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METHOD OF CONTROL OF SPECIAL MOTOR TRAINING OF YOUNG TAEKWONDISTS (WT) ON THE BASIS OF THE USE OF INNOVATIVE TECHNOLOGY

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MONOGRAPY

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Method of control of special motor training of young taekwondists (WT) on the basis of the use of innovative technology/ Monograpy: Tajibaev S.S., Yusupova N.Sh.

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In this monograph, the data presented, analyzes and scientific and practical conclusions and proposals to sports schools and schools of higher sportsmanship in this area, serve as a scientific and practical guide for scientists and researchers, specialists in this field, performing scientific research. The monograph reveals from a scientific and practical point of view the priority of special physical fitness, which is considered the main one in the formation of technical skills of young taekwondo athletes in all stages of sports training. For the complex control of special motor training of young taekwondo wrestlers, it is recommended to use the “Hardware-software complex for measuring the strikes of combatants”.

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Mazkur monografiyada keltirilgan ma’lumotlar, tahlillar hamda mazkur yo‘nalishdagi sport maktablari va oliy sport mahorati maktablariga berilgan ilmiy-amaliy xulosa va takliflar ushbu sohada ilmiy izlanishlar olib borayotgan olim va tadqiqotchilar, mutaxassislar uchun ilmiy-amaliy qo‘llanma bo‘lib xizmat qilmoqda. Monografiyada sportga tayyorgarlikning barcha bosqichlarida yosh taekvondochilarning texnik mahoratini shakllantirishda asosiy hisoblanadigan maxsus jismoniy tayyorgarlikning ustuvorligi ilmiy-amaliy nuqtai nazardan ochib berilgan. Yosh taekvondochilarning maxsus harakat tayyorgarligini kompleks nazorat qilish uchun “Yakkakurashchilarning zarbalarini o‘lchash uchun apparat-dasturiy kompleksi”dan foydalanish tavsiya etiladi.

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В данной монографии приведённые данные, анализы и научно-практические выводы и предложения в спортивные школы и школы высшего спортивного мастерства по данному направлению, выступить научно-практическим руководством для ученых и исследователей, специалистов в данной области, выполняющих научные исследования. В монографии раскрывается с научной и практической точки зрения приоритет Специальной физической подготовленности, который считается основной в формировании технического мастерства юных таэквондистов во всех этапах спортивной подготовки. Для комплексного контроля специальной двигательной подготовки юных таэквондистов рекомендуется использование “Аппаратно-программного комплекса для измерения ударов единоборцев”.

INTRODUCTION

In our country, as well as in other regions and countries of the world, the number of people involved in taekwondo, one of the martial arts that has won a worthy place in the world, is growing. Of course, the rapid development of the sport of taekwondo has led to an increase in the weight of world-class sports competitions, competitions among athletes and spectator sympathies. For the correct physical development of young taekwondo athletes, it is necessary to establish control over the development of the body of athletes using modern technologies, taking into account their sensitive stages and physical capabilities.

In our country, as well as in other regions and countries of the world, the number of people involved in taekwondo, one of the martial arts that has won a worthy place in the world, is growing. Of course, the rapid development of the sport of taekwondo has led to an increase in the weight of world-class sports competitions, competitions among athletes and spectator sympathies. For the correct physical development of young taekwondo athletes, it is necessary to establish control over the development of the body of athletes using modern technologies, taking into account their sensitive stages and physical capabilities.

At the initial preparatory stage of scientific research to increase the prestige of the sport of taekwondo in the world, much attention is paid to the problem of organizing the training process of young taekwondo athletes. The main reason for reducing the age at the stage of initial training is the continuous development of motor skills in children, the introduction of basic and basic elements of technology in different structural groups from an early age. Based on the continuous development of motor skills in children, the introduction of basic elements, the main elements of technology in different structural groups from an early age is the main reason for reducing the age at the stage of initial training. This requires the coaches to properly organize and distribute the means of the sports and training process.

Our Republic requires the effective use of innovative technologies in the training of young athletes based on modern requirements and control over their readiness. Particular attention is paid to the selection of young athletes and the selection of talented athletes in the main sports, the establishment of a system for the formation of sports reserves, and the achievement of high results in the popularization of sports among young people. Also, an important condition for the achievement of high sportsmanship by taekwondo practitioners is the widespread use of innovative technologies in preparation for the process of precompetitive training, in the face of a sharp increase in the number of official taekwondo competitions in recent years, regular changes in the competition rules and increased competition among athletes at international competitions. In this regard, there is a lack of research on the organization of special training for young taekwondo athletes based on this approach, the organization of pre-competitive training based on competitive activity, studying the problem of adapting the intensity of training to the requirements of the competition.

In response to the opportunities created by our government, researchers who have effectively used these opportunities have developed a number of programs, methodologies, recommendations and necessary conclusions, and these methodologies and recommendations that have been developed and put into practice are bearing fruit. In order to increase the efficiency of motor activity of taekwondo fighters in economic and sports schools, sports schools of the Olympic reserve, initial training, further development and improvement of the load in the system of physical training of taekwondo fighters, the state has implemented a number of measures.

In turn, a number of programs, methods, recommendations and necessary conclusions were developed and implemented in practice by researchers conducting research on the physical training of taekwondo fighters, in response to the opportunities created by our Government, effectively using the created opportunities. It is also true that these conclusions, methodologies and recommendations are being implemented and bearing fruit. Despite the above, in

order to bring the special physical training of taekwondo wrestlers to a new level, the need for laboratories enriched with the latest modern technologies is increasing to control the physical, psycho-functional technical and tactical development of martial artists.

Comprehensive training of taekwondo fighters is advisable to start from an early age. To do this, first of all, the development and implementation of innovative technologies to improve the effectiveness of training should be singled out as the main goal.

In addition to improving the efficiency of taekwondo training starting from the initial training stage, it is necessary to systematically organize the process of continuous monitoring of the normal development of the physical qualities of taekwondo fighters.

Scientific research has been carried out on the purposeful use and enrichment of means and methods for the complex development of the physical qualities of young taekwondo fighters, the development of various forms of increasing the level of their physical development and functional training.

Studies have been carried out on the use of physical activity in the accelerated development of motor skills and physical qualities, taking into account their physical capabilities, the management of motor training and training of taekwondo fighters using innovative technologies at the stage of initial training.

Since the systematic control over the physical development of young taekwondo athletes is a very important and responsible task not only in sports schools of the Olympic reserve, specialized sports schools, but also in sports sections organized in the regions of the sports, sensory stages, and it is necessary to establish control using modern technologies.

This dissertation to a certain extent contributes to the implementation of the tasks set in the Law of the Republic of Uzbekistan “About physical culture and sports” No. ZRU-394 (new edition) dated May 26, 2000, Decrees of the President of the Republic of Uzbekistan No. PP-3031 “On measures for the further development of physical culture and mass sports” dated June 3, 2017, Decree of the President of the Republic of Uzbekistan dated July 29, 2017 .2022 N PP-337

"On measures for the further development of the sport of taekwondo (WT)", Decree of the President of the Republic of Uzbekistan "On the comprehensive preparation of athletes of Uzbekistan for the XXXIII Summer Olympic and XVII Paralympic Games held in the city of Paris (France) in 2024 year" and other normative legal acts of this sphere.

The system of physical education and sports education will make it possible to identify the most talented, promising young people at the stage of initial training.

Model indicators, normative requirements, control or assessment tests, instrumental methods used in the development of special motor abilities of young taekwondo fighters and training of highly qualified athletes have been developed. In what periods and stages of a long-term training process is the effectiveness of the development of special motor abilities of young taekwondo athletes controlled, and when and how to increase or decrease scientifically based recommendations are given (L.P. Matveev, V.N. Platonov, Yu.V. Verkhoshansky, V.M. .Zatsiorsky, Yu.K.Kholodov, V.G.Kuznetsov, L.V.Volkov, V.I.Lyakh, A.V.Rodionov, F.A.Kerimov). It should also be recognized that these problems were studied in a narrow circle as the subject of a multifaceted study on the example of the sport of taekwondo (Yu.A. Shulika, M.S. Terzi, O.G. Epov) .

A number of foreign scientists have conducted extensive research on the development of the physical capabilities of taekwondo athletes at the initial preparatory stage. According to Halmukhamedov R.D., Abdurasulova G.B., Nuriddinova Sh.N., Tadzhibaev S.S., B.Sh. Rakhmatov and many other leading specialists, it is important to pay serious attention to the development of all physical qualities and abilities.

A number of domestic and foreign scientists have conducted many studies on the control and evaluation of the physical, psychophysiological and functional fitness of athletes using innovative technologies (Tadjibaev S.S. 2017, Ishtaev Zh.M. 2017, Ummatov A.A. 2018, Mirzanov Sh.S. 2019, V.D. Anashov 2020, B.Sh. Rakhmatov 2022).

According to Babov Yu.M., Konstantinova Yu.A., Volkova I.N., Pashkov I.N., Mutev A.V. and other scientists, the development of physical qualities, taking into account sensitive periods, gives good results.

Platonov V.N., Malinovsky S.V., Choi Hong Si, Choi Sung Mo and others developed their own guidelines for normalizing training loads, taking into account the age characteristics of taekwondo fighters based on the results of their research.

According to the results of the analysis of scientific and methodological literature, it is necessary to systematically monitor the physical development of taekwondo athletes aged 10-13, who are engaged in the initial training stage, in order to fully provide physically and mentally mature athletes to the youth national taekwondo team and the future national taekwondo team, it is necessary to submit developments and training new information technologies to improve the professionalism and efficiency of specialists and trainers in the industry.

CHAPTER I. SCIENTIFIC AND PEDAGOGICAL BASES OF DEVELOPMENT AND MANAGEMENT OF MOTOR TRAINING OF YOUNG TAEKWONDISTS

§ 1.1. Peculiarities of training of teenage athletes in children's and youth sports schools

The structure and content of the long-term process of sports training of teenage athletes cannot remain constant, since from the moment they start playing sports, the age of the athlete, the level of his functional state, physical fitness and characteristics of the nervous system change [8; p. 44-64., 2; p. 34-35].

At the initial stage of training, the volume of general developmental funds can be 85-90%, and the volume of special training funds can be up to 10-15% of the total volume of physical training. During the period of rapid development of the child's body and puberty, it is necessary to pay special attention to the volume and intensity of the load [20; p. 10-47].

Controversial situations arise among specialists on the issue of the rational priority of taekwondo classes at the initial stage of training teenagers.

According to I.M. Korotkov, it is necessary to train dexterity and other physical qualities along with training in sports techniques, using various means (including outdoor and sports games) and training methods. [89; p. 117-120].

Other authors believe that different sports should be used in classes with children at this stage, before specialization in the chosen sport is clearly expressed. [32; p. 4-10].

In the upbringing of the physical qualities of adolescent taekwondo athletes, an important role is played by the use of sports and outdoor games in the training process, as well as special training exercises. In the upbringing of the physical qualities of adolescent athletes, taekwondo fighters, an important role is played by the use of sports outdoor games and special training exercises in the training process. The high efficiency of the application of these methods and techniques was demonstrated by the research conducted by scientists [26; p.140].

A number of specialists conducted research on the development of the optimal ratio of means and methods of initial physical training of adolescent athletes [27; p.150., 33; p. 130]. The priority use of training tools aimed at training speed-strength skills (development of speed-strength qualities) through experience (40% of the time) is the most effective methodological design (structure) of the initial stage of training. 15% time is spent on funds aimed at developing endurance, agility and flexibility. According to N.A. Fomin and Yu.N. Vavilov, at this stage, it is necessary to allocate up to 60% of the time for general endurance training, up to 25% for speed-strength exercises, and up to 15% for training individual physical qualities.

According to R.S. Salomov for the development of strength, it is necessary to use special exercises that help develop the strength of all muscle systems or some muscle groups Salomov R.S. To develop strength, special exercises are used to help develop the strength of all muscle systems or some muscle groups[119; p. 96-105]. Other researchers [19; p. 9-15], on the contrary, it is assumed that the ratio of exercises aimed at training (development) of agility, strength and endurance should be as follows: 50, 25 and 25 percent of the time, respectively. According to I.V. Azarova, the most effective is the structure of the training process, in which 75% of the total time is devoted to general and special training (37.5% - for games and game exercises, 37.5% - for special training exercises). ON THE. Fomin and Yu.N. The Vavilovs propose to use the same amount (up to 75%) of versatile means of physical culture [32; p. 4-10].

According to some authors [21; p. 99], the development of physical qualities in boys aged 10–13 is most effectively achieved using speed exercises aimed at developing agility, strength and speed-strength qualities in a single complex. Comparison of the effectiveness of the methodology for training (development) of dexterity, strength and endurance in children aged 10-13 years with general physical training showed that the most significant changes in the level of development of motor skills (qualities), speed-strength exercises (70%).

From the opinions of the above-mentioned experts, it is known that there are different opinions of specialists about the priority of preliminary training of taekwondo teens, the means and methods of training motor skills, the optimal ratio of the forms of organization of the training process.

From the opinions of the above-mentioned experts, it is known that there are different opinions of specialists about the priority of preliminary training of taekwondo teens, the means and methods of training motor skills, the optimal ratio of the forms of organization of the training process.

The composition of the “typical” technique includes the main types of strikes and defenses, in accordance with the structure of strikes and defenses, the striking structure of the execution of hands and the number of strike zones, of which there are 12. At the same time, some experts include preparatory movements and techniques in the category of “typical” techniques, suggesting expanding them with direct and side impacts depending on the steps of the opposite leg, but narrowing the number of techniques that make up the “school” of taekwondo and consider it necessary to expand variability of their application in different situations [10; p. 324].

Thus, on the one hand, a theoretical analysis of aspects of the technical and special physical training of taekwondo fighters is carried out, and on the other hand, a different level of thinking of a number of specialists on a number of issues made it possible to identify ways to search for resources to optimize the educational process. In particular, to redefine and concretize the understanding of the main techniques in taekwondo, it is necessary to systematize the content of each technique with the appropriate means for each of them. The methods also include the determination of the rational sequence of the educational material and the substantiation of the methodological concept of the technical training of taekwondo fighters at the initial stage of sports specialization.

§ 1.2. Features of the physical development of adolescent children

One of the main conditions for the high efficiency of the training system for young athletes is the strict consideration of age and individual morphological and functional characteristics that are characteristic of individual stages of development of an athlete who has just started playing sports. This approach allows you to choose the right means and methods of training in sports, orient participants, standardize training and competitive loads, adequately select for solving problems of predicting sports achievements..

In taekwondo, elementary training groups in the Youth and Sports School are attended mainly by children aged 10-13. This age, like other age stages of development, is characterized by heterochrony and harmonious growth and development of the organism. However, this stage is a stage of relatively calm formation of body organs and improvement of its various functions [36; p. 128-141]. Each age stage is a unique stage with its own morphological features, the knowledge of which allows you to evaluate the effectiveness in promoting health, developing physical qualities, teaching sports equipment to achieve high sports results in the future [33; p.130].

Indicators of physical development include height, body weight (weight), head circumference, chest circumference and other indicators.

Growth refers to quantitative changes in the body, that is, an increase in the number of cells, an increase in the mass of organs, etc. Development is a qualitative indicator and is mainly represented by a change in functions. Threefold development: physical, mental and sexual.

Another important point when working with children is that at 13-14 years old, boys and girls clearly differ in muscle strength. This should be taken into account when doing physical exercises for boys and girls[127; p. 13-45].

It is important to note that in order to characterize the physical development of a student, it is impossible to obtain one or another anthropometric indicator in isolation from other signs. Only by considering them in relation to each other, you can get a holistic situation in a holistic approach [36; p. 12 - 49].

Body length (height) is one of the main indicators not only of the growth process of children of primary school age, but also of a certain level of maturity. Unlike body weight, its height from 77 to 98% is under hereditary control [43; p. 3-17].

According to scientists, the transverse dimensions of the body and its individual segments change unevenly from birth onwards. The period of rapid growth of the body of boys corresponds to 12-13 years [20; p. 10-47].

In children from 4 to 7 years, the growth process is enhanced, and the development process is slowed down. At the age of 6-7 years, some children experience a significant growth spurt, as a result of which they become taller than their peers[127; p. 13-45].

The rate of increase in the length of the arms obeys the same law as the rate of increase in the length of the body. In boys, the increase in arm length decreases a year earlier than the increase in body length, while the increase in body length in them remains 1.5 years longer than in girls. As a result, boys of this age have relatively long arms [38; p. 135-137].

The increase in the length of the legs corresponds in character to the growth of the body, but the decrease in the growth rate of their body and arms is much flatter than the decrease in the growth rate. The length of the legs in boys is up to 10 years, which is greater than in girls, since the decrease in the rate of length growth in women begins at 11 years [36; 48, 38; p. 135-137].

The growth rate of the leg segments significantly exceeds the growth of the arm segments (except for the shoulder) [45; p. 5-38].

