%B4%D1%96%D1%8F%D0%BB%D1%8C%D0%BD%D1%96%D1%81%D1%82%D1%8C_%D0%9C%D0%BE%D0%BD..PDF
- 3 Hryban H. P., Prontenko K. V., Prontenko V. V. [ta in.] Hyrovyyi sport u vyshchykh navchalnykh zakladakh : navch. Posibnyk [Kettlebell sports in higher educational institutions: study guide]; za red. H. P. Hrybana. Zhytomyr : Vyd-vo «Ruta» - "Ruta" publishing house, 2014. 400 s.
- 4 Nychkalo N. H. Profesiina pedahohika i pedahohika pratsi: problemy vzaiemozviazku v umovakh rynkovoï ekonomiky [Professional pedagogy and labor pedagogy: problems of interconnection in the market economy]. Pedahohika i psyholohiia : naukovo-teoretychnyi ta informatsiinyi zhurnal APN Ukrainy - Pedagogy and psychology: a scientific-theoretical and informational journal of the Academy of Pedagogical Sciences of Ukraine. 2010. № 2. S. 33–45. https://dnpb.gov.ua/wp-content/uploads/2016/01/index_12_16.pdf
- 5 Hlazyrin I. D. Osnovy dyferentsiovanoho fizychnoho vykhovannia [Basics of differentiated physical education]. Cherkasy: Vidlunnia-Plus - Cherkasy: Echo-Plus publishing, 2003. 352 s.; https://uu.edu.ua/upload/universitet/Galereya_slavi/Ulyubleni_vikladachi/Ulyubleni_vikladachi/Glazirin_I_D.doc
- 6 Hryban H. P., Prontenko K. V., Tkachenko P. P. Vpravy z hyriamy u fizychnomu vykhovanni zdobuvachiv vyshchoï osvity: navch. Posibnyk [Exercises with kettlebells in the physical education of students of higher education: a study guide]. Za red. H. P. Hrybana. Zhytomyr : Vyd-vo «Ruta» - "Ruta" publishing house, 2021. 528 s. <https://elar.naiua.kiev.ua/items/0db66888-cfda-481b-8a28-8214fc4a07dd>

cising with weights, it is necessary to consider a number of factors, especially anatomical and physiological, which significantly affect the ability of the athlete to improve in kettlebell sports, namely:

- Peculiarities of the genotypic development and relative uniformity of means of physical training of the higher education seeker;⁷
- Age-related features. There is an increase in muscle mass and strength which is caused by reaching certain age. However, upon reaching physiological maturity, muscle mass develops evenly;
- In-depth analysis and division of higher education seekers into groups, considering their morphological features and individual motor readiness;⁸
- Type of muscle fiber. The muscle structure has two types of fibers: slow-twitch and fast-twitch, which differ in morphological, biochemical, and contractile properties. Thus, so-called “slow fibers” have a low contraction speed, a large number of mitochondria (energy depots), high activity of oxidative processes, increased level of vascularization (capillarization), as well as large depots of glycogen. At the same time, “fast fibers” have a smaller number of capillaries, fewer mitochondria, high glycolytic capacity, high contraction speed. Slow-twitch muscle fibers are most adapted to long-term aerobic work. They can perform low-power efforts for a long time. Fast-twitch muscle fibers are adjusted to perform work of an anaerobic nature, that is short-term high-power efforts;⁹
- Shoulder and muscle length. Higher education seekers with a relatively short muscle length have the ability to better perform loads with a heavier weight; at the same time, individuals with a relatively long muscle length have a greater potential in the development of muscle effort;
- Place of tendon insertion. The strength of the muscle depends on the place of tendon insertion, which gives a biomechanical advantage in movement;
- Considering the functional state of the muscles and organs by monitoring the physical exercises used.¹⁰

7 Paliga Z. Sila sruwowa niesvi koncryn dolnych jako kriterium dodoru konkurencji asubkosciosilowych. *Lekkatletyka*. 1987. N 8. P. 13–14.

8 Prontenko K. V. *Navchannia hyrovomu sportu kursantiv viiskovykh zakladiv vyshchoi osvity: monohrafiia* [Kettlebell training of cadets of military higher education institutions: monograph]. Zhytomyr: «Polissia» Zhytomyr: “Polissia” publishing house. 2018. 476 s. <http://ir.polissiauniver.edu.ua/handle/123456789/8670>

9 Osypenko H. A. *Osnovy biokhimii miazovoi diialnosti: navch. Posib* [Basics of biochemistry of muscle activity: study guide]. Kyiv: Olimpiiska literatura – Kyiv: Olympic literature, 2007. 199 s.; <http://reposit.uni-sport.edu.ua/handle/7878787/1111>

10 Baranov V. V. Weight ball exercises as the means of developing students professionally-applied abilities. 3-rd International scientific-applied conference «Conditions and problems of development of weightball liftings». Athens: IWBE, 2002. P. 7.

Thus, the peculiarities of age and the anatomical-physiological development were laid as a basis for the development of means and methods for improving the strength qualities of those who exercise with kettlebells. At the same time, it was considered that the overall physical state of the higher education seekers acts not only as a personal, but also as a social value, which reflects such a degree of physical development of an individual, his/her physical qualities, which allows him/her to fully realize his/her creative and intellectual capabilities in society.

