

євро) - фінансувалося ЄС [5, 7, 8].

Сучасне обладнання за високим європейським стандартом Центру структурно-функціональних досліджень людини сприяє зміцненню позицій Щецинського університету, як партнера у міжнародних наукових і дослідницьких проєктах.

Співпраця лабораторій. Наступний крок співпраці між Факультетами відбувся у серпні 2018 року під час обміном досвідом між співробітниками Лабораторії фізіології Центру структурно-функціональних досліджень людини і Лабораторії функціональної діагностики Факультету фізичного виховання, спорту і здоров'я.

Лабораторія функціональної діагностики була заснована у 2007 році за підтримки док. пед. наук, декана, професора, Олексія Валерійовича Тимошенка. Лабораторія ФД проводить освітню діяльність, здійснює фундаментальні і прикладні наукові дослідження в галузі фізичного виховання і спорту, біологічного моніторингу фізичного стану та здоров'я осіб, що займаються фізичною культурою і спортом.

Польські колеги, члени Кафедри біологічних основ фізичної культури, та співробітники Лабораторій Центру структурно-функціональних досліджень людини - канд. біол. наук Роберт Новак, канд. біол. наук Дорота Костжева-Новак, канд. пед. наук Рафал Бурита, познайомили канд. тех. наук, зав. Лаб. ФД Мазурок Наталію з Лабораторією фізіології з її надсучасними технологіями дослідження рівня фізичної підготовленості і різних фізіологічних станах організму з реєстрацією фізіологічних і біохімічних показників: в стані спою, при дозованих і максимальних фізичних навантаженнях.

Канд. тех. наук Мазурок Наталія апробувала в процесі проведення досліджень сучасне лабораторне обладнання: газоаналізаторну систему, біомеханічну вимірювальну установку, електрокардіограф, пульсометри, бігову доріжку, велоергометр, веслярський ергометр та інші вимірювальні засоби (Рис. 4). Завідуюча ознайомила з будовою цього обладнання, принципом роботи та технічними паспортними даними і суттєво підвищила свою професійну кваліфікацію.

Більшість метрологічних засобів Лабораторії фізіології обладнана пристроями передачі експериментальних даних до Інтернету. Ця інновація дозволяє значно розширити співпрацю в режимі онлайн Лабораторій Факультетів завдяки моментальній передачі інформації через Інтернет, її обробці та аналізу фахівцями обох лабораторій.

Таким чином, можна очікувати, що міжнародна співпраця між Факультетами позитивно сприятиме підвищенню кваліфікації співробітників, їх участі в міжнародних навчальних процесах, конференціях, спільних наукових дослідженнях і проєктах в галузі фізичної культури і спорту.

Висновки. Аналіз сьогоденного стану і можливостей подальшого розвитку співпраці між Факультетом фізичного виховання, спорту і здоров'я НПУ ім. М. П. Драгоманова (Київ, Україна) і Факультетом фізичного виховання і промоції здоров'я Щецинського університету (Щецин, Польща) показав її доцільність і перспективність для вдосконалення освіти і науково-дослідної роботи в галузі фізичного виховання і спорту.

UDK 355.233:796.88

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THE FEATURES OF THE METHOD OF KETTLEBELL SNATCH TECHNIQUE SPORTSMEN TRAINING

The features of the author's method of kettlebell snatch technique training for sportsmen in kettlebell lifting are highlighted in the article. Sportsmen with a different qualification (n=77), who were attending a kettlebell lifting class while the studying at S. P. Koroliiov Zhytomyr Military Institute, took part in the investigation. Sportsmen were participated on 3 groups: group №1 – sportsmen of grade 3 and 2 (n=34); group №2 – sportsmen of grade 1 and candidates in the sports masters (n=27); group №3 – sportsmen of sports masters and international sports masters (n=16). The level of technical preparedness was examined via the following tests: the duration of the main phases of the snatch, the total duration of one complete cycle of the snatch, the comers between the parts of the body in the main phases. The aim of the article is to substantiate the method of kettlebell snatch technique sportsmen training. Research methods: theoretical analysis and generalization of scientific and methodical literature, pedagogical supervision, biomechanical video computer analysis, methods of mathematical statistics. With the help of biomechanical video-computer analysis the evaluation of the technical preparedness of sportsmen in kettlebell sport was explored; a comparative analysis of the individual parameters of technique of sportsmen with different qualification was carried out; the model characteristics of technical preparedness of sportsmen with different qualification were developed; the rational method of kettlebell snatch technique training was developed.