Body weight is an integral indicator of the sum of the weights of organs belonging to different systems, for example, height, which react differently to different training loads by changing their structure and mass. About 60% of body weight is determined by genetic factors and largely depends on the specific socio-economic conditions of life. This determines the broader possibilities of its transformation [45; p. 5-38].

The muscle mass of a newborn child is 23.3% of body weight, at 8 years old - 27.2%, at 12 years old - 29.4%, at 15 years old - 32.6%, at 18 years old - 44.2%. In a year, the muscles of the shoulder girdle and arms are well developed. In children,

the flexor muscles have a higher tension and develop faster than the extensor muscles. At the age of 12-16, the muscles necessary for walking develop [111; p. 115-146].

Such differences in annual growth rates are due to the fact that much earlier puberty is accompanied by much earlier body growth at an earlier age [41; p.100]. In modern boys, puberty begins at the age of 11-13 years [35; p. 211].

The ratio between body length and body weight is of great importance for sports practice. For all age groups, the increase in body weight in children significantly exceeds the increase in its length [11; p. 324, 42; p.100].

Tables based on special standards are used to assess physical development. In the tables, depending on the age and sex of the child, body weight, height, length (circumference) of the chest are given as average values, and these indicators are compared with the figures obtained from children, and a conclusion is made [127; p. 13-45].

The shape of the chest depends on the age of the child and the structure of the body. The chest can be conical, cylindrical (long, narrow) and flat (short and wide), the shape changes with the age of the child. In the future, the growth of the child's body is faster than the growth of the chest. At 12 and 13 years old, the shape of the chest is similar to that of an adult, but the dimensions are smaller. The chest begins to differ by gender from the age of 15, the sagittal size rapidly increases. When breathing in the chest, the lower ribs rise in boys, and the upper ribs in girls [111; p. 115 - 146].

An analysis of the absolute annual increase in the overall body dimensions (weight, height, chest circumference) of schoolchildren shows that there are no significant differences in the physical development of boys and girls from 7 to 11-12 years old [25; C.75] (Table 1.).

The annual growth rates of children's organs do not accurately characterize the rate of their growth, since they depend on the initial body dimensions, which have quite individual fluctuations. Therefore, it is advisable to use the relative indicator of annual growth, expressed as a percentage, for certain ages of the child.

Table 1

Growth rates of total body sizes of boys of elementary grades

Age, year	Annual growth		
	Body length (cm)	Body mass	Chest circumference
10-11	3,9-6,9	2,0-4,6	1,1-4,3
11- 12	3,7-7,1	2,0 - 5,4	1,1-4,3

The average annual increase in body length in boys aged 7 to 11-12 years is about 10-11%, body weight - from 8 to 11%, chest circumference - from 10 to 10.5%. The age of 10-13 years in children is characterized by a fairly rapid development of organs and functions. The average weight of the trunk increases by 2-4 kg per year, height - by 2-5 cm.

Children's bones grow and develop with age. Their growth is due to the gap between the ends of the bone and the body, and their width is due to the cells on the inner surface of the bone membrane. The development of the skeleton in women reaches 18-21 years, and in men it is completed by 20-24 years[127; p. 13-45].

Boys grow mainly by increasing the length of their legs [24; p.75].

Development is characterized by an increase in the length and width of the bones, but the increase in their size occurs unevenly. Accelerated and retarded cycles of growth have been identified. The complete formation of the skeleton is completed by the age of 20-24. The chemical composition of bones changes with age. Increases the content of calcium, phosphorus, magnesium salts, which increases bone strength. At the same time, there is an improvement in the hematopoietic-red bone marrow [15; p. 23-25].

The development of bone tissue is largely dependent on the growth of muscle tissue. The structure of children's muscles is very different from adults. Their muscles are elastic, when contracted, they are greatly shortened, and when relaxed, they lengthen more.

As soon as the child begins to walk, his muscles grow rapidly, and by the age of 2-3 they make up an average of 23% of the total body weight. Upon reaching the age

of 8, this figure is 27%, upon reaching the age of 15 it becomes 32.6% and, finally, at the age of 17-18 it is 44.2%. Due to the growth of muscle fibers both in width and in length, it increases its weight. At this time, myofibrils (contracting elements) in the fiber also increase. For example, in 7-year-old children, their number increases by 15–20 times compared to newborns [127; p. 13-45].

The heart of the child is small, not strong enough. Regulatory mechanisms of the cardiovascular system (CVS) are also in the process of formation. However, the width of the vascular space and the relative value of the minute volume of blood (MOV per 1 kg of body weight), in comparison with adults, provide adequate blood supply to the organs. However, unlike adults, the required cardiac output in children of this age is provided by a higher heart rate (HR), which compensates for the fact that the heart rate is not very high.

Against the background of low blood pressure (BP 97-98 / 51-59 mm.symv.st.), the presence of elevated blood pressure (90-96 beats / min at 8-10 years old) requires additional loads in the activity of the cardiovascular system. As age increases, stroke volume increases and heart rate decreases. Blood pressure rises slightly.

The mass of the lungs increases significantly from the age of 8, the number of alveoli approaches that of adults. Structural changes in the lungs determine an increase in the vital capacity of the lungs (VC), which increases from 2.1-2.2 to 2.4-2.7 liters. Simultaneously with an increase in external respiration and CCC power, an increase in the rate of oxygen consumption is observed both at rest and during strenuous physical work.

Positive changes in the respiratory system characterize the expansion of its functional boundaries, but it is still far from its perfection. This is primarily due to the fact that younger schoolchildren have a high respiratory rate and a relatively small volume of breathing, the effect of oxygen utilization from ventilated air is small, the energy value of mechanical work affects the time of physical activity [88; p. 45-47].

An important feature of this age is the dynamics of the development of analyzers. For example, large areas of the hemisphere belonging to the motion analyzer are quite mature. However, close interrelations of functional capabilities between motor, visual and other analyzers have not yet been observed. Similarly, it has been established that the areas of the cerebral cortex that program and control voluntary movements are not mature enough, which affects both the mastery and restoration of most movements with a complex motor structure [13; p. 324].

Thus, the functional capabilities of 10-12-year-old schoolchildren are lower in most indicators than in adults, but the progressive development of individual organs and structures, increasing the functional capabilities of the body as a whole, allows for a rapid developmental impact. Indicators of the functional capabilities of the child's body are the leading criteria for physical culture - the selection of physical activity, the structure of motor activity (SDA) [27; p. 140, 45; S. 5 - 38.].

A high emotional load that affects the child for a long time, the development of inhibition processes in the central zones of the higher parts of the nervous system (protective reflex) and a low level of general physical performance lead to rapid exhaustion of the body. But, on the other hand, children of this age (11-13 years old) quickly recover from stress. Such an exchange of functional activity in the behavior of children requires an optimal sequence of load and rest during learning. It is necessary to avoid long, repetitive actions and prolonged emotional stress. The training process should constantly include new tasks, actions, various forms of organization of training [27; p-140].

§ 1.3. Development of physical qualities of children 10-13 years old

The analysis of scientific and methodological literature showed that a lot of works are devoted to the development of age-related features of the motor function, physical qualities of adolescent athletes [10; p. 24].

In general, all physiological indicators and vital activity of the human body are associated with constant movement. One of the unique features of the child's body is growth, so it is even more important to keep moving, because active

physical activity is considered an integral part of growth. From this point of view, the child's body needs constant natural movement. This is the true essence of mass physical education of children.

Primary school age is considered the most favorable for the development of motor skills, rapidly developing (speed) and coordinated abilities to perform long-term cyclic movements in the mode of medium and high intensity. The development of motor skills is carried out in two main directions: the first is the development of stimulating motor skills, and the second is purposeful development. Motivational development occurs in the process of formation of motor skills and is associated with teaching children the basics of movement control. Purposeful development is manifested in an increase in the functional capabilities of the body and is carried out by performing well-learned exercises in conditions of changing the magnitude of the training load.

With the growth of motor activity and morphological maturation of individual links of the main motor apparatus, the qualities of movement also develop. The rate of development of the speed of movements is especially high at 7-9 years old, that is, at primary school age, and reaches the highest level at 14-15 years old.

The formation of motor functions in children is determined not only by the maturation of the musculoskeletal system (MLA), but also by the maturity of the higher centers of motor regulation. Coordination of voluntary exercises in children improves significantly at the age of 7-11 years. The movements are varied and precise, smooth and harmonious. Children of this age will be able to dose their loads, subordinate their movements to a certain rhythm, slow them down in a timely manner, and avoid unnecessary movements. Increasing the managerial role of the cerebral cortex creates favorable conditions for purposeful activity [9; p. 44-64].

In children 6-13 years old, involved in sports, the development of the body occurs at a faster pace. Therefore, functional changes at this age create favorable conditions for the development of motor qualities [22; p. 10-47].

Childhood is an important stage of many years of physical development and is convenient for starting sports [8; p.160].

In children and adolescents who are systematically involved in sports, the development of physical qualities occurs more expediently and at a much higher rate than in their peers who are limited to physical education [15; p. 166].

Indicators of the development of motor functions in children aged 11-13 who go in for sports can vary from 5 to 25% depending on the use of various means of physical education [26; p. 75].

The increase in indicators of the development of physical qualities in adolescents who regularly go in for sports is two times higher than the average growth rate, which is typical for schoolchildren who do not go in for sports regularly for 3 years [33; p. 68-85].

In the scientific and methodological literature [25; p. 73], on the basis of the obtained data of school-age students, there are age-specific features that are specific for the development of physical qualities:

- the development of different physical qualities occurs heterochronously;

- the values of annual increments are not the same in different age periods and differ in their relative values when comparing the increments of motor qualities;

- in most children of primary and secondary school age, the indicators of physical qualities differ in their level (for example, the level of power static endurance, as a rule, does not coincide with the level of development of dynamic endurance);

- special training according to the same scheme, when the volume and intensity of physical activity are the same, allows you to compare the data of children of different ages, gender, physical development, has a diverse pedagogical impact - during the period of natural growth of physical development in adolescents (sensory period)), these qualities significantly exceed the average level of development of these qualities in children, adolescents who are not involved in sports [33; p.130];

- the level of development of physical qualities at each age differs among representatives of different sports [29; p. 150].

Consideration of age characteristics is important in the process of functional training of adolescent athletes at the stage of initial training.

With a change in age, speed develops more actively in younger schoolchildren than in high school students. Speed, muscle strength, technique, flexion, ability to accelerate are closely related to the level of effort[119; p. 96 - 105].

The ability to move at high speed is determined not only by functional, but also by morphological features of a person, for example: body length, weight, etc.

According to R. S. Salomov, speed is the ability of a person to perform motor activity with minimal time under certain conditions.

The main forms of manifestation of speed are as follows:

1) latent (hidden) exposure time;

2) the speed of certain movements (with a small external resistance);

3) action speed.

By the age of 13-14, the time of a simple motor reaction, determined by the speed of physiological processes in the nervous system, also reaches the level of an adult. Normal reaction time is hereditarily programmed, less influenced by training, and its reduction does not exceed 10-15%. From 7 to 13 years, the maximum arbitrary frequency of movements increases [23; p. 99], the best conditions are created for the formation of the frequency of movements at this stage of individual development [15; p. 166].

In the course of training there is a complex demonstration of speed. A person places the greatest emphasis not on the manifestation of elementary forms of speed, but on the speed of performing the whole act of action [26; p.75]. They are chosen as control exercises to assess the level of development of physical qualities in children of school age. For example, running 30 meters from a high start is used to assess the level of development of physical qualities in schoolchildren.

Overcoming external resistance or weight during fast movements is accompanied by significant muscle tension. Therefore, in sports practice, speed is

manifested in specific forms of speed-strength qualities. Children aged 11–13 years tolerate short-term speed-strength loads well [22; p. 10-47].

For the development of speed-strength qualities, dynamic exercises of an explosive nature are more often used. At the age of 12–14 years, the speed of movements increases due to the development of speed-strength qualities [17; p. 211].

At the age of 10-14 years, flexibility can be effectively developed by performing actions aimed at a specific goal. If the appropriate conditions are not used at the age of 14 years and later, the mobility of the joints increases with great difficulty.

At 10-14 years old, joint flexibility develops almost twice as efficiently as at senior school age.

At the stage of specialized development of mobility in the joints, the tasks of the widest development are set, which contribute to a faster mastery of sports equipment, and on this basis the results are improved.

The common task in the process of training strength as a physical quality of a person over the years is its comprehensive development and ensuring its manifestation at a high level in various activities (sports, work, etc.) [119; p. 96 - 105].

By the age of 8–11, favorable morphological and functional possibilities for the development of strength are formed. An increase in strength is associated with an increase in muscle mass, an increase in the thickness of muscle fibers, an increase in their reserves of carbohydrates, proteins rich in energy compounds, and an improvement in nervous activity [25; p.75].

To develop strength, special exercises are used to help develop the strength of all muscle systems or some muscle groups.

Strength development is uneven. At the age of 8-11 years, strength increases rapidly, and at the age of 11-13 years, the rate of growth in strength slows down due to puberty. From the age of 14-15, the strength again increases rapidly, and by the age of 18-20 it reaches its maximum value. These periods are the phase of increased sensitivity to dynamic strength exercises. Schoolchildren 7–10 years old have static stresses with rapid development of fatigue [21; p. 331]. In adolescent athletes, the

absolute and relative strength increases under the influence of two factors - natural age-related changes in the body and an increase in sportsmanship. For example, absolute strength gains in swimmers are largely determined by natural changes, while relative strength gains depend on the swimmer's skill level. Thus, the increase in sports results in swimming does not occur with an increase in absolute strength, but mainly with an increase in relative strength. If in swimmers a sharp increase in strength is detected at the age of 14-17 years, in basketball players, football players - at the age of 13-15 years, and the growth rate of the sum of absolute strength significantly exceeds the growth rate of the sum of relative forces. The annual increase in absolute strength is 21% from the start of systematic football until the age of 14, while the increase in relative strength is only 2.5-3%. This difference is explained by the anatomical and physiological features of the development of a teenager at this age and the tradition of weight gain and growth [11; p. 24, 35; p.130].

Endurance develops later than other physical qualities, while it is characterized by adequate maintenance of the body's performance [22; p.75]. With age, endurance increases significantly both under static loads and during dynamic work. In children 3 years old, the duration of static tension of the flexor muscles of the fingers is 36 seconds, and by the age of 16-18, the tension increases by 3-4 times. The increase in the duration of tension of different muscle groups is not the same and uneven with age. At the age of 8-11 years, the muscles that extend the trunk are characterized by low endurance, and the muscles that flex and extend the shoulder region are characterized by high endurance. At the age of 11-14 years, leg muscle endurance increases significantly. In adolescents of both sexes aged 13-14 years, there is a slight decrease in the static endurance of the muscles that flex and regulate the shoulder area, and the muscles that regulate the body.

Opportunities for developing endurance will be strictly individual.

There is an opinion that the development of this quality should begin at aged 6-10-20 years [32; p.140]. Scientific studies of individual specialists show that a rapid increase in endurance to dynamic work is observed from the age of 11-12.

For example, if we take the volume of dynamic work of 7-year-old schoolchildren as 100%, then by the age of 10 it will be 150%, and by the age of 14-15 - 400% [21; p. 9-15]. Under the conditions of a gradual increase in the duration of low-intensity exercises, boys of 11-12 years old can run up to 14 km per week, and the performance of teenage swimmers of 8-15 years old increases by 3-4 times [23; p. 99]. Consequently, adolescent athletes are characterized by a stable increase in working capacity.

1. As you grow older, the possible duration of work increases when performing vigorous exercises with weights (from a maximum of 50%). The amount of work for children aged 11-12 is 66.5 kg/m, which is 3.5 times less than for adults [40; 135-137].

Some authors [25; p.75], argued that physical qualities play a leading role in the formation of motor skills.

The ability of a teenage athlete to realize the achieved level of development of physical qualities in a particular motor act is of paramount importance, therefore, it is necessary to analyze not only the interdependence of functions, but also the interdependence of functions with the level of technical skill and sports results [23; p. 10-47].

When developing motor qualities, it is most effective to use a set of exercises from the means of general physical training in separate exercises, using exercises aimed at speed, strength and endurance, or giving priority to the development of speed and speed endurance. The most effective option in such a complex is as follows: 35% of the training time is devoted to speed development, 30% to strength development and 35% to endurance, which is used at the beginning of the fastest phase of speed development in adolescents aged 13-14 [30; p.150].

For the development of power qualities in junior schoolchildren, it is advisable to use dynamic speed-strength exercises [27; p. 75].

Taking into account the age characteristics of children, it is distinguished by the effectiveness of the use of two main methods - repetitive and dynamic loads in the development of strength. The use of exercises with strong resistance consists of

various objects (medicated balls, dumbbells, etc.), counter movements of the partner, resistance of external weights and the weight of one's own body [64; p. 67].

Means of developing strength should contribute to the improvement of key muscle groups - the waist, arms and legs, muscles of the body (back, chest and abdomen). The greatest effect in the training of strength skills is achieved by organizing exercises that allow you to comprehensively develop all muscle groups.