The development of strength during training is accompanied by the improvement of all organs and systems of high education seekers, improvement of their activity. Quantitative accumulation of positive changes leads to further development of the body, disclosure of its reserve capabilities, improvement of blood circulation of functional organs, activation of endocrine glands that produce hormones for muscle work. As a result of training, the muscles increase in volume due to the thickening of individual muscle fibers, as the result their performance increases.¹¹

Improving the properties of strength of the students can be effective and optimal if this process is considered as a system with many interconnected components, namely: means, methods and forms of pedagogical influence and the main peculiarities of the age-related development of their physical abilities.¹² It has been proven that exercises aimed at developing strength contribute to: increasing the level of health; aesthetic self-improvement due to the proportionality and symmetry of muscles and the overall harmonious development of all muscle groups; correction of the physique, including the elimination of deficiencies in it, recovery from injuries, increase in working capacity; formation of a harmonious physique.¹³

Means and methods of strength training include various exercises with kettlebells, which allow to influence either a large part of the muscle system, or selectively impact individual muscle groups. Like physical training in general, strength training has two directions: general strength training and special strength training. General strength training is aimed at the harmonious development of all the main muscle groups, which are important for the physical development and fitness of an individual, and special strength weights

11 Hryban H. P. Zhyttiedialnist ta rukhova aktyvnist studentiv [Students living and motor activity]; monohrafiia. Zhytomyr : Vyd-vo «Ruta» - monograph. Zhytomyr: «Ruta» publishing house, 2009. 593 s.; <http://eprints.zu.edu.ua/24476/1/%D0BD..PDF>

12 Hryban H. P., Prontenko K. V., Prontenko V. V. [ta in.] Hyrovyi sport u vyshchkykh navchalnykh zakladakh : navch. Posibnyk [Kettlebell sports in higher educational institutions: study guide]; za red. H. P. Hrybana. Zhytomyr : Vyd-vo «Ruta» - «Ruta» publishing house, 2014. 400 s.

13 Oleshko V. H. Sylovi vydy sportu [Power sports]. K. : Olimpiiska l-ra – Kyiv : Olympic literature, 1999. 287 s.

training involves the development of strength qualities in relation to kettlebell sports, connecting the manifestation of the strength of the corresponding muscle groups with the technique of lifting weights and performing various competitive and auxiliary exercises.¹⁴ Therefore, exercises with kettlebells are considered the means of special strength training, which, by the nature of the manifestation of muscle effort and the structure of movement, are similar to competitive exercises, and actually can be identified as ones.¹⁵

We have proven that the method of improving strength qualities of students of institutions of higher education should be aimed mainly at the development of the muscles of the back, neck and arms, strengthening the muscles of the legs, which is important for vital activities. At the same time, exercises with kettlebells can effectively influence the expansion of the range of functional capabilities of the athlete, increase the arsenal of his/her motor activity, ensure the adaptation of the body to numerous factors of the activity, including the development of the necessary professionally important motor properties.¹⁶

It has been established that the effectiveness of exercises with kettlebells depends significantly on the forms of classes offered to the students. Higher education seekers prefer scheduled classes (38.1%), classes in sports sections (25.0%), training independently with friends (20.4%), individual classes according to the customized program under the guidance of a teacher/coach – 16 % (Table 1).

Table 1

**Forms of educational and training classes
preferred by the students (% , n = 501).**

Source: authors' research.

Forms of classes	Year of study		Overall %
	I	II	
1	2	3	4
Scheduled classes	43,3	32,9	38,1

14 Hryban H. P. Zhyttiedialnist ta rukhova aktyvnist studentiv [Students living and motor activity]: monohrafiia. Zhytomyr : Vyd-vo «Ruta» - monograph. Zhytomyr: "Ruta" publishing house, 2009. 593 s.; http://eprints.zu.edu.ua/2-4476/1/%D0%96%D0%B8%D1%82%D1%82%D1%94%D0%B4%D1%96%D1%8F%D0%BB%D1%8C%D0%BD%D1%96%D1%81%D1%82%D1%8C_%D0%9C%D0%BE%D0%BD..PDF

15 Hryban H. P., Prontenko K. V., Tkachenko P. P. Vpravy z hyriamy u fizychnomu vykhovanni zdobuvachiv vyshchoi osvity: navch. Posibnyk [Exercises with kettlebells in the physical education of students of higher education: a study guide]. Za red. H. P. Hrybana. Zhytomyr : Vyd-vo «Ruta» - "Ruta" publishing house, 2021. 528 s. <https://elar.naiu.kiev.ua/items/0db66888-cfda-481b-8a28-8214fc4a07dd>

16 Nosko M. O. Teoretychni ta metodychni osnovy formuvannya rukhovoï funktsii u molodi pid chas zaniat fizychnoiu kulturoiu ta sportom [Theoretical and methodological foundations of the formation of motor function in young people during physical education and sports]: avtoref. dys. na zdobuttia naukovoï stupenia dokt. ped. nauk. K., 2003. 53 s.

<i>Continuation of table 2</i>			
1	2	3	4
Classes in sports sections	26,9	22,9	25,0
Training independently with friends	13,1	27,7	20,4
Individual classes according to the customized program under the guidance of a teacher/coach	16,7	16,5	16,5

It has been proven that 2-4 hours of physical exercise per week is not enough for students to maintain a high level of physical fitness, work capacity and health.¹⁷ Thus, we drew the attention of higher education seekers to the expediency of performing physical exercises at home, visiting gyms, conducting self-remedial walks, as well as offering additional tasks and physical exertion to each student. This was caused by the fact that 11.9% of students exercise two or three times a month, and 28.7% of respondents attend educational classes or do physical exercises only once a week; 3.6% of students do not attend classes at all and only 24.8% of higher education seekers exercise three or more times a week (Table 2).