Keywords: *technique, method, kettlebell snatch, kettlebell sport.*

Бойко Д. В., Пронтенко К. В., Андрейчук В. Я. Особливості методики навчання спортсменів-гирьовиків техніки виконання ривка гирі. У статті висвітлено особливості авторської методики навчання гирьовиків техніки виконання ривка гирі. У дослідженні взяли участь 77 спортсменів, які займалися гирьовим спортом у секції Житомирського військового інституту. Було сформовано 3 групи: група №1 – спортсмени, які виконали III та II розряду з гирьового спорту (n=34), група №2 – гирьовики I розряду і КМС (n=27), група №3 – спортсмени рівня МС і МСМК (n=16).

За допомогою біомеханічного відеокomp'ютерного аналізу: здійснено оцінювання показників технічної підготовленості спортсменів; проведено порівняльний аналіз окремих параметрів технічних дій у гирьовиків різної кваліфікації; розроблено модельні характеристики технічної підготовленості гирьовиків; обґрунтовано раціональну методикау навчання спортсменів техніки ривка.

Ключові слова: техніка, методика, ривок, гирьовий спорт.

Бойко Д. В., Пронтенко К. В., Андрейчук В. Я. Особенности методики обучения спортсменов-гиревиков техники выполнения рывка гири. В статье освещены особенности авторской методики обучения гиревиков техники выполнения рывка гири. В исследовании приняли участие 77 спортсменов, которые занимались гиревым спортом в секции Житомирского военного института. Были сформированы 3 группы: группа №1 – спортсмены, выполнившие III и II разряды по гиревому спорту (n=34), группа №2 – гиревики I разряда и КМС (n=27), группа №3 – спортсмены уровня МС и МСМК (n=16). С помощью биомеханического видеокomp'ютерного анализа: осуществлена оценка показателей технической подготовленности спортсменов; проведен сравнительный анализ отдельных параметров технических действий в гиревиков различной квалификации; разработаны модельные характеристики технической подготовленности гиревиков; обоснована рациональная методика обучения спортсменов техники рывка.

Ключевые слова: техника, методика, рывок, гиревой спорт.

Formulation of the problem. Sporting technique is a complex of methods for performing movements that provide more complete realization of physical capabilities of sportsman [2, 3]. In the kettlebell exercises technique, as in any other kinds of sport, there are many «little things» that depend on the overall coordination of movements, the correctness of breathing and the sporting result. Sporting technique is continuously improved, its improvement is due to the desire to find more rational ways to perform exercises within the existing rules and, accordingly, increase the sporting result. Low level of development of physical qualities and functional abilities of sportsman can worsen the mastery of rational technique. The research of protocols of competitions of various levels, as well as the sporting and coaching experience of the authors indicate that the development of kettlebell snatch technique takes much more time and effort than the development of kettlebell jerk technique. In contrast to the jerk, the general scheme of kettlebell snatch beginners shows practically from the first attempt, but with an increase in the level of their skill, there is a significant increasing of the results of the kettlebell jerk against the slow increasing of the results of the kettlebell snatch. Therefore, the substantiation of the kettlebell snatch technique sportsmen training is relevant for improving their technical preparedness and increasing the competitive results.