The main method of developing speed is an exercise performed at maximum speed. Speed skills are small and develop most successfully during adolescence. During this period, it is advisable to train speed by means aimed at increasing the frequency of movements. At the age of 11-14 years, speed should be increased, mainly due to speed-strength exercises. The duration of speed exercises should be within 4-6 seconds for children and adolescents, and depending on the training, the number of movements per unit of time should increase by a small amount.

Before performing exercises aimed at training speed abilities and preparing the OD for performing high-speed movements, it is necessary to perform a warm-up for 15-20 minutes [38; p. 12-49].

Speed exercises should be used at the beginning of the main part of the training session, followed by strength and endurance exercises. The development of speed is very effective when using sports and outdoor games in training [36; p.130].

When training speed, the exercises must comply with the following methodological rules: the exercise should not be technically difficult; exercises should be well learned by those involved; the duration of the exercise should be such that by its end the speed does not decrease due to fatigue; the duration of fast exercises should not exceed 16-17 seconds in children and adolescents; subsequent exercises are performed in the high recovery phase; active rest is applied before the repetition of high-speed exercises, it can last 1-2 minutes; speed exercises are performed primarily in training sessions.

The ability to resist fatigue is developed in the body of the trainee in the process of training to fatigue. Many researchers have shown that static endurance

can be formed from early school age, when children do not have a high degree of endurance development [35; p. 4-10].

Some experts suggested at this age to pay more attention to the development of general endurance, recommending the use of slow running at a measured pace. However, from 10-11 years old, it is necessary to gradually reduce the training distance, increase the speed of its passage [Khalmukhamedov R.D., 2010]. This work is performed with a pulse of 170-185 beats / min, and the rest interval is recommended to be 45-90 seconds. By gradually increasing the duration of low-intensity work, it is possible to increase the amount of running load up to 12 km per week at the age of 10–11 years [29; p.140].

Some authors, when working with children aged 10–13, suggested using the most intense running or outdoor games in one direction to develop endurance [36; P.130]. Motor tests of general endurance, such as alternating running and walking, are also easier for younger children to perform than accelerated endurance tests. From the age of 4, general endurance develops very quickly, high rates of its growth persist up to 9 years in girls and 11 years in boys. During 2-3 years of puberty, the growth rate decreases slightly, and then increases again. Endurance can be developed starting from primary school age, with the help of slow jogging lasting 8-30 minutes, sports games lasting 30-60 minutes (football, handball).

Volume and intensity can be controlled through rest intervals targeting a maximum of 190 beats per minute. When using short tracks (30-80 m) in running, the duration of the rest interval can vary from 1 minute to 1.5 minutes. When using longer distances (150-250 m), the rest time can increase up to 3-4 minutes [64; p. 67].

The combined use of various means of training influence to a greater extent characterizes the effectiveness of endurance training.

General preparatory, special preparatory and competitive exercises are used as a means of developing endurance.

With the development of general endurance, continuous long-term (at least 25-30 minutes, 50-120 minutes or more for young amateurs) work performed at a constant or variable speed is used.

The repetition method allows you to control the load by the number of repetitions when the rest intervals are sufficient.

Interval method precisely adjusts training and recovery times.

The variable method involves performing exercises at a variable pace, with rest intervals from 1-1.5 minutes to 3-4 minutes, depending on the magnitude of the load, at the peak of 140-180 beats / min, depending on fitness.

The circular method allows various use of various means of OFP, SFP and their combinations.

The competitive method involves the improvement of the leading physical qualities characteristic of the chosen sport in activities with an acute conflict with an opponent [16; p. 23-25].

With the development of endurance, the intensity of exercises can be 75-85% of the maximum, and the rest intervals are supplemented by low-intensity work [37; p. 48].

Motor-coordination ability is a unit of interaction between the central and peripheral control functions of the human sensory system, which allows reconstructing the biomechanical structure of motor actions in accordance with the changing conditions for solving motor tasks [27; p. 75].

Motor-sport games, gymnastics, acrobatics, athletic jumping, throwing are effective means of developing motor-coordination skills [9; p. 160]. When educating dexterity, some methodological considerations should be taken into account [26; p. 75]. Apply original case in special view; perform exercises, reflected in the mirror; change the pace or speed of movements; change the spatial boundaries of the exercise; changing exercise methods; complicating exercises with additional movements; changing the counter movements of participants during group or pair exercises.

The rest interval should be sufficient for a relatively complete recovery. Subsequent exercises should be started in the absence of significant fatigue from the previous load. Exercises aimed at developing motor-coordination skills should be performed at the beginning of the main part of each training session [39; p. 12-49].

Age-related features of dosing physical activity in boys are as follows: for the spine - from 45 to 60 repetitions, for the pelvic joint - from 30 to 35 repetitions for each leg; for the shoulder girdle - 25-35 repetitions for each catch. Exercises are performed in series - with a gradual increase in amplitude by 3-5 rhythmic repetitions. You should add the number of repetitions every 10 sessions [100; p. 48].

The specifics of flexibility training can be represented as follows: large-amplitude active and passive motor exercises; exercises with a partner or with a load.

With the development of flexibility, in addition to dynamic exercises, static exercises should also be used with fixation of individual parts of the body for 20-30 seconds.

Flexibility exercises have a positive effect if you do them every day. The best time to develop flexibility is from 10 am to 11 am and from 3 pm to 4 pm. An increase in the efficiency of flexibility development is associated with classes in a warm room with previous vigorous warm-up exercises.

Flexibility exercises should be included in the preparatory or final part of the lesson and general developmental exercises should be performed..

Conclusions on the first chapter.

Analysis of scientific and methodological literature, pedagogical observation, anthropometry, pedagogical experiments became the basis for the following important conclusions:

Analysis of the scientific and methodological literature on the topic revealed that it is possible to control the development of special movements of taekwondo fighters, to achieve a uniform development of all physical qualities and thereby improve the sports results of athletes;

The analysis of scientific sources revealed the absence of methods and innovative technologies that combine a wide range of alternatives for managing

special movements of taekwondo fighters aged 10-13, who are engaged at the stage of initial training;

Existing methods and innovative technologies associated with this area have limited capabilities or control only a very narrow range of qualities;

As a logical continuation of the above conclusions, it should be noted the need to develop and put into practice innovative technologies with high technological capabilities aimed at fully managing the development of special movements of young taekwondo fighters, not only taekwondo fighters, but also martial arts masters;

At the stage of initial training, it was found that the indicators of the physical development of taekwondo fighters, along with the indicators of the development of physical qualities, also need systematic monitoring for the development of psychofunctional indicators;

Along with the physical development of taekwondo fighters, it is necessary to pay serious attention to their psycho-functional training, and the regulation of motor activity is one of the most important and urgent issues. Since improper normalization of training loads increases the risk of excessive physical and psychological stress in athletes;

To achieve the above tasks, it is necessary to establish broad cooperation between practitioners in the field of physical education to achieve practical results, conduct a comprehensive study of the field of physical education (especially taekwondo) in developed countries and exchange experience, it is necessary to improve existing methods and learn new ones.

CHAPTER II. EFFICIENCY OF USE OF MODERN TECHNOLOGIES IN DETERMINING THE INDICATORS OF PHYSICAL TRAINING OF TAEKWONDISTS

§ 2.1. Application of modern technologies in determining the physical fitness of taekwondo athletes

In martial arts, the results of a tournament are determined by a number of interrelated factors: the characteristics of movements, technique, tactics, psychological characteristics of athletes, the method of refereeing [123; C 224;], [30; P.75], [80; P. 176], [126; P.6-9], [125; From 18-20]. The force of impact or impact is an important element of special physical training [125; P.18-20], [109; P.37], [132; P. 445-450], [109; P. 37]. It has been proven that the force of the kick is greater than the force of the punch of the boxer's leading hand, and that the force of the penetrating force depends on the skill of the athletes. The same can be said about the power of punching in taekwondo.

The main purpose of the study was to develop a new system for measuring the force of impact and kick, as well as to determine the reaction time of athletes to a signal, the accuracy of a strike on both legs and arms in martial arts. In addition, the study examined whether such devices were designed to measure the force of punches thrown by boxers and the force of punches thrown by taekwondo fighters..

The presented device was developed and approved by the Academy of Sciences of the Republic of Uzbekistan, the Scientific and Technical Center, the Design Bureau and pilot production. “Hardware-software complex for measuring martial arts strikes” is designed for boxers and taekwondo fighters, and in general, this device can be used in all types of martial arts.

«Hardware-software complex for measuring strikes of combatants” consists of a boxing bag with accelerometric sensors, a data processing unit and computer software “TABO-STAR”. When connected wirelessly to a computer, the device operates from a 220 V network. It allows you to measure the impact force on the boxing bag, the speed of the punches (number of punches per minute), the athlete's

reaction time, the signal and the area of the bag that was hit. Maximum measuring force - 8000 kg.

The punching bag looks like a cylinder. Its height is 130 cm and its diameter is 45 cm. The bag is divided into five impact zones in height (pictured). During the exercise, the scientific researcher (trainer, instructor) must give a “hit” signal to a certain area. Inside the punching bag are a number of ADXL345 accelerometer sensors that measure the acceleration resulting from the "hit". The measurement result from all sensors is digitized and transmitted to the data processing unit via a wire bus.

In the processing unit, the data measured using mathematical calculations are converted into the value of the force applied to the bag. In addition, the microprocessor of the data processing unit has a timer function that counts the time. According to the results of the calculation, the speed of blows on the bag is determined, that is, the number of blows for a given time interval. The data processing unit is also equipped with a sound signal source - a buzzer. In some exercises, the sound of the signal signals the athletes to strike. The microprocessor calculates the time from the moment the signal is given to the moment of impact and thus determines the athlete's reaction time to the signal.

“Hardware-software complex for measuring strikes of combatants” is controlled by the computer program “TABO-STAR”. Communication between the computer and the data processing unit of the device is wireless.

The computer program for managing the connection to the device includes controls; tabular lists with athletes' data and exercise results; control of the choice of the mode of operation and the launch of the corresponding exercises; in Microsoft Excel format, the tasks of exporting and saving exercise tables are performed.

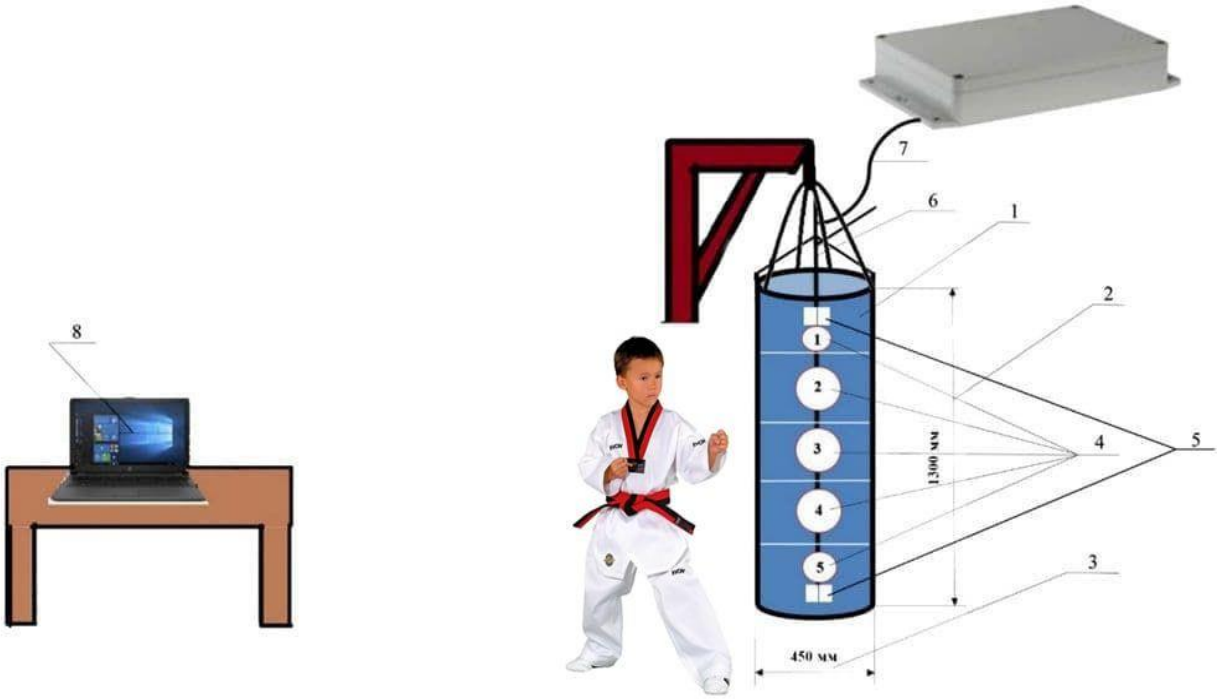


Figure 2.1. “Hardware-software complex for measuring strikes of combatants”

1. Boxing bag weight: 60 kg

2. Boxing bag height: 130 cm.

3. Punching bag diameter: 45 cm.

4. The height of the bag is divided into five equal zones to determine the accuracy of the "hit".

5. Accelerometer sensors for signaling athletes and recording impacts.

6. USB cable for information transfer to a computer

7. Data Processing Unit.

8. For fighters, a laptop with a bilingual program and rules.

The order of operation of the complex is as follows. The teacher launches the program on the computer and selects the required exercise from the list. In addition, one athlete is selected from the list of the table and the start training button is pressed. This puts the processing units and sensors into measuring mode.

If an athlete is not on the list of the table, then he or she must be added to the list before the start of the exercise.

When the device switches to the measurement mode, depending on the selected exercise, the microprocessor starts the timer, starts polling the sensors and beeps. Each impact on the bag is fixed by a microprocessor, its power, place (impact zone) is calculated. If necessary, the delay time from the moment the signal is given is set, and the number of beats in the selected time interval is also determined. In addition, the program allows the teacher to signal manually by pressing the appropriate button.

When the athlete has completed the exercise, the microprocessor exits the measurement mode, calculates the necessary parameters and transfers the results of the exercise to the computer. The program enters the received data into the corresponding columns of the table. The instructor can then select another athlete and restart the previously selected exercise or start selecting another exercise. After completing all the exercises, you can save the results from the spreadsheet in Microsoft Excel format.

The main goal of the study was to create a new device for measuring the strength and speed of punches, determining the accuracy of punches and kicks, as well as determining the athlete's response to a signal. The measurement result received from all sensors is digitized and transmitted by wire to the data processing unit, which is equipped with an audio signal source - a buzzer, and the data processing unit converts the measurement results into values using mathematical calculations. In addition to the impact force applied to the bag, the microprocessor of the data processing unit has a timer function that transmits data to the computer via bluetooth (without wired data transmission). In the literature, one can find different ways of measuring “hit” and “strike force”, as well as very different values of force, speed [107; P. 560], [109; P. 37], [121; P.24-28], [1], [103; P. 12-14].

§ 2.2. Development of speed and accuracy in young taekwondo athletes (WT)

Competitive motor activity in taekwondo is characterized by a significant manifestation of speed-strength abilities. This is due to the fact that the competitive motor activity of a taekwondo fighter is based on a variety of motor actions that require significant muscle strength, in other words, under the conditions of gravitational force and opposition from an opponent. In this regard, due attention is paid to the speed-strength training of taekwondo athletes.

The urgency of solving this problem lies in the fact that the development of the scientific basis and content of the methodology for developing the speed and accuracy of strikes among young taekwondo fighters and its implementation in practice will significantly increase the efficiency of training taekwondo fighters, many defense and attack techniques have a positive effect on the growth of sportsmanship, enabling coaches use progressive tactics.

The purpose of this study was to develop a methodology for developing the speed and accuracy of strikes, taking into account the characteristics of competitive motor activity in the annual training cycle of young taekwondo athletes..

Research methods. The study is divided into two stages: the basic rules for the speed and accuracy of strikes in taekwondo, the means and methods that should be used by young taekwondo fighters in a one-year training cycle, and sequence. At the first stage, a formative pedagogical experiment was carried out, confirming the newly developed methodology. A comprehensive analysis and generalization of the results was carried out.

Анализ литературы позволил выявить тесты, направленные на определение степени развития у юных таэквондистов скорости и точности.

1. Pull-ups (times)
2. Flexion and extension of the arms in the prone position (times)
3. 30 meters run
4. Standing long jump (cm)
5. Forward bend from standing position (cm)

6. Pulling up the legs at the crossbar (times).

7. Run for 1000 meters (min).

8. Raising and lowering legs (within 10 seconds)

9. The coin test focuses on reaction speed (time)

10. Half squat for 6 seconds (times).

11. Newspaper sheet test.[38; p. 47]

According to [6; P. 22] speed has different manifestations. The author singles out speed as the ability of a quick motor reaction to visual, sound or tactile stimuli. For example, the speed with which the fencer reacts to the movement of the opponent, the speed with which the runner moves from the very beginning over short distances. Speed is also expressed in the ability to change the direction and nature of movement, to stop movement. It is this aspect of the quality of speed that is most clearly manifested in sports games, skiing, slalom.