Table 2

**Number of physical exercise classes attended
by the students during the week (% , n = 501)**

Source: authors' research.

Number of classes	Year of study		Overall %
	I	II	
Once a week	40,1	17,3	28,7
Three and more times a week	19,4	30,1	24,8
Two times a week	11,5	33,4	22,4
Two-three times a month	14,7	9,2	11,9
Every day/daily	8,3	8,8	8,6
Attendance has not been registered/none	6,0	1,2	3,6

Exercising and going in for sports can be both invigorating and refreshing, as well as debilitating for students. The surveys conducted showed that only 79.7% of the higher education seekers get emotional elevation and improved

¹⁷ Hryban H. P., Prontenko K. V., Tkachenko P. P. Vpravy z hyriamy u fizychnomu vykhovanni zdobuvachiv vyshchoi osvity: navch. Posibnyk [Exercises with kettlebells in the physical education of students of higher education: a study guide]. Za red. H. P. Hrybana. Zhytomyr : Vyd-vo «Ruta» - "Ruta" publishing house, 2021. 528 s.; <https://elar.naiu.kiev.ua/items/0db66888-cfda-481b-8a28-8214fc4a07dd>

mood from physical exercises; 25.9% of respondents like communicating with new people during the classes; 20.8% of surveyed feel themselves pleased after exercising in the open air. It should also be noted that violations of the methodology of conducting classes, as well as the inconsistency of the physical load with the level of functional readiness of the students and other factors cause 13.2% of the higher education seekers to acquire negative emotional response as well as corresponding physical side effects (fatigue, lethargy); 5.1% of respondents identified the signs of bad mood and depression (Table 3).

Table 3

The influence of physical exercises and sports on the condition and well-being of the students (%, n = 501)

Source: authors' research.

Condition and well-being	Year of study		Overall %
	I	II	
Emotional elevation	88,9	70,4	79,7
Satisfaction from communication with other people	26,3	25,4	25,9
Satisfaction from exercising outdoors/in the open air	15,2	26,5	20,8
Fatigue, lethargy, loss of focus	14,1	12,2	13,2
Bad mood and depression	6,1	4,1	5,1

The introduction of kettlebell sports into the process of physical education alters the pedagogical process (educational system). Thus, the technique of physical education is primary in relation to the pedagogical system. Accordingly, the design of a new pedagogical system is connected, firstly, with the peculiarities and implementation of a new learning model and, secondly, with further changes in other subsystems of the pedagogical process. According to the theory of the activity, the educational-upbringings process of physical education of higher education seekers was carried out in accordance with the following: needs – motives – tasks – actions – operation¹⁸. The basis of the system of developing strength qualities was the idea of self-development of the students' personality both in the educational process and during independent classes (Fig. 1).

18 Hryban H. P. *Metodychna systema fizychnoho vykhovannia studentiv : navch. Posibnyk [Methodical system of physical education of students: study guide]*. Zhytomyr : Vyd-vo «Ruta» - Zhytomyr : «Ruta» publishing house, 2014. 306 s. <http://eprints.zu.edu.ua/32273/1/Gryban-monografiya.pdf>

Source: authors' research.

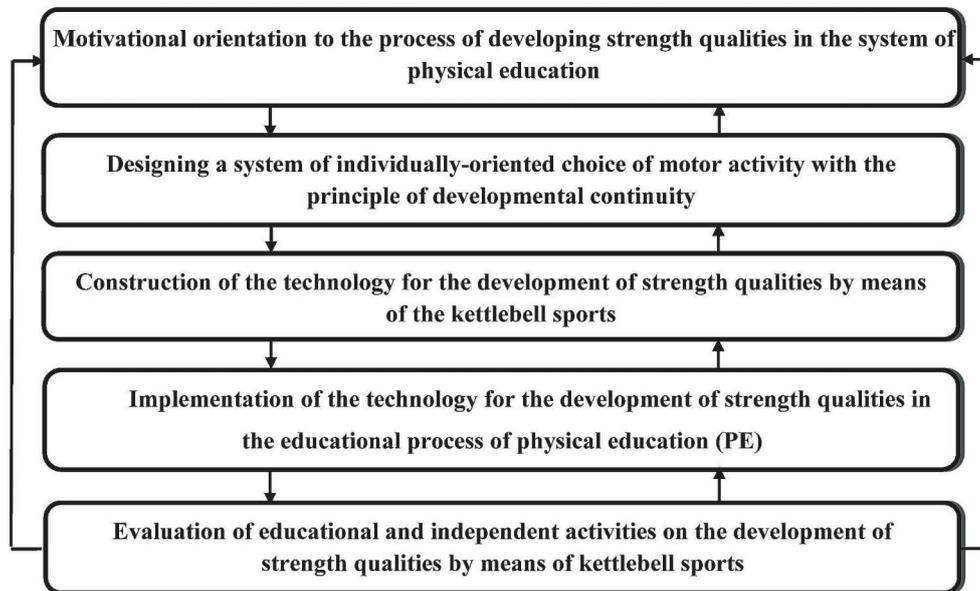


Fig. 1. The system of designing the development of strength qualities of students in the educational process of PE

The basis of the *motivational component* of the development of strength qualities is the motivational-value attitude of the students to the process of performing exercises with kettlebells, as well as conducting self-healing, undergoing self-development and self-improvement.

The *design component* implies how to provide an individual-oriented selection of kettlebell sports to meet the personal need of each particular higher education seeker. The main aim of this component is to introduce the principles of composing the list of educational (obligatory) and independent (optional) exercises with kettlebells in the educational process.