Analysis of literary sources [2, 3, 5, 7] shows that the main factors of influencing the effectiveness of the exercises technique with kettlebells are: target orientation, conditions for the exercise, basic physical laws of interaction of bodies, anatomical structure of the body, physiological functions of the organism. The main purpose of the athlete in the process of implementation the kettlebell snatch is to improve the result. The main condition that determines the structure of kettlebells lifting is the competition rules, where the weight of kettlebells is determined, the time for exercises, the ways of lifting, etc. The laws of physics, which explain how the movements are carried out, are the laws of dynamics, and those who explain how to maintain equilibrium in the system of «athlete- kettlebells» are the laws of statics and kinematics. The indices that characterize the anatomical features of the structure of the body include: the structure and mobility of the joints; ratio of muscle fibers; level of development of muscles-extensors of the body, legs, hands; topography (location) of muscles and muscle groups [1, 8]. Among the basic physiological functions of the organism that affect the kettlebell snatch technique: the metabolism, which should occur if the body enters the required amount of oxygen and removal of decay products (which emphasizes the importance of rational breathing); coordination of tension and relaxation of working muscles (sufficient blood supply to working muscles occurs only during their relaxation, when blood vessels are released from muscle pressure and venous blood flow from the body decay products); forming the «sense of kettlebell», «feeling of the platform» on the basis of information from various analyzers (receptors of the muscles, eyes, vestibular apparatus, skin, blood vessels), which allows you to better feel the position of your body, the effect of gravity, acceleration, rhythm, etc. [2, 5].

The questions of technical preparedness of kettlebell lifters are presented in the works of a some scientists [2, 3, 6, 7]. However, the problem of improving the kettlebell snatch technique, as an important reserve for improving the competitive results of Ukrainian sportsmen on the international arena, requires further researches.

The aim of the article is to substantiate the method of kettlebell snatch technique sportsmen training.

Methods of research: theoretical analysis and generalization of scientific and methodical literature, pedagogical observation, biomechanical video-computer analysis, methods of mathematical statistics.

Organization of research. Sportsmen with a different qualification (n=77), who were attending a kettlebell lifting class while the studying at S. P. Koroliov Zhytomyr Military Institute, took part in the investigation. Sportsmen were participated on 3 groups: group №1 – sportsmen of grade 3 and 2 (n=34); group №2 – sportsmen of grade 1 and candidates in the sports masters (n=27); group №3 – sportsmen of sports masters (MS) and international sports masters (IMS) (n=16). The level of technical preparedness was examined via the following tests: the duration of the main phases of the snatch, the total duration of one complete cycle of the snatch, the corners between the parts of the body in the main phases of the snatch. The video camera (Sony FDR-X3000) was used to record the technical preparedness of sportsmen. The information was processed using Windows Movie Maker, Simi Twinner Pro. The study of the parameters of technical preparedness was also carried out at the Biomechanical technologies in physical education and Olympic sport Laboratory of the National University of Physical Education and Sports of Ukraine with the use of the optical and electronic system «Qualisys» and the Qualisys Track Manager software.

The main results of the study. Kettlebell snatch is the second exercise of the kettlebell biathlon, during which the kettlebell should be lifted on upright hand with one continuous motion. The kettlebell falls into the low position in one movement, without touching the chest and other parts of the body. Kettlebell snatch is performing by one, then another hand without rest during

10 minutes. The main technical elements of the kettlebell snatch are: the starting position, putting the kettlebell back behind the knees, lifting the kettlebell on the straight hand, fixation, lowering the kettlebell. With the help of biomechanical video-computer analysis the evaluation of the technical preparedness of sportsmen in kettlebell sport was explored; a comparative analysis of the individual parameters of technique of sportsmen with different qualification was carried out; the model characteristics of technical preparedness of sportsmen with different qualification were developed (Table 1); the rational method of kettlebell snatch technique training was developed.