Among the general means of physical training that contribute to the development of speed of movement, the following are recommended::

1. Gymnastic exercises and outdoor sports games that set high requirements for the manifestation of speed qualities.

2. Running exercises: high hip lift, small run, up and down acceleration, walking, resistance run, 3-step acceleration.

3. Several jumps or runs performed from a standing position, or a short flight run.

4. Pulling the hip to the chest with quick bounces.

5. Switching legs when jumping from a deep run.

6. For ease of hands - the exercise is to imitate a blow.

7. Exercises for the abdominal muscles in the hanging on the wall of the gym are fast oncoming movements (“scissors”) of legs brought together in a vertical plane.

8. A similar exercise to stretch the muscles of the back and hips is performed lying face to face on a gymnastic bench.

The list of exercises can be continued, but each coach and student will use the most suitable and favorite in practice. Exercise time control is a good incentive to increase movement speed.

From the arsenal of special physical training, we can recommend the following exercises that will help develop speed:

1. Perform hits at maximum speed with rackets, paws, pillows and bags of various weights.

2. Execute part of the sparring movement at a restraining or limiting speed (half-movements: for example, bringing the knee to the apcha).

3. An exercise with a rubber shock absorber that imitates kicks or hand strikes.

4. Exchange of exercises at maximum speed (with and without contact with an opponent) when performing exercises in pairs or several partners.

5. To imitate high-speed movements - exercises on power simulators, etc..

It should be noted that the retention time of the speed nature of the GPP and SPP exercises depends on the intensity of their implementation, the time and nature of the breaks between the exercise and the sequence of exercises..

Exercises performed at maximum intensity maintain their speed for approximately 6-8 seconds. The interval of rest between exercises should be such that, with sufficient full recovery of working capacity, motor activity does not significantly decrease.[38; p. 42-43]

One way to increase speed is to schedule speed-focused microcycles during your workout. However, a high training effect of such microcycles is possible only if they are planned after recovery microcycles, which allows achieving the greatest effectiveness in individual exercises.

Table 2 shows individual speed, justified duration of pauses between exercises, during the development of complex speed skills, depending on the size of the muscles involved in the work of each exercise, and the intensity of work.

Consistent execution of exercises will help to increase the amount of work on the development of speed skills. For example, a series may contain 10-15 short-

term exercises of a local nature. With a sufficiently long performance of partial and global exercises, their number in a series can be reduced to 3-4 or 2-3. The duration of pauses between series also depends on the nature of the exercises, their duration, intensity of work and is usually 2-6 minutes..

Table 2.

Mode of work and rest during the development of complex speed skills

Duration of exercise, s	Work intensity, % of maximum speed	Duration of pauses during exercise, s		
		Local character	Normal character	Global character
Up to 1	95-100	15-20	30-40	45-60
	90-95	10-15	20-30	30-45
	80-90	5-10	15-20	20-30
4-5	95-100	30-40	50-80	80-120
	90-95	20-50	40-60	60-90
	80-90	15-20	30-40	50-60
8-10	95-100	40-60	80-100	120-150
	80-90	20-30	40-60	60-90
15-20	95-100	80-120	120-150	150-180
	90-95	60-80	100-120	150-180
	80-90	40-60	80-100	120-150

When developing speed training programs, it should be taken into account that local exercises (short strikes, punches and other motor movements) involve less than 30% of muscle mass in work. Most strikes in taekwondo are performed on the move and in place, the steps require the participation of the average size of the muscles (up to 60%) and therefore involve partial exercises. Examples of exercises of a global nature (more than 60% of muscle mass) include jumps, jumps, multiple strikes and combinations of strikes. [38; p. 44-45]

Research results. The study involved 619 young taekwondo athletes. The initial level of development of accuracy in the control and experimental groups was determined by specially designed tests. Quantitative selection is appropriate for each manifestation of this quality. Analysis of the data showed that there was no significant difference in the initial level of development of accuracy in all subjects.

The accuracy of each movement was determined by the degree of its compliance with the form of external training and was determined by the following parameters: direction of movement, magnitude of amplitude, intensity of execution, speed of movement and ease. Strenuous movements are learned quickly and easily with a very high level of accuracy. At the same time, the tension is so divided that the preparatory movements are overlooked, and the judges and spectators focus on the main movement.

An experimental group of young taekwondo athletes were asked to give a rhythmic description of their movements. The main moment was determined when it was necessary to learn the rhythm of the training, the preparatory and final movements were divided. This allowed the simultaneous control of several movements, which was perceived as a natural flow of movements.

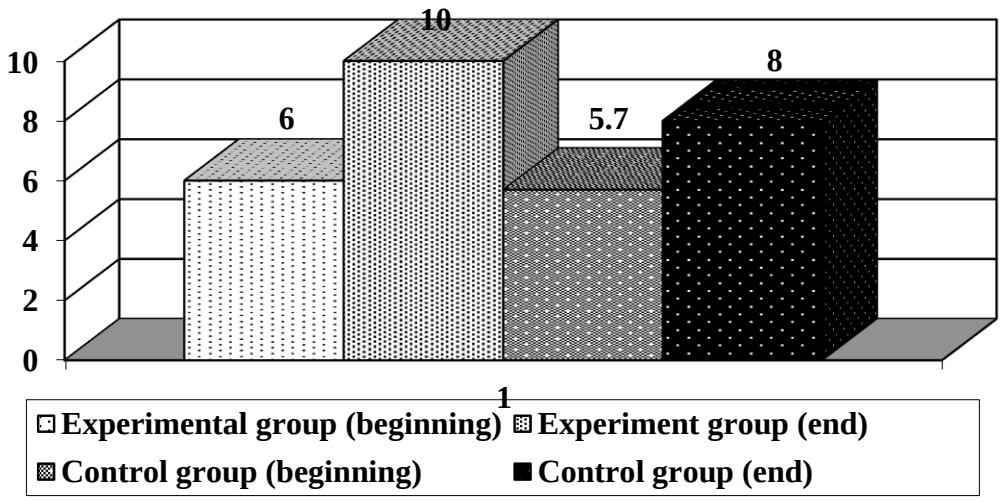


Figure. 2.1. Pulling up on the horizontal bar (times);

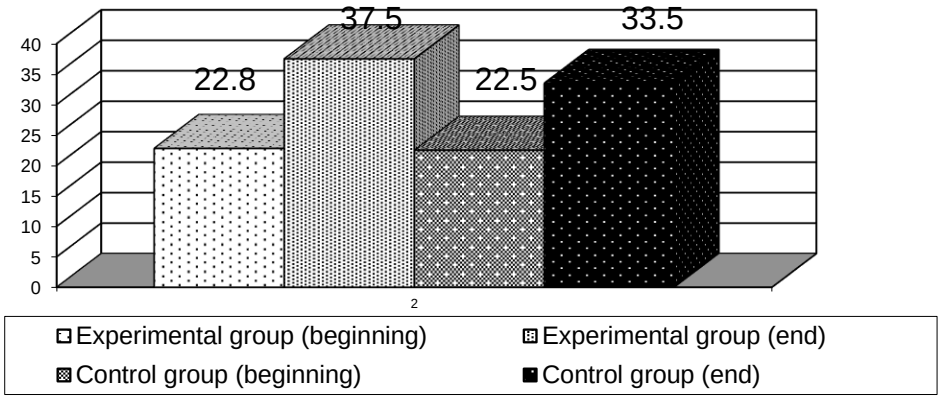


Figure. 2.2. Push up

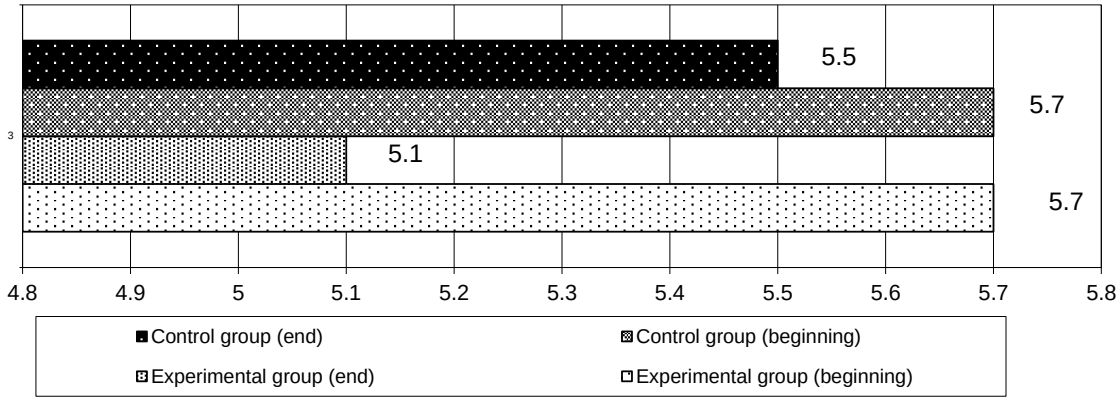


Figure 2.3. 30m run (second);

§ 2.3. Indicators of the physical development of taekwondo athletes aged 10-13

Before talking about the indicators of physical development of young taekwondo fighters of initial training, it is advisable to first give detailed information about what is meant by the term physical development, what is included in the indicators of physical development and what methods are used.

So why are the indicators of the physical development of children an integral indicator of their health?

Because it describes the conditions of upbringing and education created for children in the family, preschool institutions, schools and the state of children's health. Indicates the presence of a disease. That is why indicators of physical development are an integral indicator of children's health..

The physical development of children and adolescents is characterized by the following indicators:

- somatometry: height, weight, chest circumference;
- physiometric: muscle strength, thickness of the subcutaneous fat layer, vital capacity of the lungs, pulse rate, blood pressure;
- somatoscopic: sexual development formula, skeletal condition, number of permanent teeth, body skin condition.

Assessment of the physical development of children and adolescents is carried out in comparison with the standards of physical development. There are the following types of methods of personal assessment of physical development:

- According to the regression scale;
- According to the complex scheme;
- On the Senthil scale.

The order of personal assessment of physical development:

- a regression scale is found taking into account the exact time of the birth of the child and the time of the examination;
- there is a regression scale corresponding to gender, age, ethnicity and place of residence.
- child development indicators are determined taking into account growth (average, above average, below average, etc.);
- on the scales find what should be the weight on this height;
- determine the value of yoσ (sigma deflection) for body weight and chest circumference. For example, the real weight of a child is 30 kg, the weight according to the table is 32.1 + 3.1, so the weight deviation sigma = (32.1-30): 3.1 = 0.7. If the value of the sigma deviation is about 1 sigma, then the physical development is harmonious; sigma deviation is considered disharmonious if it is from yo1 to yo2 sigma, and sharply disharmonious if it is greater than 2 sigma.

There are the following standards of physical development.

According to the regression scale;

- According to the complex scheme;
- On the Senthil scale;
- Sigma deviation method;

The following discussion discusses why in organized comunities physical development is assessed against.

Comparison with the standards of physical development allows you to accurately assess the level of physical development of the child and timely adjust the hygienic factors of the children's environment, including children's nutrition,

the type and level of physical activity, the organization of places in schools and circles, a well-structured daily routine, as well as the order and nature of school classes , the correctness of the sanitary equipment of children's institutions, the quality of lighting in the rooms.

Using the motion algorithm to compare the physical development of children in organized communities, the value for each group of compared indicators is calculated and the index of reliability of differences in "t" is determined. The level of reliability of differences is estimated. The necessary conclusions and recommendations for assessing the indicators of physical development in the compared group of children are given..

Studies based on these rules have proven that many high results can be achieved by applying the recommendations and conclusions made on the basis of scientific research in sports practice..

It is known that the bright future of sports depends on the breadth and quality of the set of sports resources. It is important to raise Uzbek sports to the world stage, raise it to a competitive level, organize children's sports on a scientific basis, develop effective means and methods in this regard and introduce them into the training process.

Today, one of the most popular and developing sports in our country is taekwondo (WTF). Therefore, it is an urgent requirement of our time, in the Asian and World arenas in this sport, the emphasis on training highly qualified taekwondo athletes who will adequately defend the honor of our country, we must start from the initial stage of training.

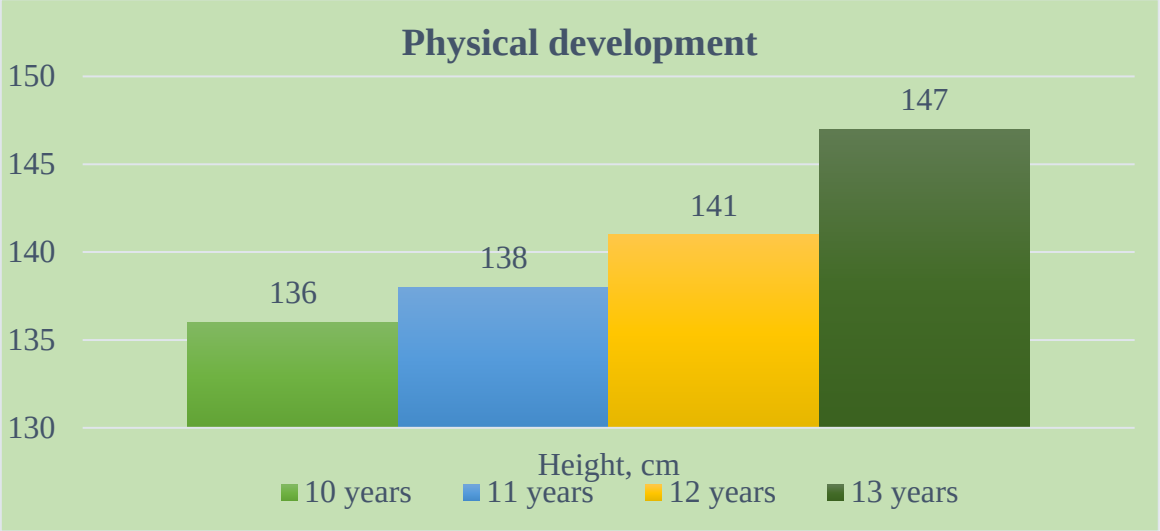


Figure. - 2.4. Age dynamics of growth indicators of taekwondo athletes 10-13 years old

In the training group, the goal was to identify differences in body length and physical development of taekwondo athletes 10, 11, 12 and 13 years old. Measurements were taken of the body length of taekwondo fighters who were engaged at the stage of initial training.

According to the data, the body length of 10-year-old taekwondo athletes was 136 cm, 11-year-old taekwondo athletes - 138 cm, 12-year-old taekwondo athletes - 141 cm, and the last 13-year-old taekwondo athletes selected for the study had a body length of 147 cm (see Fig. 2.4.).

In the growth of 10-13-year-old taekwondo athletes at the stage of initial training, the greatest differential result was found in 12-13-year-olds (6 cm).

Certain results in terms of body weight of taekwondo fighters 10-11-12 and 13 years old were 31.5±2.11 kg; 33 ± 1.01 kg; and 32.8 ± 4.25 kg. Among the results obtained for these indicators, there was practically no significant difference. The average body weight of 13-year-old taekwondo athletes was 37.8 ± 4.88 kg. (See Figure 2.5.)

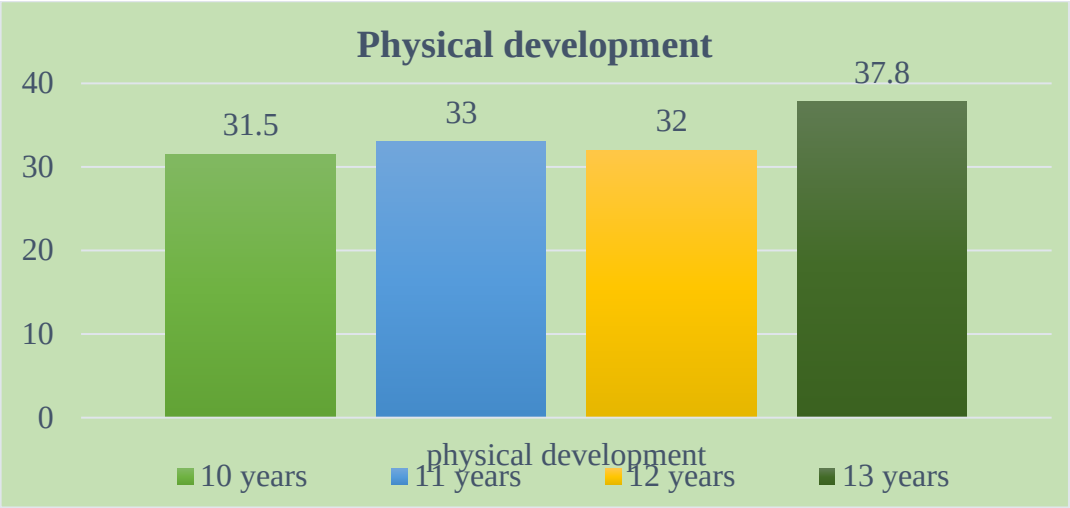


Fig-2.5. Dynamics of body weight of taekwondo fighters aged 10-13

The result was 6 kg higher than that of taekwondo athletes of other ages. A comparison of the results of a study conducted by physiologists (1991) showed that the increase in body weight in 13-year-old taekwondo athletes was normal.