The *constructive component* involves adjusting the educational and training sessions, as well as methods, and techniques of solving the tasks of developing strength qualities by means of kettlebell sports. An important condition for the implementation of this component is the compliance of means and technologies with the level of readiness of the students.

The *implementation component* introduces the method of developing strength qualities by means of kettlebell sports into the process of accomplishing the objectives in physical education, provides for the implementation of a system of corresponding motor actions.

The *evaluation component* is aimed at justifying the personal attitude regarding one's own actions, self-analysis, and assessment of the process of going in for sports as well as the level of self-improvement, self-evaluation of the current health condition and sports activities performed. At the same time, the student's own achievements, unresolved tasks regarding the development of strength qualities are recorded, and the means of further improvement in kettlebell sports are substantiated.

During the formation of the content of training exercises with kettlebells, we assumed that "teaching method" and "teaching techniques" have certain distinctive features. They are manifested, first of all, in the fact that the concept "*method*" determines *how one can achieve the set results in education*, and the concept of "*technique*" substantiates *how to do it guaranteed*. Secondly, the teaching technique has an inherent personalized character and is essentially very close to the concept of "author's teaching method".¹⁹ The methodology reveals an algorithm for the use of a complex of teaching methods and techniques that do not directly relate to a specific person who implements them, and the teaching technology involves adapting to it the teacher's personality in all its various manifestations. Accordingly, each didactic task can be effectively solved with the help of technology designed and implemented by a qualified educator.

The training method is considered a set of systematized means, forms, rules and techniques, pedagogical technologies, with the help of which awareness, correct execution and mastery of motor actions are carried out by the students and are studied to achieve the set goals. The methodology should ensure determinism and massiveness. Thus, *determinism* means that, using this algorithm, any higher education seeker can get a positive result. Massiveness implies that the developed rules can be used to solve a wide range of similar tasks. Regarding the development of physical qualities, the term "methodology" means the rational application of appropriate physical exercises and adequate methods of their performance in order to effectively solve a specific pedagogical task in a separate class and in a system of related classes.²⁰

19 Teoriia i metodyka fizychnoho vykhovannia: Pidruchnyk dlia stud. vuziv fiz. vykhov. i sportu: u 2 t. Za red. T. Yu. Krutsevych. T. 2. Metodyka fizychnoho vykhovannia riznykh hrup na-seleennia [Theory and methods of physical education: Textbook for students of universities of physical education and sports: in 2 volumes. Edited by T. Yu. Krutsevich. Volume 2. Methodology of physical education of different population groups]. K.: Olimpiiska literatura – Kyiv : Olympic literature, 2008. 368 s.

20 Hryban H. P., Prontenko K. V., Tkachenko P. P. Vpravy z hyriamy u fizychnomu vykhovanni zdobuvachiv vyshchoi osvity: navch. Posibnyk [Exercises with kettlebells in the physical education of students of higher education: a study guide]. Za red. H. P. Hrybana. Zhytomyr : Vyd-vo «Ruta» - "Ruta" publishing house, 2021. 528 s.; <https://elar.naiu.kiev.ua/items/0db66888-cfda-481b-8a28-8214fc4a07dd>

The methodology for the development of strength qualities of students of higher education institutions by the means of kettlebell exercises in the educational process of PE has certain common requirements and obligatory compliance with the master-scheme of building the algorithm of the methodology for the development of physical qualities, namely: 1) setting a pedagogical task. Based on the analysis of the state of physical fitness of the students, it should be determined to what level it is necessary to develop strength qualities in kettlebell sports; 2) selection of the most effective physical exercises for solving the pedagogical task with each student or group; 3) choosing adequate methods of performing exercises; 4) determining the place of exercises in a specific class and the system of related classes in accordance with the rules of the physical qualities and properties development; 5) determination of the duration of the period of development of physical qualities and the required number of training sessions; 6) determination of the total amount of educational loads and their dynamics in accordance with the rules of adaptation.²¹

Moreover, during the development of strength qualities of higher education seekers using kettlebell sports, it should be taken into account that the training effect of any exercise depends on the appropriate effort due to its repetition and elimination of errors in previous performances, timely periodic changes in the conditions and nature of the exercise performance, and increasing the level of requirements, the relationship between the number of repetitions of exercises in one set and the number of sets, duration and properties of rest.

The components of the methodology for the development of strength qualities of the students by means of kettlebell sports during the PE classes were: the opportunity to choose a sports specialization (classic dueling, exercises with weights in a long cycle, separate exercises); to increase the level of sports qualifications, as well as to simultaneously master modern planning and management technologies of the educational-training process; the organization of competitions; the method of refereeing competitions in kettlebell sports; distribution of students into groups with low, medium and high levels of physical fitness; pedagogically justified variability of the chosen

21 Hryban H. P., Prontenko K. V., Tkachenko P. P. Vpravy z hyriamy u fizychnomu vykhovanni zdobuvachiv vyshchoi osvity: navch. Posibnyk [Exercises with kettlebells in the physical education of students of higher education: a study guide]. Za red. H. P. Hrybana. Zhytomyr : Vyd-vo «Ruta» - "Ruta" publishing house, 2021. 528 s.; <https://elar.naiu.kiev.ua/items/0db66888-cfda-481b-8a28-8214fc4a07dd>

methods, forms and means of developing strength qualities in kettlebell sports; application of a complex of general preparatory, special preparatory and competitive exercises from kettlebell sports; learning the technique of performing competitive exercises to create motor automatism; correction of volume and intensity of load during the development of strength qualities and formation of special abilities and skills for performing competitive exercises with kettlebells; the use of a group form of education with a differentiated and individual approach; application of visualization methods (analysis of videos and movies, photographs, posters, diagrams of one's own exercise technique), attendance of corresponding competitions as well active participation in them; the use of pedagogical and operational control over the state of health, physical and technical readiness of students.