Table 1

Model characteristics of technical preparedness of sportsmen with different qualification ($\bar{X} \pm m$)

The indexes of technical preparedness	Level of sportsmen qualification		
	III, II grade	I grade, KMS	MS, IMS
<i>Duration of main phases of kettlebell snatch, sec</i>			
«Working period» (lowering the kettlebell putting the kettlebell back behind the knees, lifting the kettlebell on the straight hand)	2.84±0.38	3.35±0.35	2.69±0.32
Fixation	1.45±0.17	1.06±0.14	1.24±0.13
Duration of one whole cycle	4.29±0.18	4.43±0.15	3.94±0.09
<i>Angular characteristics in the main phases of kettlebell snatch, deg.</i>			
Corner between body and hand during kettlebell lowering	23.1±0.91	18.4±0.93	7.2±0.45
Corner between body and legs in «dead point»	112.9±1.26	104.5±0.98	90.3±1.09
Corner between body and hands in «dead point»	41.5±1.15	13.6±1.21	12.4±0.96
Corner between body and hand during kettlebell lifting	27.3±0.66	10.7±0.59	3.9±0.41

Kettlebell snatch should be executed at the expense of a clear movement of the body and legs, using the principle of a pendulum. It is important to bring to the consciousness of athletes information that if the natural movement of the kettlebell will coincide with the direction of the effort application, they are summed up, and if vice versa, then subtracted. After swinging the pendulum once, this movement is much easier to maintain, using inertia, than to stop it from the bottom every time and again spend the effort to roll it out. Using the inertia, which manifests itself in the continuation of movement after the end of the muscular effort, sportsman can more economically use his motor apparatus, provide periodic rest for muscles and nerve centers and increase the result.

The kettlebell snatch training requires the use of preparatory exercises. At first you need to learn the correct grip of kettlebell. To do this you need to do the following exercise. Output position – legs apart, kettlebell is ahead a little. Lean forward and take the kettlebell on top of handle so that the middle finger grabs the middle of the handle, the palm is superimposed on the top. The thumb is superimposed on the forefinger, forming a closed ring. To check the correctness of this position, it is necessary to tear off the kettlebell from the floor by 10-15 cm, remaining in the incline. If everything is good the kettlebell and arm should be one unit: there should be no deviations of the kettlebell from the vertical, no scrolling handle, the muscles of the hands are as relaxed as possible, back is straight. After learning this position it is worthwhile to go to the learning of the flywheel (fly stroke).

This exercise is carried out by bending and extending the trunk and legs, but not at the expense of applying strength of hands. To do this, it needs to be explained that during the snatch, the main attention must be paid at the moment of beginning of flexion and extension of the body. It must be strictly in line with the movement of the kettlebell: at the moment of lowering the kettlebell, the shoulders and head should move a little back, the body bends forward only after touching the forearm to the body. That is, maximum deviation of the kettlebell forward should correspond to the maximum deviation of the body back, and vice versa. Even high-skilled sportsmen sometimes do not adhere to this condition and make mistakes at the time of the extreme deviation of the kettlebell back (at the «dead point»): the hand after touching the body stops, and the kettlebell continues to move. It leads to additional strain of the muscles of the hands, breakage of the skin of the palm of the surface and, as a result, early termination of exercise.

This moment of kettlebell snatch is especially difficult during the training. Therefore, the special attention of beginners should be emphasized on the phase of lowering the kettlebell. Preparatory exercise is to lift the kettlebell to the position of fixation above the head by two hands and put it down by one. At the same time, the lowering of the kettlebell begins with the rotation of it body around the forearm – the wrist returns a little finger in side, kettlebell falls, at the level of the head (chest) the interception of the handle is carried. Then, during the free fall of the kettlebell on the level of the belt, the arm is extended, and the kettlebell moves along the arc behind the knees. At the end of the lowering phase, the vertical speed of the along the arc gradually decreases due to the bending of the legs, the trunk remains straight. The inclination of the torso ahead must be completed by a full stop of kettlebell in the «dead point». However, some athletes perform kettlebell snatch on their straight legs, which leads to additional tension in the muscles of the back, the connection to the work of ineffective muscle of the hands and premature fatigue of the body. The bending of the legs provides a smooth stop of the kettlebell in the «dead point», the stretching of the working legs muscles and the creation of an elastic potential for them to effectively carry out the next phase of a kettlebell snatch – a kettlebell blow up. It executes at the expense of simultaneous and powerful extension of legs and trunk. The kettlebell blow up should be carried out at the height of the shoulders and end with a short-term phase of free flight (movement of the kettlebell by inertia), which is characterized by a significant decrease of the effort to capture the handle (the moment of rest). The kettlebell blow up is carried out during the movement of the kettlebell forward at the moment of the detachment of the forearm from the body due to the extension of the body and legs and the movement of the shoulder back. Proper kettlebell blow up will ensure the flight of the kettlebell at a sufficient height for fixing above the head. It is because of proper kettlebell blow up athlete has the opportunity to rest and push the arm in a handle so that its inner