The next test is an indicator of the physical development of taekwondo fighters 10-11-12 and 13 years old, involved in the initial training stage, also includes the results of the study obtained to determine the strength of the hand-arms. In order to be able to compare the level of development of the strength of the hand-arms and draw accurate conclusions, the indicators of the right and left hands, taekwondo fighters were recorded separately. To determine the strength of the hand, the results of the study were as follows.

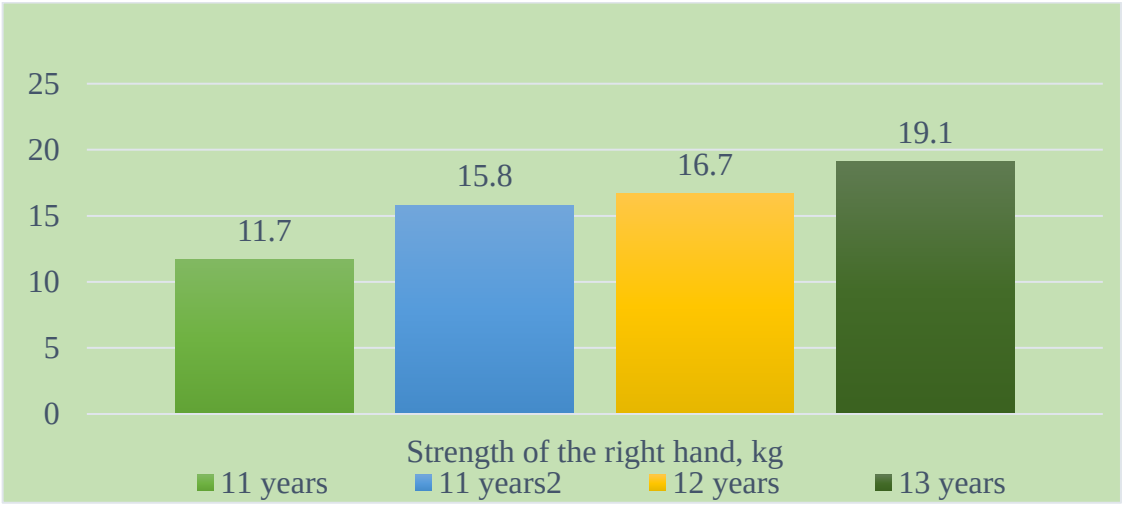


Fig.2.6. Dynamics of hand strength in taekwondo fighters aged 10–13

According to the data, the indicators of right hand strength in 10-year-old taekwondo athletes at the initial training stage averaged 11.7 kg, it was 10.9 kg with a slightly lower indicator in the left hand. According to the same indicators, in the results of 11-year-old taekwondo athletes, the data on the strength of both hands were obtained..

If you first give the results from the right hand, you can see that the result of this indicator was 15.8 kg. In 11-year-olds, as well as in 10-year-old taekwondo athletes, the index of the strength of the left hand was slightly lower - 13.4 points compared to the strength of the right hand.

At the stage of initial training, 12-year-old taekwondo fighters are somewhat behind in development at this age than 10- and 11-year-olds, both in terms of hand strength and in terms of the level of physical qualities of hand strength. The strength of the hand-arms of the right hand in children of 12 years old was 16.7 kg, and the average dynamics of the development of the left hand was 14.6 kg.

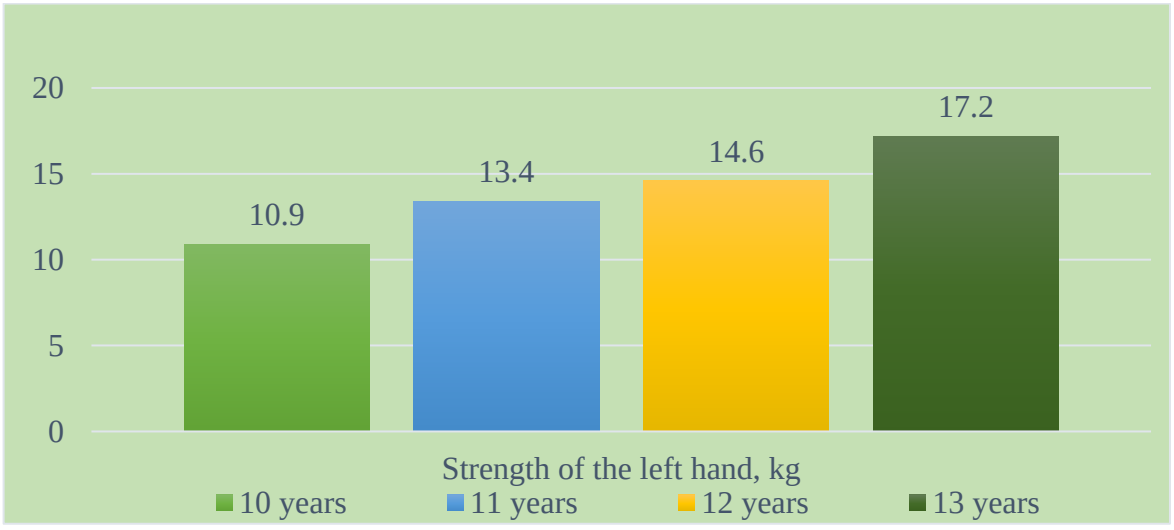


Fig. 2.7. Dynamics of hand strength in taekwondo fighters aged 10–13

In taekwondo fighters, the state of a rapid increase in the dynamics of the development of indicators of the physical strength of the hand was observed at the age of 13. The right hand strength of the 13-year-old taekwondo fighter was 19.1 kg, while the left hand hand strength was 17.2 kg.

Based on the results obtained, it can be concluded that the level of hand-arm strength development dynamics at the age of 10 and 11 years can be assessed as satisfactory. It can be seen that this rate of development decreases slightly between the ages of 11 and 12. And, of course, you can see that growth rates improve again at ages 12 and 13. The best indicators of the dynamics of physical development were observed in 10-11-year-olds in the age group of 12-13 years. At the age of 11-12 years, the rate of development was low.

One of the main indicators of the physical development of taekwondo practitioners at the stage of initial training is the circumference of the chest. Also, measurements of the chest circumference of taekwondo fighters 10-13 years old were obtained, which made it possible to make a complete conclusion about which age group corresponds to the fastest development indicators when analyzing data on the results obtained.

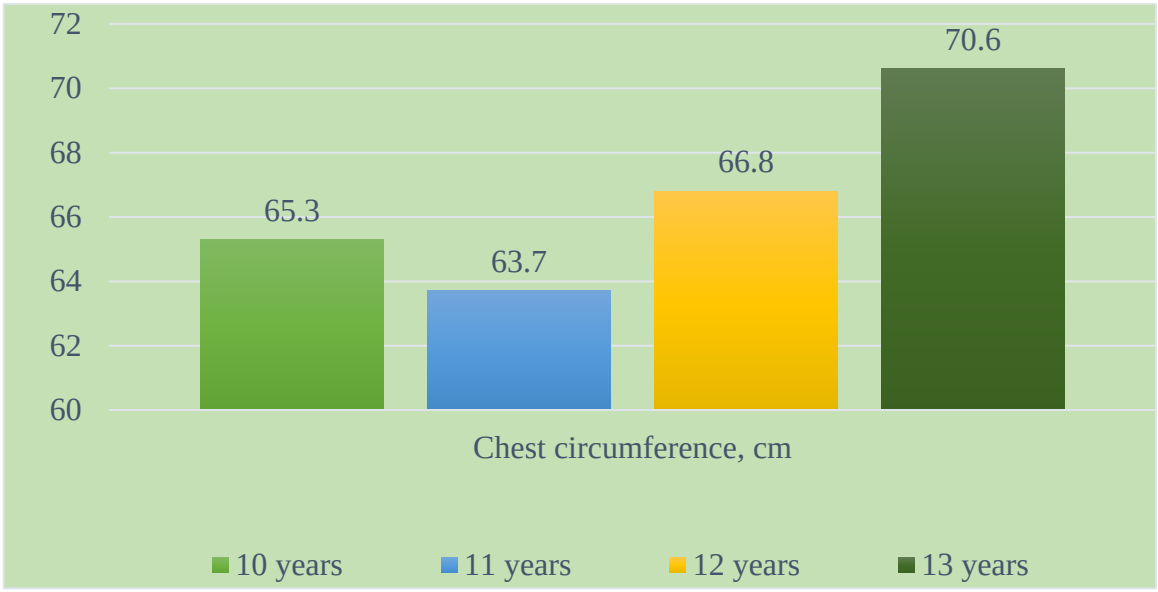


Figure. 2.8. Age dynamics of chest circumference of taekwondo fighters 10-13 years old (at rest (cm))

The lowest resting chest circumference was 63.7 in 11-year-old taekwondo athletes.

It was found that the size of the circumference of the chest during deep breathing is almost the same at the age of 10-12 years. In a 10-year-old teenager,

the result was 65.3 cm, and in a 12-year-old - 66.8 cm. One of the indicators of the physical development of taekwondo athletes at the stage of initial training was the circumference of the chest, the highest and best level of development according to the results of measurements was exactly 70.6 see corresponding to 13 years of age.

The average results of the study of lung capacity of 10-13-year-old taekwondo athletes were 1.82 ml in 10-year-olds; 1.87 ml in 11-year-olds; At 12 years old 2.3 ml; and, at the end, our 13-year-old taekwondo athletes had 2.26 mln. (See Figure 2.9).

It can be seen that if we trace the dynamics of the development of the vital capacity of the lungs of taekwondo fighters 10-13 years old, we can see that there is practically no big difference in the vital capacity of the lungs of 10-11-year-olds, and a small difference in the vital capacity of the lungs of 12-13-year-olds.

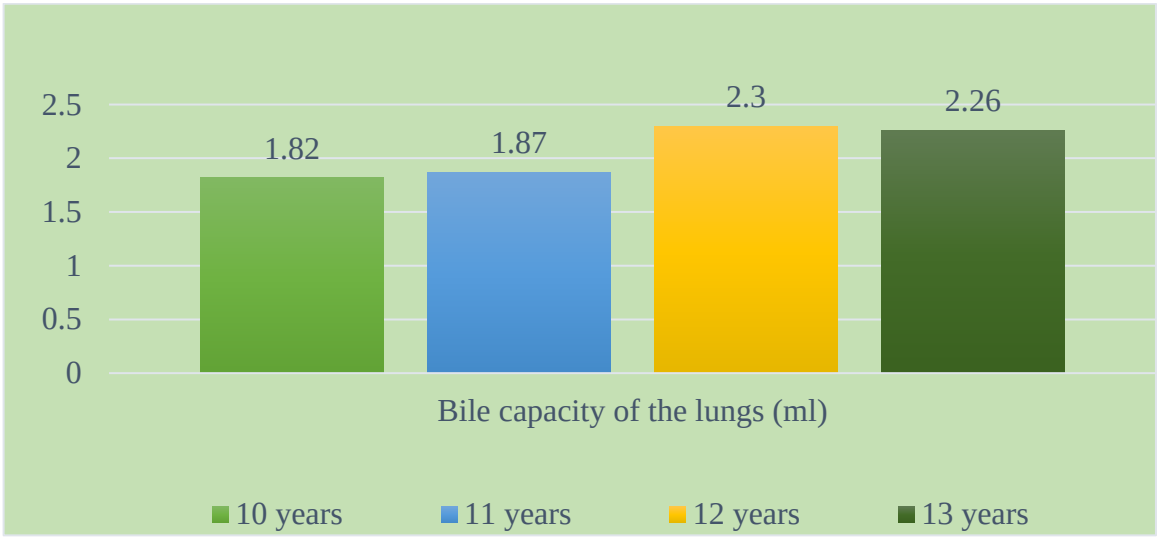


Fig. 2.9. Age dynamics (mln) VC of taekwondo athletes aged 10-13

The main stage in the development of the dynamics of lung capacity in taekwondo athletes involved in the initial training stage was observed at the age of 11-12 years.

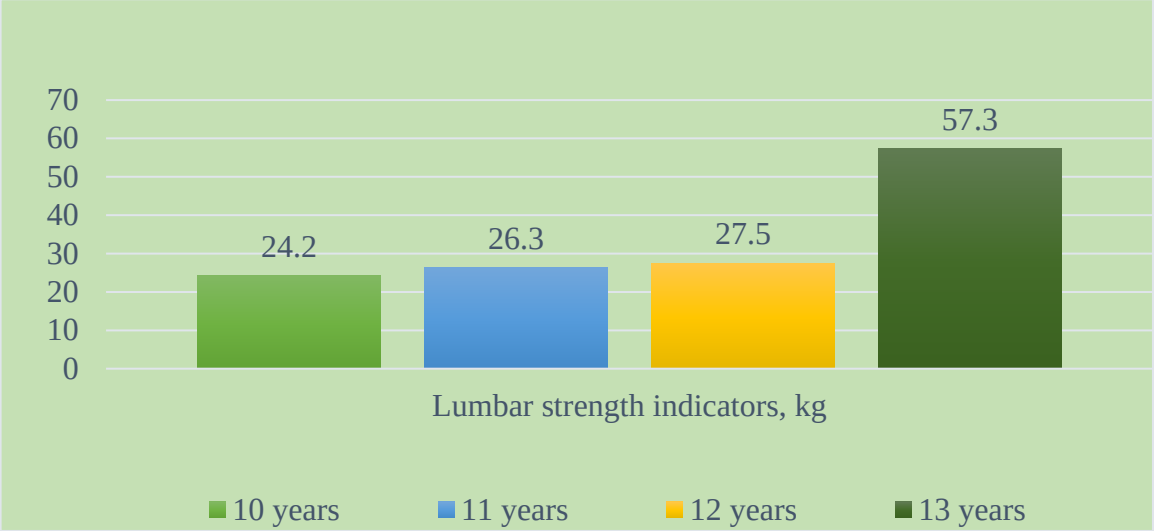


Fig. 2.10. Age dynamics of lumbar strength indicators of taekwondo athletes aged 10-13 years kg

In order to obtain complete information about the level of physical development of taekwondo fighters at the age of 10-13 years and in order to draw appropriate conclusions on the identified problems, tests were included in the research plan to determine the lumbar strength of taekwondo fighters and certain results were obtained..

The data obtained was as follows. According to the data, the lumbar strength of 10-year-old taekwondo athletes averaged 24.2 kg, while we can see that the difference in lumbar strength of 11-12-year-old taekwondo athletes is negligible, that is, 26.3 kg for 11-year-olds and 27.5 kg in 12 year olds. The highest level of development of the dynamics of the physical development of the lumbar strength was noted in 13-year-olds. And this figure was 57.3 kg.

Analysis of the obtained results showed that the highest level of development of lumbar strength was noted in 13-year-olds with a score of 57.3. In the remaining 10–11–12 years, the level of development of lumbar strength turned out to be slightly lower. It was established that the lowest rates of development are observed at the age of 11–12 years.

§ 2.4. Dynamics of indicators of physical fitness of taekwondo fighters aged 10-13

The trend in the development of all modern sports included in the Olympic program, according to the results of scientific and methodological analysis, the general physical training of taekwondo athletes of this age from the initial stage of training, the systematic monitoring of indicators of general physical fitness by specialists guarantees the effectiveness of the results of the competitive activity of taekwondo athletes.

It should be noted that specialists do face a number of problems when looking for alternative solutions to these problems. In order to systematically monitor the general physical development of taekwondo fighters and draw accurate conclusions about the results of the general physical fitness of athletes and create convenience for specialists working in this field and to make the necessary recommendations, a “Hardware and software complex for measuring the strikes of martial artists” was developed with special software “TABO-STAR”.

This “TABO-STAR” software contains a number of tests and includes about a dozen tests for both boxers and taekwondo athletes. Among the test samples of an athlete, several dozen tasks are performed, such as determining the degree of impact force, reaction to a signal, the number and quality of impacts given for a given time interval.

“Hardware-software complex for measuring strikes of martial artists” equipped with TABO-STAR software has a number of tools designed to determine the general level of physical fitness of taekwondo fighters, measure and count the strikes of martial artists, as well as the general level of physical fitness of an athlete, biochemical processes occurring in the body during physical activity, also allows a specialist to express his opinion with high accuracy based on the results of a study conducted using the "Hardware-software complex for measuring the strikes of martial artists", it can be concluded that the level of physical fitness of 10-13-year-old taekwondo fighters is passive.

The device includes one of dozens of tests: for 40 seconds, the taekwondo fighter delivers side blows to the “Hardware-software complex for measuring martial arts strikes”, equipped with the TABO-STAR software, while the data processing unit enters the level of accuracy of quantity and quality into the program transmitted pulses for 40 s. Thus, the results of each taekwondoist are collected, and as a result, it is possible to give an objective assessment to each athlete in accordance with the indicators of the general level of physical fitness.

One of the main tasks included in this research plan and intended for solution is to conduct a number of the above studies in order to fully assess the level of general physical fitness of athletes, the scientific analysis of the results of which is described below.