Peculiarities of the technique of developing strength qualities of the students by means of kettlebell sports are revealed in: the availability of exercises with kettlebells, which ensures a high density of educational and training classes; a wide range of weights available, which allows to rationally dose physical activity; controlled load increase in accordance with the individual capabilities of each higher education seeker, which helps to strengthen health, improve physical development, functional systems of the body, and increase the work capacity; conducting multi-stage competitions, which allows the students to perform sports classes in a short period of time (3–6 months) and increase motivation to participate in weightlifting sports; a high level of general physical fitness of the applicants, which allows to create a solid foundation for the effective formation of professional and applied qualities for future professional activity and viability.

The methodology for the development of strength qualities in students using kettlebell sports is based on the principles of the adaptation and learning motor actions/development of physical properties theories, planning physical load, as well as the general theory of training athletes in kettlebell sports. Classes according to this method were held three times a week according to the educational schedule for 4 hours and 2 hours of independent classes under the guidance of the teacher, 90 minutes each during the academic year.

The *main objective* of the technique of developing strength qualities of the higher education seekers was to improve health, develop the basic strength qualities necessary for a kettlebell athlete, increase general physical fitness, and

create a solid foundation for improving work capacity and forming motivation to engage in kettlebell sports.

The main tasks of the methodology are aimed at: 1) increasing the level of general physical fitness and working capacity; 2) stimulating the predominant development of strength qualities (general and static endurance of trunk muscles, special endurance, speed, coordination and flexibility); 3) improving physical development, functional capabilities of the cardiorespiratory system and improving the condition of health of students; 4) mastering and improving technical preparation in kettlebell sports; 5) increasing the body's resistance to adverse environmental factors and training; 6) developing psychological qualities, willpower in particular; 7) improving sportsmanship and achieving high results in kettlebell sports; 8) developing interest in physical education classes and formation of motivation for systematic classes in kettlebell sports.

The introduced methodology for the development of strength qualities in students of higher education institutions through kettlebell exercises consisted of four components (motivational, organizational, content and evaluation), which determined its functional structure. Each component of the methodology for the development of strength qualities in the process of physical education solves certain tasks that arise in the specific conditions of the educational process, depend on the individual features of the students, time requirements and other internal and external factors that can influence the formation of the personality of the higher education seeker both positively and negatively. The application of the modeling method and individual-oriented physical education of the students made it possible to determine the goals, tasks, methods, principles, means and approaches to the modernization of the PE educational process aimed at developing independence, initiative, stimulating the acquisition of theoretical knowledge, the formation of practical skills and abilities, as well as corresponding physical qualities, increasing the level of physical fitness and work capacity, taking into account the comprehensive and harmonious development of the recipient's personality.

The methodology was based on the structure of PE with the solution of educational, recreational, organizational, training, preventive, and restorative functions, all of which are interrelated and provided by the specifics of training sessions, content of training, use of carefully selected methods, forms and means, control and analysis of results.

In addition, in the educational and training process as well as during the organization of independent work, the “educator – seeker of higher education” model of communication was widely used, and opportunities were created for acquirers to independently use methodical recommendations. A rational combination of various organizational forms, means, and methods of exercises with kettlebells made it possible to control all stages of the creation and implementation of the methodology for the development of strength qualities of students. The individual-oriented technology of training the higher education seekers according to the method of developing strength qualities by means of kettlebell sports was ensured by the implementation and assessment of tasks and ways of its implementation during four stages (Table 4).

Table 4

Stages of implementation of the technology of teaching physical education according to the method of developing the strength qualities students by means of the kettlebell sports

Source: authors' research.

Stages	Objectives and ways of implementation of the methodology of development of strength qualities of higher education seekers
I (motivational)	1. Determination of the aim of the design and technology of the educational and training process of PE by means of the kettlebell sports. 2. Activation of the educational-motivational and value attitude of the students towards kettlebell sports.
II (organizational)	3. Determination of the system of pedagogical conditions for achieving the goal of the method of developing the strength qualities of students by means of kettlebell sports. 4. Evaluation of the initial data gathered (the level of physical development and overall fitness), which determine the qualitative indicators of the PE educational process. 5. Creation of the scheme of the methodology for the development of the strength qualities of the higher education seekers by means of the kettlebell sports (modeling).
III (content)	6. Establishing the content and forms of the PE educational and training process in accordance with the purpose of using the means of kettlebell sports. 7. Implementation of the methodology for the development of strength qualities in students in the process of PE by means of the kettlebell sports.
IV (evaluative)	8. Determination of evaluation and control criteria for mastering the individual-oriented content of physical education. 9. Evaluation of the results of the implementation of the methodology for the development of the strength qualities of the students by means of the kettlebell sports.

Vertical structuring shows that the implementation of the methodology for the development of strength qualities is carried out in two directions: 1) personal physical improvement of the student in kettlebell sports; 2) through the transfer of theoretical knowledge for mastering the method of improvement in kettlebell sports, i.e., methodical level of training. The implementation of these two levels is interconnected and mutually determined. Personal physical improvement of the high education seeker is basic for the formation of certain knowledge, abilities and skills and lays the foundation for competences in weightlifting and physical culture, health, and sports-related activities. The methodological level performs the function of adapting the methods, forms, and means of kettlebell sports to the comprehensive development and adaptation of the recipient to the conditions of life.