surface lay on the thumb. Some sportsmen make mistakes in putting the kettlebell on the forearm. The blow is due to the fact that an acceleration, which is much greater than the optimal, was given to kettlebell (the muscles of the hands were included in the work), as well as in the case when kettlebell rotates through the wrist in place of the roundabout around the forearm (placing the hand on the side of the kettlebell).

Whole cycle of kettlebell snatch should be made only after learning all preparatory exercises; otherwise it is possible to make a mistake in the technique. During performing a kettlebell snatch, the main problem is to protect the acceleration of the kettlebell when it is falling down from the position of fixation above the head. The techniques for resisting acceleration can not be modeled by preparatory exercises; they are learned in the process of performing the whole cycle of kettlebell snatch. For this purpose, lowering the kettlebell is accompanied by a deviation of the trunk back and a turn of the hand, feet bent in the knees a little. During a free fall the hand is released. It is important that, during free fall of the kettlebell, all the muscles of the hand, with the exception of the fingers, have been relaxed. The hand should resemble the rope to which the weigh is tied. All these techniques provide a reduction in the height of the fall of the kettlebell and increase the height of the capture of handle, and, consequently, decrease the length of the free fall of the kettlebell. The vertical fall of the kettlebell gradually passes into the pendulum movement, the effort on the muscle of the hands increases gradually. Then the kettlebell is carried out behind the knees, forward and a kettlebell blow up. It is important to ensure that the handle of the kettlebell in any phases of the snatch has to be higher than the body of the kettlebell.

The rhythm of breathing should correspond to the phases of the kettlebell snatch, while the attention should be made on exhalation, and not on inhalation, delay and stopping of breathing are unacceptable. The ability to combine breathing and movements is an integral part of technique. In 10 minutes of competition, leading athletes lift to 10 tons, while the body's need for oxygen is quite significant. Any violation of the rhythm of breathing leads to oxygen "fasting" of the body, its premature fatigue, which adversely affects the result as a whole. From the position of fixating, the full cycle of the kettlebell snatch is carried out on two exhalation and inhalation: the beginning of lowering the kettlebell – short inhalation, lowering the kettlebell until the maximum tilt of the trunk forward – full exhalation, during the blow up – inhalation, fixating the kettlebell above the head – exhalation. The number of cycles of breathing in the position of fixation is individual and regulates the rate of kettlebell snatch. It should be noted that the position of fixation is not a phase of relaxation; it requires effort to hold the kettlebell. Therefore, the elimination of errors in the position of fixation should be given special attention: «inclusion» of the elbow, lowering the shoulder under the weight of the kettlebell, straightening the legs, «shaking» the muscles of the thigh, equal breathing, and the lack of extensibility of the wrist under pressure of kettlebell. The choice of the rate should also allow the exercise to be carried out within the competition time.

Thus, the mastery of rational kettlebell snatch technique and its constant improvement, together with the rhythmic breathing, is a necessary condition and an important reserve for improving the results in kettlebell lifting.

Conclusions. The basic parameters of the kettlebell snatch technique of sportsmen with different qualifications are studied and the model characteristics of technical preparedness in the kettlebell snatch are developed. The peculiarities of kettlebell snatch technique are revealed and the rational method of sportsmen training is grounded.

Prospects for further researches. It is supposed to introduce the author's method in the training process and check its effectiveness.

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