According to the results of the study, the physical indicators of taekwondo fighters aged 10-13 at the stage of initial training were as follows.

Specialists in this field, such as Zatsiorsky V.M., Aleshinsky S.Yu., Yakunin N.A. [81; p. 21-24], conducted a special analysis of the structure of physical training of wrestlers, which made it possible to determine how different aspects of the level of physical fitness of athletes affect the results in sports.

According to the results of our study, the dynamics of indicators of the general physical fitness of taekwondo athletes involved in the initial training stage was as follows. According to the data, if 10-year-old taekwondo wrestlers with an average body weight of up to 30 kg in kicks on the “Hardware-software complex for measuring kicks of martial artists” with their feet for 40 s, the coefficient of explosive endurance of side kicks for martial artists was on average 4.26. The coefficient of explosive endurance of taekwondo wrestlers with a body weight of 30 to 36 kg was 1.79. (See Fig. 2.11)

According to this indicator, the explosive endurance coefficient of 11-year-old taekwondo athletes weighing up to 36 kg was 0.90, and the explosive endurance coefficient of 11-year-old taekwondo athletes weighing up to 41 kg was 1.04. And the coefficient of explosive endurance of 11-year-old taekwondo athletes, whose last body weight was about 53 kg, was 1.08.

When summing up the results of taekwondo fighters aged 12 and 13 for the same indicator, it was found that taekwondo fighters recorded the following results. The explosive endurance coefficient of 12-year-old taekwondo wrestlers weighing up to 36 kg was 1.75, while the explosive endurance coefficient of taekwondo wrestlers weighing up to 41 kg was 1.90, the weight category up to 53 kg became the next weight category of the study, and it was found that the coefficient explosive endurance of taekwondo athletes was 1.34.

The 12-year-old taekwondo athletes selected for the final weight category, weighing more than 53 kg, had an explosive endurance coefficient of 1.03 (see Fig. 2.11).

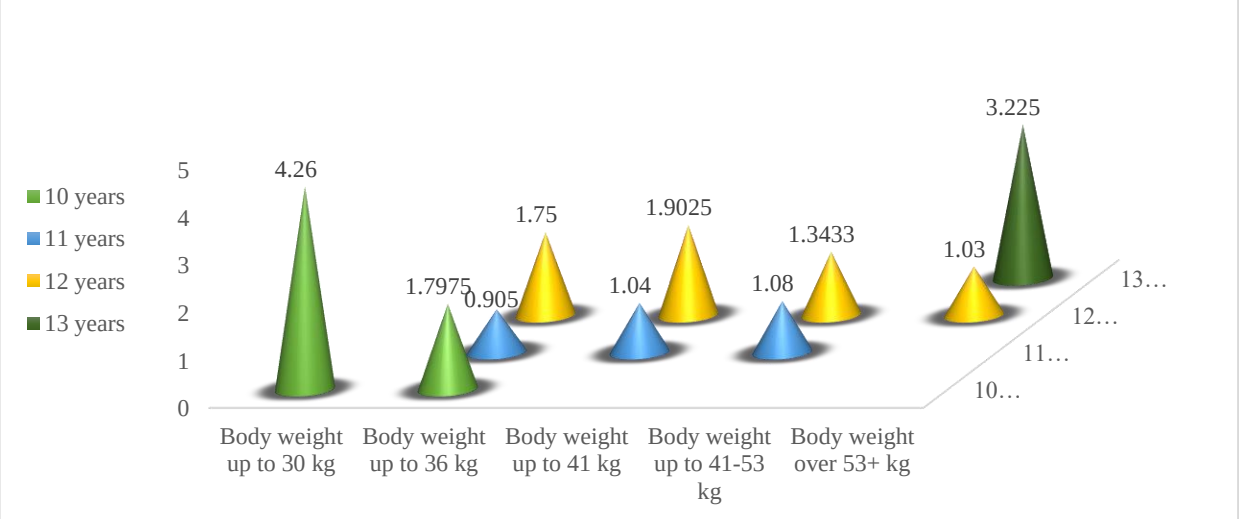


Fig. 2.11. Explosive endurance coefficient of taekwondo fighters aged 10-13

The results of 13-year-old taekwondo athletes and the results of the explosive endurance coefficient of athletes weighing up to 53 kg and weighing more than 53+ kg with a high result were 3.22 compared to other weight and age categories.

The next test of this study, conducted to determine the general physical fitness of taekwondo fighters aged 10-13, was to determine the level of development of the explosive endurance index in these taekwondo fighters. (See Fig. 2.12)

According to the study, at the stage of initial training, the results of 10-year-old taekwondo athletes weighing up to 30 kg in terms of the physical indicator of

explosive endurance were 47.82, it was for the same indicators that it turned out that the explosive endurance index of 10-year-old taekwondo athletes weighing up to 36 kg in averaged 29.43.

Testing to determine the index of explosive endurance in 11-year-old taekwondo athletes, the results of which are as follows.

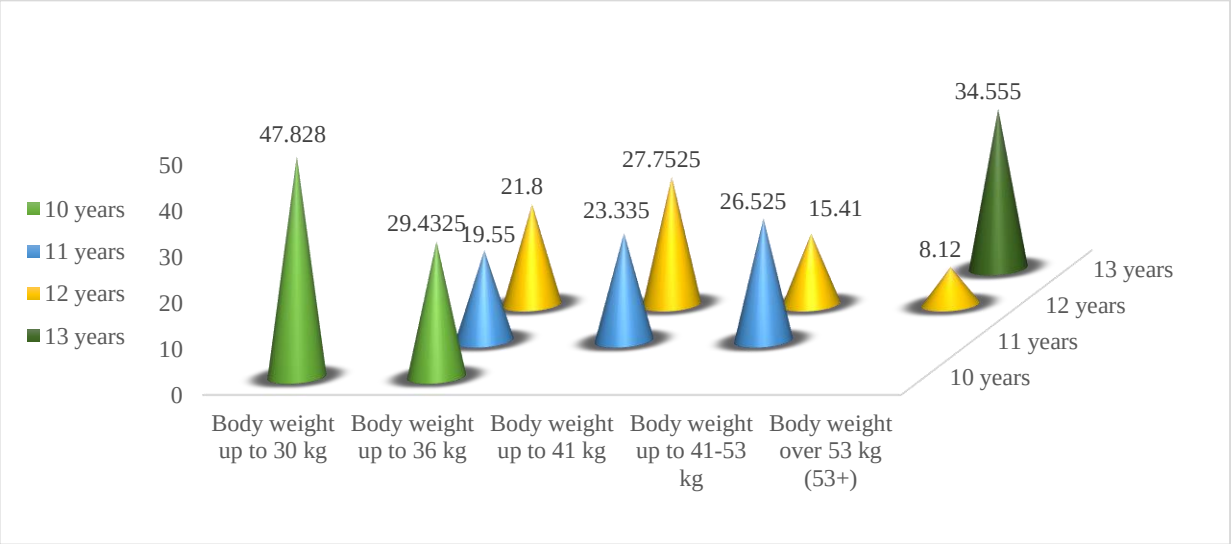


Figure 2.12. Indicators of the index of explosive endurance in taekwondo fighters aged 10-13

And so, the explosive endurance index of 11-year-old taekwondo athletes with an average weight of up to 36 kg was 19.55. The results of taekwondo athletes up to 41 kg, defined as the next weight category, are equal to their body weight and averaged 23.33 results, proving that explosive endurance is passive.

The other weight category of 11-year-old taekwondo athletes selected as the next weight category in the study were taekwondo athletes up to 53 kg with an average explosive endurance index of 26.52.

When determining the index of explosive endurance in 12-year-old taekwondo athletes, the results were as follows. According to these data, according to the explosive index of taekwondo athletes weighing up to 36 kg, the average result was 21.8. According to this indicator, the average index of explosive endurance of 12-year-old taekwondo athletes up to 41 kg was 27.75, and the index of explosive endurance of athletes up to 53 kg was 15.41. And mathematical statistical analysis revealed that the average score for those who weighed 53 kg and

those who weighed more than 53 kg at the end of the study of the last weight category was 8.12.

The coefficients of explosive endurance of taekwondo athletes up to 36 kg, athletes of the control and experimental groups in the pre-educational pedagogical experiment, the average coefficient of explosive endurance in the control group was 0.75, and in the experimental group weighing up to 36 kg, athletes gained 0.91 at the beginning of the pedagogical experiment (see Fig. Table 3).

Table 3.

Indicators of explosive endurance coefficient of 11-year-old taekwondo wrestlers in the control and experimental groups before and after the experiment

№	Groups and weight categories	Before research	After research	t	P
1.	Experimental group 36 kg (n=56).	0,91	0,9	2,65	<0,05
2.	Control group 36 kg (n=44)	0,75	1,01	1,48	>0,05
3.	Experimental group 41 kg (n=38).	0,93	1,04	2,45	<0,05
4.	Control group 41 kg (n=37).	0,98	1,03	0,85	>0,05
5.	Experimental group 53 kg (n=28).	0,89	1,08	3,12	<0,001
6.	Control group 53 kg (n=25).	0,99	1,1	1,25	>0,05

It can be seen that the performance of athletes in the experimental and control groups after pedagogical experiments returned to 0.9 in the experimental group and 1.01 in the control group. In athletes weighing up to 41 kg, pre- and post-experimental results of 0.98 at the beginning of the experiment and 0.93 in the experimental group were observed to be equal.

According to the results of studying the dynamics of the index of explosive endurance of 11-year-old taekwondo fighters in the experimental and control groups with body weight up to 53 kg, the results of 11-year-old taekwondo fighters up to 53 kg were as follows. In the athletes of the control group at the beginning of the pedagogical experiment, the average indicator was 0.99, while in the experimental group the results were 0.89.

The test results after pedagogical experiments were 1.08 in the experimental group and 1.1 in the control group. According to the indicators of the development of the coefficient of the index of explosive endurance of taekwondo fighters in each weight category, the athletes of the experimental group showed a high rate of development.

When determining the level of development of the index of explosive endurance of taekwondo fighters for 11 years, the results obtained by taekwondo fighters were as follows. Thus, below is a comparative analysis of the results before and after the study of taekwondo athletes involved in the initial training stage.

The results of the test to determine the performance of 11-year-old taekwondo athletes are as follows. Thus, the index of explosive endurance of 11-year-old taekwondo athletes, the average score of athletes in the experimental group with a body weight of up to 36 kg, before the study was 17.89. The average pre-pedagogical working capacity of the control group was 18.17, the results of the control group after pedagogical experiments - 20.05, the post-pedagogical working capacity of the athletes of the experimental group - 19.55.

The preliminary results of tests of pedagogical experiments of taekwondo athletes up to 41 kg, defined as the next weight category, amounted to 21.17, and the initial average value of the athletes of the experimental group in terms of explosive endurance was 20.15.

The results of these taekwondo athletes after pedagogical experiments were 23.33 in the experimental group, and the results of taekwondo athletes in the

control group were 22.81, the levels of development were determined (see Table 4).

Table 4.

Indicators of the explosive endurance index of 11-year-old taekwondo athletes in the control and experimental groups before and after the experiment

№	Groups and weight categories	Before experiment	After the experiment	t	p
1.	Experimental group 36 kg (n=56).	17,89±1,2	20,05±0,67	2,85	<0,05
2.	Control group 36 kg (n=44)	18,17±0,85	19,05±0,68	1,41	>0,05
3.	Experimental group 41 kg (n=38).	20,15±1,3	23,36±1,3	2,62	<0,05
4.	Control group 41 kg (n=37)	21,17±0,95	22,81±1,4	0,84	>0,05
5.	Experimental group 53 kg (n=28).	22,36±0,87	26,52±1,2	3,91	<0,001
6.	Control group 53 kg (n=25)	24,56±0,87	26,09±0,87	1,62	>0,05

Comparative analysis of the results of 11-year-old taekwondo athletes up to 53 kg in the experimental and control groups in terms of explosive endurance at the beginning and end of pedagogical experiments returned during testing is as follows. During the initial testing of 11-year-old taekwondo athletes of the control group in the initial part of the pedagogical study, the result was 24.56, while the athletes of the experimental group showed a result of 22.36 points.

In the final part of the study, in the final test taken from 11-year-old taekwondo athletes weighing up to 53 kg, the athletes of the experimental group showed 26.52, and the athletes of the control group scored 26.09.

In order to determine the indicator of the development of explosive endurance of 11-year-old taekwondo athletes at the stage of initial training, based on the results of organized pedagogical classes, it can be concluded that 11-year-old taekwondo athletes of the experimental group are higher than those of 11-year-old taekwondo athletes, have a development indicator.

In the course of the study, indicators of the dynamics of the index of creatine phosphate performance of taekwondo athletes at the age of 10-13 years were also taken, and during their generalization and scientific and methodological analysis, it was found that the average performance of taekwondo athletes was as follows. The average efficiency index of creatine phosphate in 10-year-old athletes weighing up to 30 kg was 463.57. The average result of athletes at this age weighing up to 36 kg was 357.13. (See Figure 2.13.)

For 40 seconds of exercises performed by 11-year-old taekwondo athletes (36 kg and more), the average indicator of the dynamics of the creatine phosphate performance index was 277.22 results, up to (36 kg) and amounted to 234.56 results. It was noted that in taekwondo athletes of this age (41 kg) there is an increase in the dynamics of the creatine phosphate index by an average of 147.8 compared to the average results of their peers up to (36 kg).

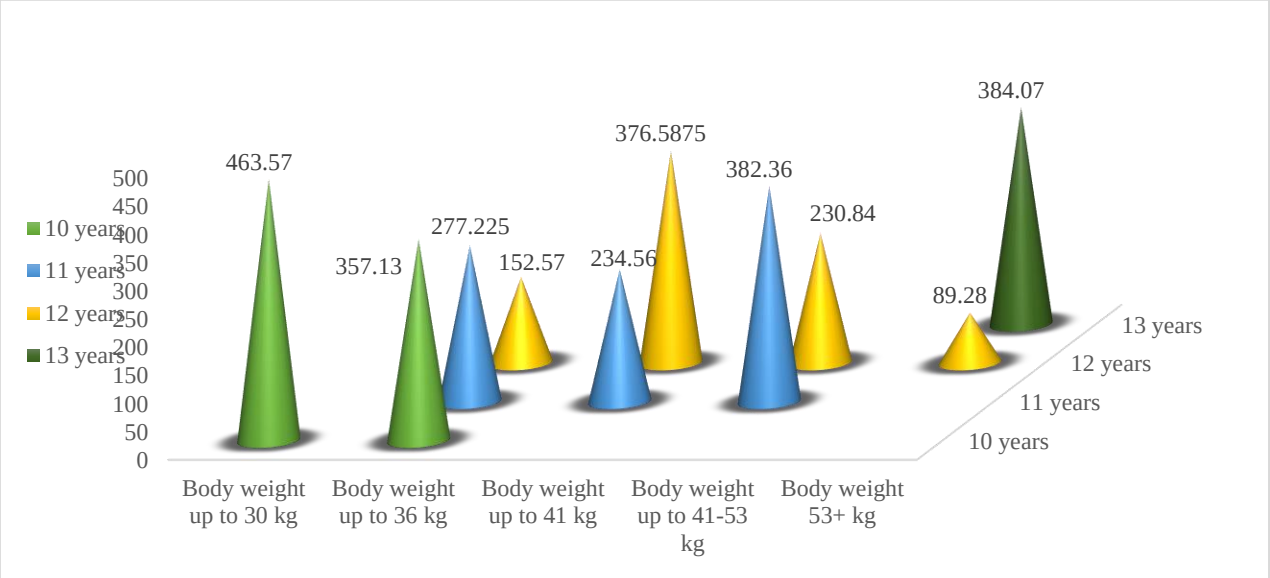


Fig. 2.13. Indicators of the dynamics of the creatine phosphate index of working capacity of taekwondo athletes aged 10-13

In taekwondo athletes aged 12 years (weighing 36 kg), the average index of the dynamics of the creatine phosphate index was 152.57, and the index of the dynamics of the creatine phosphate index (weighing 41) was 376.58, which is a significant difference from their peers with a body weight of 36 kg. Athletes of this age with a body weight (53 kg) showed a result of 230.84 and it was noticed that the indicators of persons with a body weight of 53 kg or more, selected as the largest weight of the study, were 89.29 and there were significant differences.

The dynamics of the creatine phosphate index of taekwondo fighters 13 years old with a body weight of 53 kg and above is as follows: taekwondo fighters in this indicator, in addition to the highest body weight, the result recorded by them also showed a result of 384.07, which is the highest.

At the stage of initial training, in order to determine the dynamics of the development of the speed endurance coefficient of taekwondo fighters 10-13 years old, it was found that the results of the study were summarized and analyzed as follows.

According to the results of the dynamics of the speed-endurance coefficient of taekwondo fighters 10 years old up to body weight (30 kg) is 0.66 at an average level of development. The results of 10-year-old athletes weighing up to 36 kg were equal to 0.815.