The motivational component of the methodology was aimed at increasing the educational-motivational value attitude of the students towards the means of motor activity, in particular kettlebell sports, creating a micro-environment that develops interests and motives for active exercises with kettlebells, which forms a positive attitude of the higher education seekers towards the PE educational process and independent classes in kettlebell sports. In addition, this component provided for the improvement of the effectiveness of the educational process due to the differentiation of means, the individualization of interaction models with students, the creation of comfortable conditions in educational classes, which significantly increases the motivational-value attitude to the educational process, activates the training process and promotes the mastery of skills and abilities in using equipment for kettlebell sports. Involvement of students in active classes in weight sports, where the physical and mental potential of an individual is challenged plays and important role in the higher education system. Also, it contains an indivisible component of a complete socio-pedagogical and educational system of higher education institutions, which serves as one of the effective means of educating young people.

During the development of the above-mentioned methodology, we took into the consideration the fact that solving the problem of comprehensive personality development is possible only under the condition of a holistic approach to physical education, which determines the unity of goals and

orientation of educational and extracurricular activities with kettlebell exercises. Therefore, during the training classes, it is necessary to emphasize the educational and upbringing orientation of PE, thus all the methods used have the maximum psychological and pedagogical impact on the educational process and formation of organizational-management, and motor activities of the students. Therefore, the content of extracurricular PE activities should be a continuation of main educational classes. In the process of independent training, the emphasis should be on the process of performing corresponding physical exercises. It is also possible to change the very form of organizing mass sports events and competitions by creating a situation that encourages all higher education seekers to participate in competitions; preparation, organization and conduct of such events should be carried out by the students themselves with the methodical assistance of educators. In addition, it is necessary to consider the principle of voluntary participation of higher education seekers in the competitions organized.

Since the goal of psychological-pedagogical influence in the process of kettlebell sports is not only physical and mental, but also volitional development of the student's personality, it is advisable to focus on the following criteria in order to access the development of the motivational component while using the methodology for improving the strength qualities, namely: a) the presence of an active need for self-development and self-improvement on the basis of adequate self-assessment of one's body; b) awareness of the phenomenon of the value of a healthy lifestyle as a necessary condition for strengthening health, maintaining high work capacity and achieving high results in weightlifting sports; c) positive changes in the system of motivational-value attitude of the student's personality towards kettlebell sports as the main type of motor activity; d) awareness of the beauty of sports posture, aesthetic perception of light, graceful, refined movements and creation of one's image as an athlete; e) formation of the personality of higher education seekers as a subject of social activity and his/her ability to create and consistently implement his/her own sports improvement program.

The *organizational component* of the methodology for the development of strength qualities consisted in a pedagogically justified way of organizing the activity of the students. After passing the medical examination, the physical condition and state of health of the higher education seekers who expressed

a desire to engage in physical education classes in kettlebell sports were analyzed. In addition, primary testing was conducted, which made it possible to determine the physical development and level of physical fitness of each recipient. Based on the results of the testing, three groups were formed for exercises with kettlebells and engagement in kettlebell sports with a low, medium, and high level of physical fitness.

Before the beginning of exercises with kettlebells, in order to prevent accidents and reduce injuries, preventive work (initial briefing) was carried out among the students. Safety training included all types of necessary instructions, namely: introductory, periodic, daily, group, which were carried out during PE classes, as well as before the independent training, participation in mass sports and health-preserving events and competitions. In addition, the students attended courses of basics of medicine and compiled the manuals for providing first aid during injuries and accidents.²²

The method of developing strength qualities by means of kettlebell sports did not require changes to the standard forms of organization and conducting of training sessions, however, each educational and training session had its own focus and structure. Theoretical and practical sections were planned and conducted in the form of methodical, practical, and independent classes under the guidance of a teacher.

Thus, the *organizational component* of the methodology provided that the students should learn the following: an indicator of the effectiveness of kettlebell training classes is the dynamics of increasing the level of special training in competitive exercises; the volume and intensity of training loads are determined by the individual capabilities, state of health and level of general and special physical fitness of each individual; record of training loads (number of classes, number of sets, number of performed repetitions of exercises, weight of kettlebells or other types of weights, etc.) is kept personally by each higher education seeker in a motor activity diary; the effectiveness of weight training classes depends on nutrition, duration of sleep and rest, daily routine, etc.; recovery of physical capacity after physical exertion requires some time; training classes can be held at any time, but no earlier than 1.5-2 hours after eating and no later than 1.5-2 hours before bedtime. The most favorable hours for educa-

22 Hryban H. P., Hamov V. H., Zornik V. R. Bezpeka zhyttiedijalnosti u fizychnii kulturi i sporti : navch. Posibnyk [Life safety in physical education and sports: study guide]. Za red. H. P. Hrybana. Zhytomyr : Vyd-vo «Ruta» - Zhytomyr : "Ruta" publishing house, 2012. 536 s. <http://ir.polissiauniver.edu.ua/handle/123456789/8994>

tional and independent classes in kettlebell sports are: from 10:00 a.m. to 12:00 p.m. and from 4:00 p.m. to 7:00 p.m.

The content component of the development of strength qualities methodology included pedagogic educational and corresponding influences on the students through the use of methods, forms and means of training during exercises with weights. Training in kettlebell sports is a complex pedagogical process that involves acquiring the necessary knowledge, training special skills, improving physical properties and willpower qualities. Learning and training are a part of single process. Thus, training methods, as well as training elements, are both used in the process of performing exercises. Moreover, In the process of mastering kettlebell sports techniques, it is vital to use various learning methods and means, namely: verbal commands, visual aids, software training exercises, analysis of the corresponding specialized literature, testing skills and abilities, etc. At the same time, it should be taken into account that there are many peculiarities in the technique of performing competitive exercises in kettlebell sports, which depend on the general coordination of movements, correct breathing and the overall result.

At the initial stage, training should prevail: the technique of competitive exercises in kettlebell sports, special preparatory exercises, means of general physical training are conducted, and the theoretical foundations of kettlebell sports are studied. The process of learning and training of higher education seekers as the means of preparing them for participation in competitive kettlebell sports can be structured in the form of three consecutive and closely related stages, each of which has its own methodological objectives: 1st stage – familiarization with the technique of performing the exercises; 2nd – learning how the exercises are performed, drilling the exercises; 3rd – consecutive training (improvement). The stages of learning are considered as a single and indivisible process. They are interconnected and there are no clearly defined boundaries and transitions between them. Stages overlap each other; moreover, each subsequent stage begins on the basis of the previous one.

The main *aim* of the introductory stage is to create a correct idea of the technique of performing competitive exercises in kettlebell sports and to ensure a clear understanding of it. Thus, it is necessary to correctly name the exercise, show it in an exemplary manner, and explain its effect on the body. Also, the demonstration precedes the detailed explanation of its features and

peculiarities. The exemplary set of exercises should be performed by the most trained student or coach. It is especially important to explain the role of the main element (phase) of the exercise.

Demonstration of visual aids is a supplement to the exemplary set of exercises. Posters, drawings, photos are considered teaching aids that can be used to better explain specific features of the process. Demonstration of video materials and attendance at competitions and training sessions of highly qualified sportsmen are a particularly valuable means of visual training. It should be noted that a common mistake of teachers at this stage is the use of significant (excessive) flow of information. For example, it is unnecessary to explain in detail all the basic mechanisms of movements due to inability of the beginners to perceive the material due to insufficient mastery of the technique.

The *study of the exercise*, depending on its complexity and the readiness of the higher education seekers, is carried out in different way, namely: as a whole, in parts, in sections, with the help of preparatory exercises. When learning exercises in parts, it is necessary to include a familiarization stage for each part. Studying an exercise or technique in parts begins with studying its main element (phase) if it is possible to isolate it without breaking the connection with other movements. The study of each phase of the exercise is preceded using preparatory exercises, which in terms of coordination are similar to the exercise being studied, and at the same time are simpler in structure (following the principle “from simple to complex”). At the same time, each subsequent preparatory exercise should be similar in structure to the previous one and make it more difficult. Their repeated execution ensures the formation of the necessary skill, after which the training of the exercise *as a whole* begins.

Improving the technique of performing competitive exercises in kettlebell sports is ensured by systematic, repeated performance of the exercise with a gradual increase in physical load. As a result of repeatedly performing the exercise with gradual carefully implemented changes (increase in the number of repetitions, weight or type of the weights used), the acquired skills are gradually consolidated, the automation of neuromuscular processes begins. At this stage, the *main focus* should be on perfecting the most important phases and performing the exercise *as a whole*. In the course of learning the technique

of performing kettlebell exercises, it is also necessary to master specific knowledge about movements, which should ultimately improve corresponding movement skills and abilities. At the same time, the low level of development of physical qualities and functional capabilities of the student's body can worsen the correctness of execution of the technique. In this case, the learners should gradually develop backward physical qualities, for there is a constant need to improve the technique of performing competitive exercises.

In the process of learning and improving the technique of competitive exercises with kettlebells, special attention should be paid to rhythmic breathing, which should be carried out without stops and delays. The ability to combine movements with breathing is an integral part of the technique. Even minor failures and delays in breathing immediately affect the work of the muscles, which, in turn, negatively affects the overall result.

Beginners who have not sufficiently mastered the technique of performing exercises prefer the strength-based version of solving the motor task. Therefore, highlighting and comparing the features of the exercise technique of low-skilled weightlifters in comparison with high-class athletes is expedient and necessary to improve results of sports activities.

In the process of teaching the technique of competitive exercises in kettlebell sports, as well as training, the educator must always remember that even in the case of using the correct training method, errors in the process of executing the technique may appear. The *main causes of errors* are the following: a wrong preliminary evaluation of the exercise being studied; considerable weight of kettlebells; low level of development of basic physical qualities; the negative impact of previously acquired skills; the condition of the student's body (overwork, fatigue, illness), etc. Before correcting the errors, it is necessary to identify their cause. Moreover, the main error (those that impact the overall result of the training) should be corrected first due to the possibility to encounter more minor errors connected with the major one.

The effectiveness of mastering the techniques of performing competitive exercises with kettlebells in the process of preparation for sports activities was associated with the level of students' physical fitness, the formation of special abilities and skills, which was carried out according to the principle of the formation of conditioned reflexes by repeatedly performing exercises until the formation of a motor skill, a dynamic automation of technical

actions. During kettlebell sports, we oriented the students to the perception of information by means of active directed concentration of attention on visual, auditory, and proprioceptive sensations. At the same time, it was considered that the training of kettlebell exercises is built based on creating an integral image of a complete motor action.