For 11-year-old taekwondo athletes, the results started with a different result, as expected. This means that athletes with a body weight (36 kg) scored 0.355 in this direction. Those with a body weight (41 kg) showed a result of 0.81, almost equal to the result of a 10-year-old athlete up to 36 kg. The results of the last group of athletes at this age up to body weight (53 kg) were 0.52, which differed from the result of their peers (see Fig. 2.14).

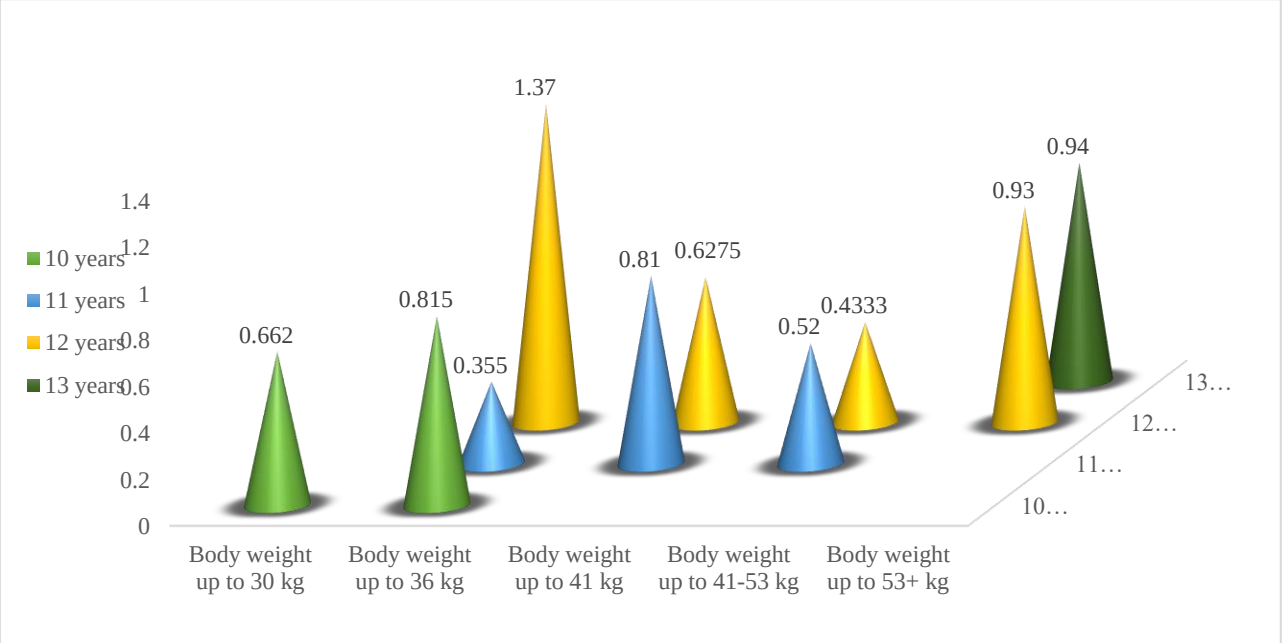


Fig. 2.14. Indicators of the dynamics of the coefficient of speed endurance of taekwondo athletes aged 10-13

The following results were obtained, in which the dynamics of the development of the coefficient of quick endurance of taekwondo athletes involved in the 12-year stage of initial training differed sharply from each other. According to the results obtained, the average result of taekwondo athletes under 12 years old (36 kg) was 17.39, while the results of athletes with a body weight (41 kg) showed a result of 6.19, which is a significant difference from their peers. With an increase in body weight, athletes experienced a decrease in the number of results, in the next weight category (53 kg) the result was 3.13, as the weight increased, the result changed to a weight category in the direction of decreasing (53+ kg), and the result was 5.08.

Taekwondo fighters aged 13 years weighing (53 kg) or more delivered side blows for 40 seconds on the “Hardware-software complex for measuring the strikes of combatants”, equipped with the “TABO-STAR” software, for taekwondo fighters, the dynamics of the speed endurance coefficient was 0.94, which is close to the results shown by athletes of other ages.

In addition to determining the dynamics of the coefficient of speed endurance of taekwondo fighters 10-13 years old at the stage of initial training,

studies were carried out to determine the index of speed endurance of taekwondo fighters of this age, and the results of these tests were as follows. (See Figure 3.15.)

With the help of the “Hardware-software complex for measuring martial arts strikes” equipped with the “TABO-STAR” software, the accuracy of side kicks, differences between kicks, changes in kicks in different parts in 40 seconds were assessed, based on the following, we can say that the average speed endurance of 10-year-old taekwondo wrestlers with body weight up to (30 kg) was 6.11, and 11-year-old taekwondo wrestlers with body weight up to (36 kg) was 8.76.

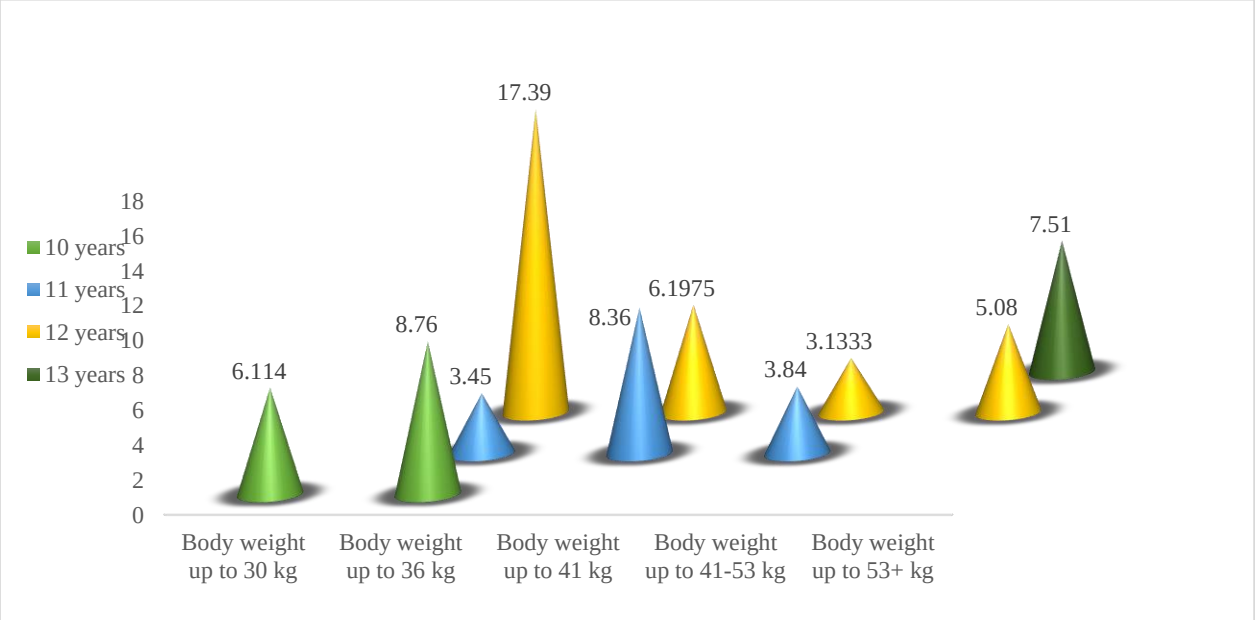


Fig. 2.15. Indicators of the dynamics of the speed endurance index of taekwondo athletes aged 10-13

The average result of 11-year-old taekwondo athletes weighing up to 36 kg in this indicator was 3.45. The results of taekwondo wrestlers weighing up to 41 kg compared with their peers were 8.36, while the results of taekwondo wrestlers weighing up to 53 kg differed almost equally from their peers with a result of 3.84.

The speed endurance index of 12-year-old taekwondo athletes at the stage of initial training is as follows: according to the results of taekwondo in the weight category up to 30 and 36 kg, the highest results were 17.39 and 6.19. The results of 12-year-olds, relatively heavier in body weight (up to 53 kg) and having the highest weight in the study (53 kg) and above, showed results of 3.13 and 5.08,

respectively, and closed the results of 12-year-olds with these indicators. Persons 13 years old, with a body weight (53 kg) and above, had an indicator of 7.51.

When analyzing the results of determining the dynamics of the glycolytic endurance index and the integral labor force index of 10-13 year old taekwondo fighters, the average index of 10 year old taekwondo fighters at the initial training stage was 98,142, and the integral labor force index was 53.94. We see that the results of taekwondo athletes up to weight (36 kg) are somewhat higher than the results of their peers 163,555, and on the integral labor force index, on the contrary, the results were 38.19. When averaging the results of 11-year-old taekwondo athletes by weight categories, the results were as follows. And so, the result of 11-year-old athletes in terms of body weight (36 kg) in this area was 68.53, and the average score for the integral indicator of the labor force index was 20.45. In taekwondo athletes with a body weight (41 kg), the results recorded in both directions were as follows, the average glycolytic endurance was 133.04. The integral labor force index turned out to be 27.91 (see Fig. 2.16-17).

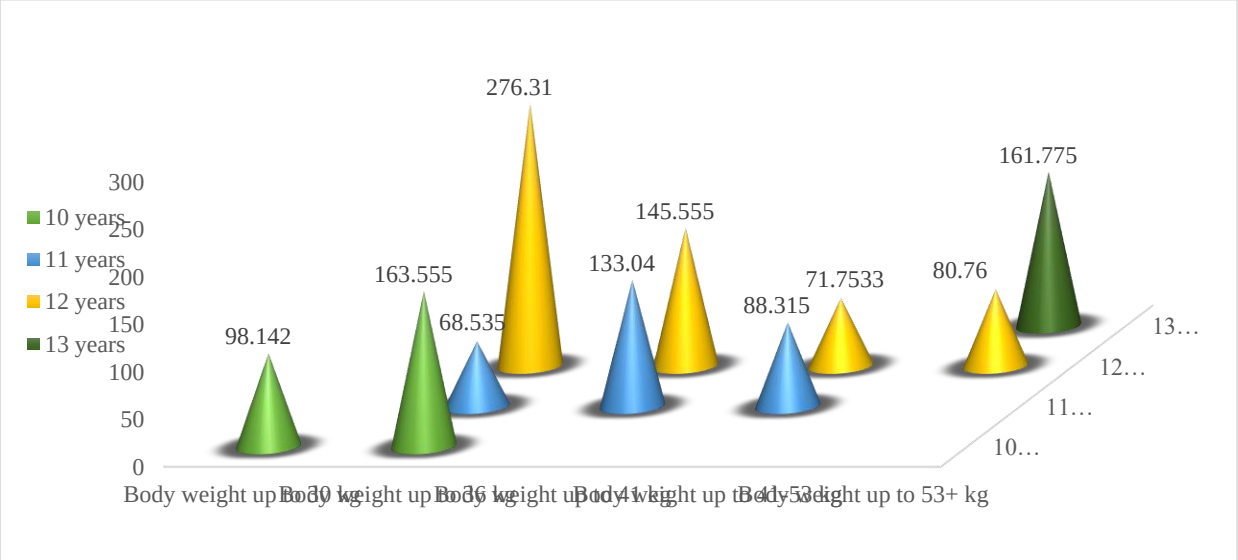


Fig. 2.16. Indicators of the dynamics of the index of glycolytic endurance of taekwondo athletes aged 10-13

According to the results, the analysis of the results of taekwondo athletes with a body weight of 53 kg in terms of the glycolytic endurance index and the integral indicator of labor force is described below. In 11-year-old taekwondo athletes, the average index of glycolytic endurance was 88.31, and the integral

labor force index showed a result of 30.36, which is slightly higher than that of their peers..

It turned out that the difference between the results of 12-year-old taekwondo athletes in terms of the glycolytic endurance index and the integral indicator of labor force, who are engaged in the initial training stage, differs significantly from the results in the weight categories of taekwondo athletes of other ages.

This means that if taekwondo athletes under the age of 12 years (36 kg) had an index of glycolytic endurance and an integral working capacity index of 276.31 and 39.18, then the results of taekwondo athletes with a body weight (41 kg) were as follows. With an index of glycolytic endurance of 145.55, the average value of the integral labor force index was 33.94,

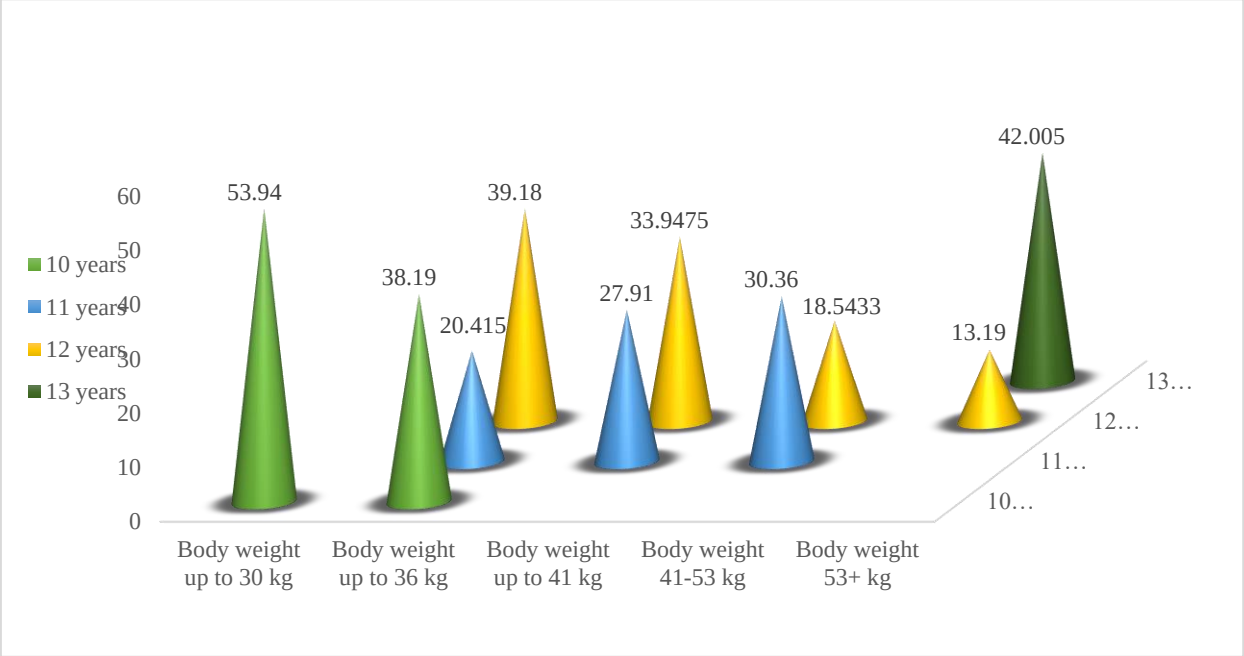


Fig. 2.17. Indicators of the dynamics of the integral indicator of the labor force of taekwondo fighters aged 10-13 years

The results of taekwondo fighters 10-13 years old with a body weight (53 kg) in the initial preparatory stage in terms of the dynamics of the glycolytic endurance index and the dynamics of the integral labor force index were 71.75 and 18.54, respectively, the results of 12-year-old taekwondo fighters with a body weight of 53 kg) and (53+) are as follows: they showed a result with an index of

glycolytic endurance of 80.76, while from the integral labor force they showed a result of 13.19 points.

The results of 13-year-old taekwondo athletes of the last weight category included in the study plan, with the highest level of physical fitness, which includes the integral labor force index and the glycolytic endurance index, are as follows: in terms of glycolytic endurance, athletes aged 13 years (53 kg) and (53+ kg) showed a result of 42,005, one of the highest rates recorded in the study age group (see Fig. 3.18).

The research test, which lasted 40 s, made it possible to obtain and summarize the following information about the integral indicator of speed-strength training, which is one of the indicators of the physical fitness of taekwondo athletes aged 10-13, among the physical data of the indicators mentioned above. According to him, the average indicator of taekwondo athletes aged 10 years up to (30 kg) at the stage of initial training was 561.71, and for 10-year-olds weighing up to (36 kg) it was 520.67.