Physical exercises, as well as the conditions for their performance, were the main means of developing the strength qualities of the higher education seekers during weightlifting classes. The speed and quality of learning physical exercises depended on the level of psychomotor abilities and the level of physical and technical preparation of the recipients. At the beginning of the classes, clear limits of physical exertion were established depending on the physical condition and level of physical fitness of the learners, namely:

- for the *low level*: the intensity of classes is 40–50% of the maximum permissible heart rate; means: walking, slow running, strength endurance and flexibility exercises; the pace is uniform, the priority method is repeated exercise;
- for the *medium level*: the intensity of classes is 56–66% of the maximum heart rate; means: fast walking, slow running, jumping, strength and speed-strength endurance exercises, dexterity; the pace is uniform, the priority method is circular training;
- for the *high level*: the intensity of classes is 70–80% of the maximum permissible heart rate; means: exercises for the development of speed and strength, strength qualities, strength endurance, dexterity; the pace can be uniform and/or variable, the priority method is to perform the exercise “until first failure”.²³

In addition, when performing physical exercises aimed at developing the physical qualities of the student, the following heart rate variations are observed: speed development exercises – 150-160 hbpm; coordination abilities – 140 hbpm; speed-strength, speed and speed-strength endurance – 170–190 hbpm; general endurance – 130–140 hbpm.²⁴

23 Hryban H. P., Prontenko K. V., Tkachenko P. P. Vpravy z hyriamy u fizychnomu vykhovanni zdobuvachiv vyshchoi osvity: navch. Posibnyk [Exercises with kettlebells in the physical education of students of higher education: a study guide]. Za red. H. P. Hrybana. Zhytomyr : Vyd-vo «Ruta» - “Ruta” publishing house, 2021. 528 s.; <https://elar.naiu.kiev.ua/items/0db66888-cfda-481b-8a28-8214fc4a07dd>

24 Hryban H. P., Prontenko K. V., Prontenko V. V. [ta in.] Hyrovyi sport u vyshchykh navchalnykh zakladakh : navch. Posibnyk [Kettlebell sports in higher educational institutions: study guide]; za red. H. P. Hrybana. Zhytomyr : Vyd-vo «Ruta» - “Ruta” publishing house, 2014. 400 s.

A wide toolset of physical exercises was used to develop strength qualities:

- general preparatory exercises comprised 50–70% of the total volume of exercises used in the educational and training process;
- special preparatory and auxiliary exercises – up to 20–35%;
- competitive exercises – 10–40% of the total amount of exercises.²⁵

The ration of corresponding means varied according to the level of preparedness of the learners. Thus, to perform the tasks of the general preparatory cycle, exercises that ensure comprehensive functional development of the body are used, namely: exercises for the development of strength qualities should make up 50% of the volume of general preparatory exercises (weightlifting with kettlebells, barbells and other types of weights, exercises on gymnastic shells, exercises with weight of student's and partner's bodies); for the development of endurance (cross training, exercises with weights and one's own body weight) – 30% and for the development of other physical qualities – 20%.

When planning the load, it is important to consider the individual capabilities of each higher education seeker since not every individual can perform the recommended number of lifts in each exercise without preliminary correctional training. Thus, the number of repetitions of the exercise should be decreased correspondingly, moreover, individual-oriented method must be applied. Remarkable improvement in physical fitness allows the increased number of lifts to be performed. Therefore, the method of developing the strength qualities of the learners involved algorithmizing – mastering not only the technique of performing exercises, but also clearly defined the order of application of physical exertion, periods of rest and recovery of work capacity, which ensured the solution of educational tasks.

Thus, the management of the development of strength qualities of students in the educational process of physical education is formed on the basis of designing and adjusting the content of the educational process, taking into account the individual-oriented approach to the choice of motor activity, kettlebell sports in particular, and includes: determining the aim of the training as well as the levels of kettlebell sports mastery; selection of means, methods, pedagogical factors and conditions that will contribute to the achievement of

²⁵ Hryban H. P., Prontenko K. V., Tkachenko P. P., Boiko D. V. Fizychna pidhotovka studentiv u hyrovomu sporti: navch.-metod. Posib [Physical training of students in kettlebell sports: educational and methodical Guide]. Za red. H. P. Hrybana. Zhytomyr : Vyd-vo «Ruta» - Zhytomyr : "Ruta" publishing house, 2014. 118 s.

the goal; creating a structure for planning and conducting educational and training classes, i.e. modeling; systematic selection and structuring of the content of educational and training classes, which correspond to the given goal and level of preparedness of the students; systematic evaluation of the performance of tasks and monitoring of the mastery of the content of the educational and training process.²⁶

The theoretical provisions of the organization of pedagogical research allow us to consider the method of developing the strength qualities of higher education seekers by the means of kettlebell sports as an open dynamic system that has many interconnected and interdependent elements. During the creation of the above-mentioned methodology, it was considered that its connections and components can be influenced by environmental factors such as the quality of life of the students, the system of pedagogical influences, age and functional capabilities and individual preferences. The methodology for the development of strength qualities of learners consists of four major components, namely: motivational, organizational, content and evaluation, which have many internal connections between their elements, and include the goal, tasks, objectives, content, principles, methods, forms, means of control, evaluation, assessment, and measurement of the process of training and its results respectively. All components of the methodology are aimed at achieving the goal of developing the personality of the student through the educational and training process by the means of active participation in kettlebell sports as well as performing competitive exercises.

26 Hryban H. P., Tkachenko P. P. *Osnovy pidhotovky v hyrovomu sporti : navch.-metod. Posibnyk* [Basics of training in kettlebell sports: educational and methodical guide]. Zhytomyr : Vyd-vo «Ruta» - Zhytomyr : "Ruta" publishing house, 2013. 100 s.; http://eprints.zu.edu.ua/26571/1/%D0%9C%D0%B5%D1%82._%D1%80%D0%B5%D0%BA._%D0%93.%D0%A1_3.PDF