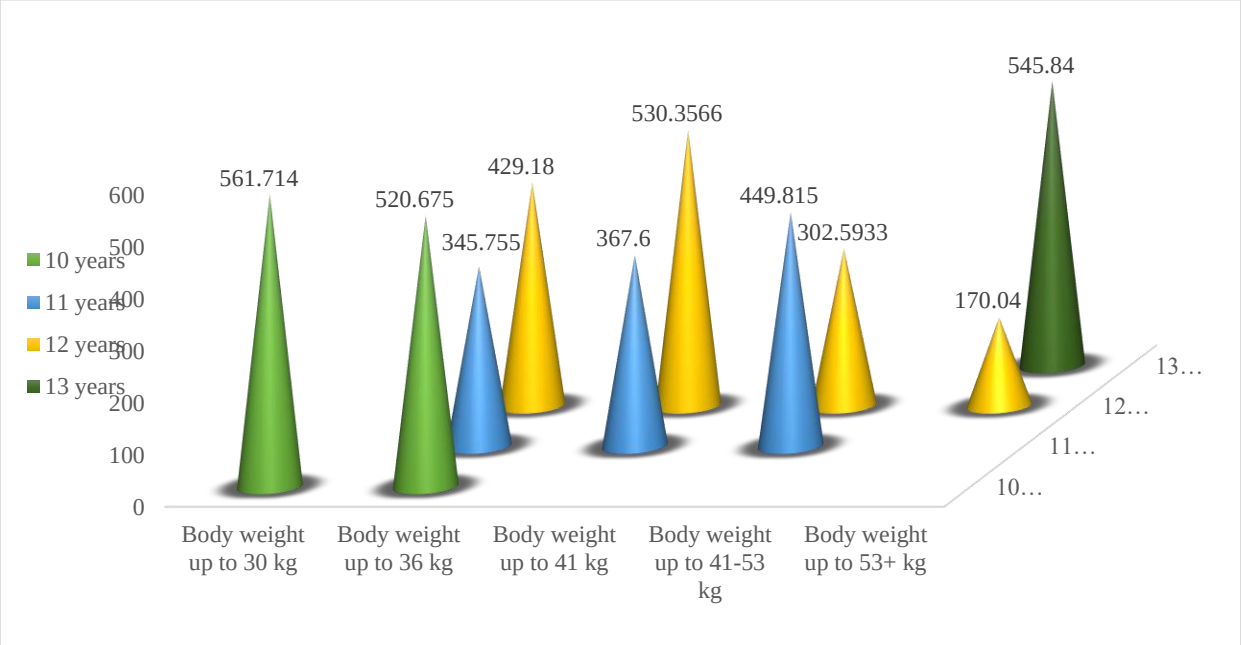


Fig. 2.18. Indicators of the dynamics of the integral indicator of speed-strength training of taekwondo athletes aged 10-13

On the other hand, for 11-year-old athletes, it differs from the rest of the age group, and as the weight categories increase, so do the numbers reflecting the

results. Athletes up to (36 kg) initially scored 345.75 points, and athletes weighing less than 41 kg - 367.6 points, taekwondo athletes weighing 53 kg supplemented the results of 11-year-olds with a score of 449.81.

Athletes 12 years old up to (36 kg) scored 429.18 points, and up to 41 kg - 530.35, those with body weight (53 kg) averaged 302.59. And 13-year-old taekwondo wrestlers, who weighed in the final weight categories (53 kg and 53+ kg), scored an average of 545.84 points according to the integral indicator of speed-strength training..

In dozens of publications written by a number of foreign and Uzbek scientists, on the basis of scientific analysis of many studies, the total load of strength exercises of taekwondo fighters 10-13 years old at the stage of initial training for 5 s. ", also managed to obtain complete information about the general strength indicators of the exercise and the levels of accuracy of strikes delivered during this time, below, first, a scientific and methodological analysis of data on the general strength indicators of taekwondo fighters is described. (See Figure 2.19).

As already mentioned, the next total force of strikes of taekwondo fighters 10-13 years old in 5 seconds. The average indicator of the total strength of 10-year-old taekwondo athletes weighing up to (30 kg) was 2252.17. In taekwondo athletes weighing up to 36 kg, this figure was 2858.07, completing the results of 10-year-old taekwondo athletes.

According to this quality, the average indicators of 11-year-old taekwondo athletes for this short period of time are as follows, that is, athletes with a body weight of up to (36 kg) had a result of 3858.74, and athletes with a body weight of up to (41 kg) recorded an average of this indicator 3041.58, which should have been determined. The results of taekwondo athletes with body weight up to (53 kg) for this quality amounted to 3612.64, which is almost not close to both of the above results..

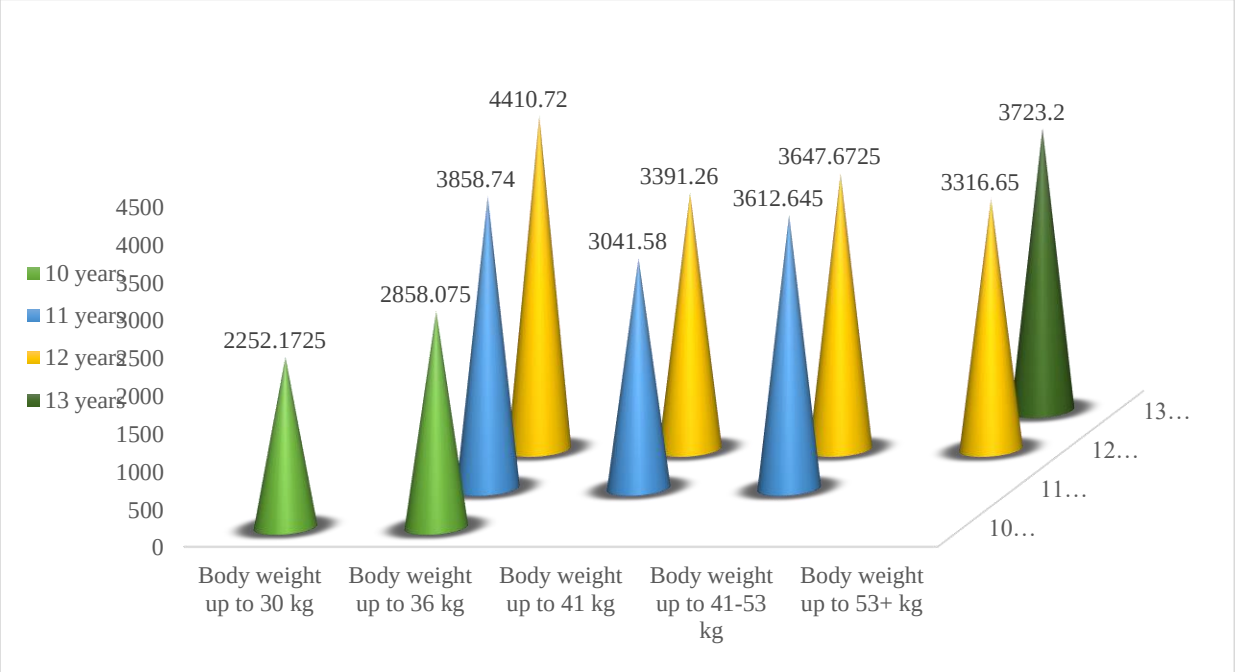


Fig.2.19. General strength indicators of physical fitness of taekwondo athletes aged 10-13

According to the results of testing the indicators of general strength, the dynamics of the indicators of special physical training of 12-year-old adolescent taekwondo athletes involved in the initial training stage were as follows. According to him, 12-year-old taekwondo athletes with an average weight up to (36 kg) showed an average total strength of 3391.26, and taekwondo athletes up to 41 kg showed an average result of 3391.26, while the weight categories of 12-year-old taekwondo athletes (53 kg) showed the result is 3647.67, the results of the average indicators of 12-year-old taekwondo athletes in 3 weight categories were also presented.

The 12-year-old top-weight taekwondo athletes (53+ kg) in elementary training had an average total strength test score of 3316.65.

Another of the tests included in the research plan, to determine the dynamics of physical training of martial artists, using the "Hardware-software complex for measuring punches of martial artists", is as follows: analysis of the average level of accuracy of side kicks on a boxing bag for 5 s. The average accuracy index of taekwondo athletes weighing up to 30 kg was 59.41, while taekwondo athletes

with an average body weight of this age up to (36 kg) showed a result of 48.94, which is somewhat lower than that of their peers. (See Figure 2.20)

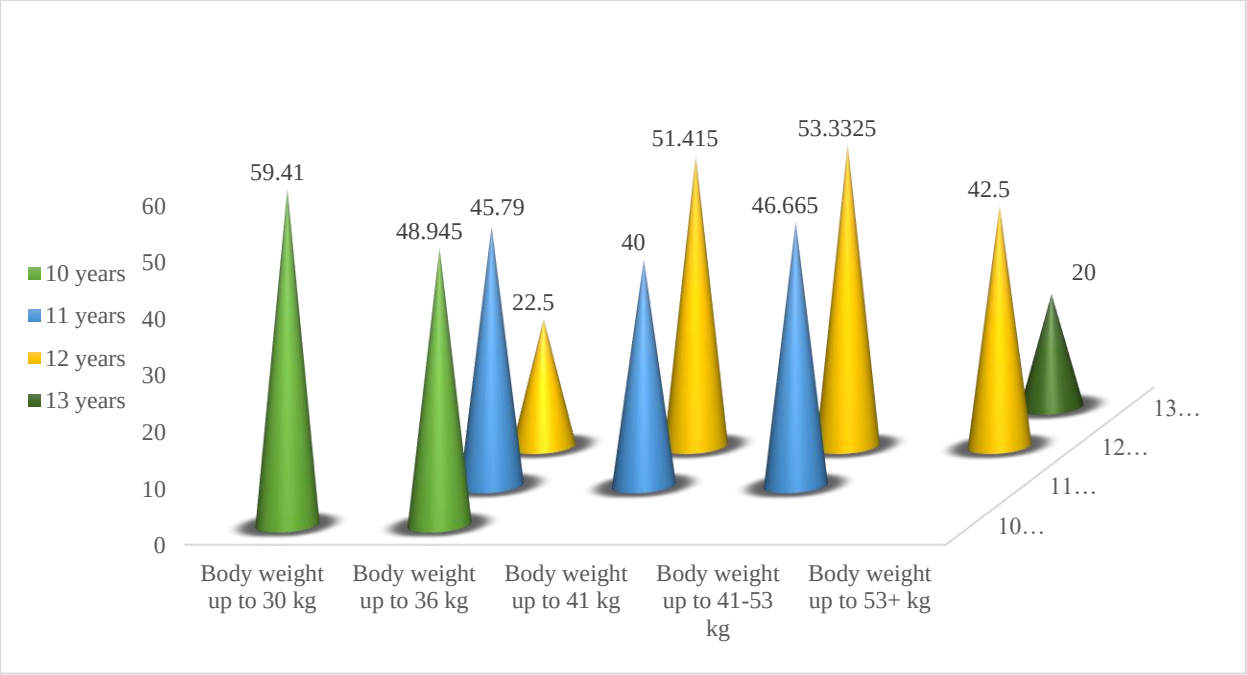


Fig. 2.20. Accuracy indicators of taekwondo fighters 10-13 years old

At the stage of initial training of taekwondo fighters aged 10-13, according to the results of the accuracy quality test, 11-year-old taekwondo fighters with body weight up to (36 kg) showed an average of 45.79 results, and the level of accuracy of athletes with body weight up to (41 kg) was estimated with the result 40.0 points.

The 11-year-old taekwondo athletes, who weighed in at 53kg, finished with a score of 46.66, reflecting their level of accuracy.

According to this indicator, in the scientific and methodological analysis of the test results in 12-year-old adolescents and in the form of pedagogical observations, it was found that the results significantly differed from the results of other age groups when observed in each weight category.

The average performance of 12-year-old taekwondo athletes weighing up to 36 kg was 22.5, and athletes weighing up to 41 kg showed a result of 51.41, which is twice as much as athletes up to 36 kg. The process of increasing the results of athletes up to 53 kg continued, the average figures in this weight were 53.33.

Taekwondo strike accuracy results of 12 and 13 year olds with a maximum weight of 53+ kg: 12 year olds scored 42.5, but 13 year olds completed the results of taekwondo strike accuracy with a score of 20.

Conclusions on the second chapter

3.1. Analysis of scientific and practical literature revealed the need to substantiate the physiological and psychological performance of athletes and its patterns in the development of special exercises. However, the methodological decision of L.D. Nazarenko (3) full of hope.

So, to improve this physical quality, you should choose the following exercises:

- reaction rate development;
- help to get things done quickly;
- help develop the most rational methods of action.

The quality of studies improved in all control and experimental groups. However, the growth rate was different. The increase in accuracy in the control group is mainly due to the natural growth of the body. In the experimental group, this included the use of special techniques to develop and improve accuracy..

3.2. Based on the results obtained during the testing process, included in the pedagogical experiments conducted during the study, we can conclude that there is no continuous uniform development in the special motor actions of young taekwondo fighters aged 10-13 at the stage of initial training.

In the course of pedagogical experiments, the psychophysiological indicators of athletes and equipment were used in practice, which allows for systematic control over the development of special exercises, and its effectiveness has been proven in practice.

3.3 Analysis of the obtained results showed that the highest level of development of lumbar strength was noted in 13-year-olds with a result of 57.3 kg. In the rest, 10-11-12 years old, the rate of development of lumbar strength was somewhat lower. It has been established that the lowest rate of development is observed at the age of 11–12 years.

The device, designed to "measure and calculate the accuracy of the impact force of athletes in martial arts", was put into practice during this study and proved in practice that it can create a number of techniques in determining the physical fitness of athletes.

The hardware-software complex is designed to calculate the determination of the strength of the legs and arms, the speed and number of strokes for a given period of time, this device also includes several dozen more tests. These include: signal characteristic, "Explosion resistance coefficient", "Explosion resistance index", "Speed endurance coefficient", "Speed endurance index" and so on. This device can be used in all types of martial arts, which provides a number of conveniences for the researcher.

A distinctive feature of this device from previous analogues and prototypes is that it combines several dozen tasks, such as determining the accuracy of the impact on the five-zone shock bag, the athlete's reaction time to the signal and the number of blows delivered in a given time.

The hardware complex is controlled using the TABO-STAR computer program, and the results are transmitted from the data processing unit to a wireless computer. This device can be used in martial arts federations as well as in sports research laboratories.

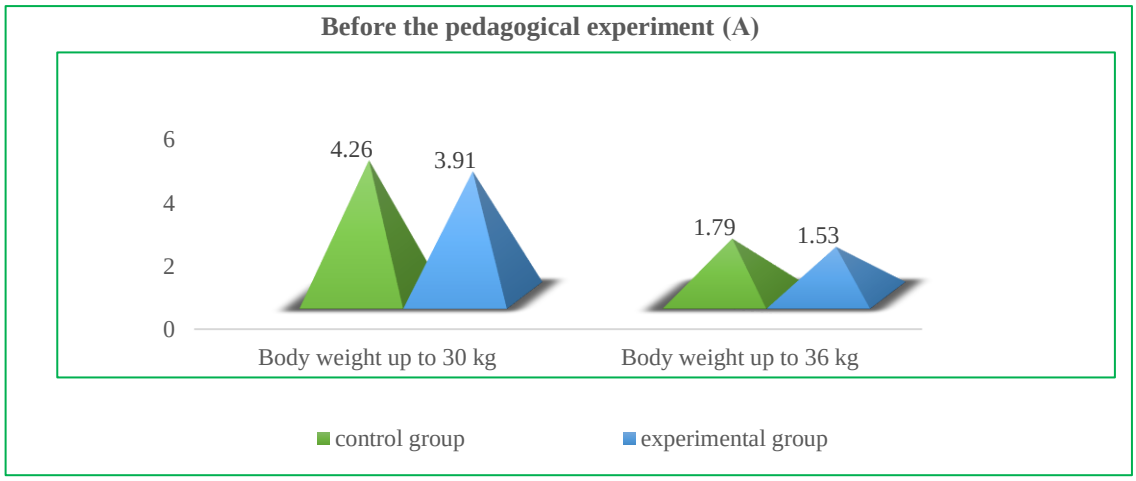
"Hardware-software complex for measuring strikes of combatants" (Tashkent) is designed to determine the strength of kicks and punches, the speed of punches, the number of beats per minute, measuring the response to a signal, determining the accuracy of strikes to the indicated five zones of both boxers and taekwondo fighters. This device can use all kinds of martial arts sports. A distinctive feature of this device from previous analogues and prototypes is the determination of the accuracy of the assignment of blows to the indicated five zones on the punching bag, the reaction time of athletes to the signal and the determination of the number of blows delivered to the indicated zone. The control of the hardware complex is carried out with the help of the computer program "TABO-STAR", as well as from the data processing unit for submitting results to

the computer. This device can be used by both martial arts federations and research laboratories.

CHAPTER III. EXPERIMENTAL RESULTS AND THEIR ANALYSIS

§ 3.1. Dynamics of indicators of physical readiness of taekwondo athletes for 10 years

At the end of the study, the second results of the study were obtained, according to which the indicators of the dynamics of the physical development of 10-year-old taekwondo athletes are presented below in digital form and subjected to scientific and methodological analysis. At the stage of initial training, 10-year-old taekwondo athletes with an average body weight of up to 30 kg kicked for 40 seconds. on a boxing bag, the indicators of the dynamics of the coefficient of explosive endurance of blows, given on the side of the "Hardware-software complex for measuring the blows of combatants", are as follows. At the beginning of the study, 10-year-old taekwondo fighters in the control group weighing up to 30 kg, who were engaged at the stage of initial training, at the beginning of the pedagogical experiment, the average indicator was 4.26, and by the end of the experiment, the indicator was 4.01. It was in these young athletes with overweight, included in the experimental group, that by the beginning of the pedagogical experiment, the indicators for the explosive resistance coefficient averaged 3.91, but it was found that they reached a growth rate of 3.05 with an index after the study (see Figure 3. 1 (A, B)).



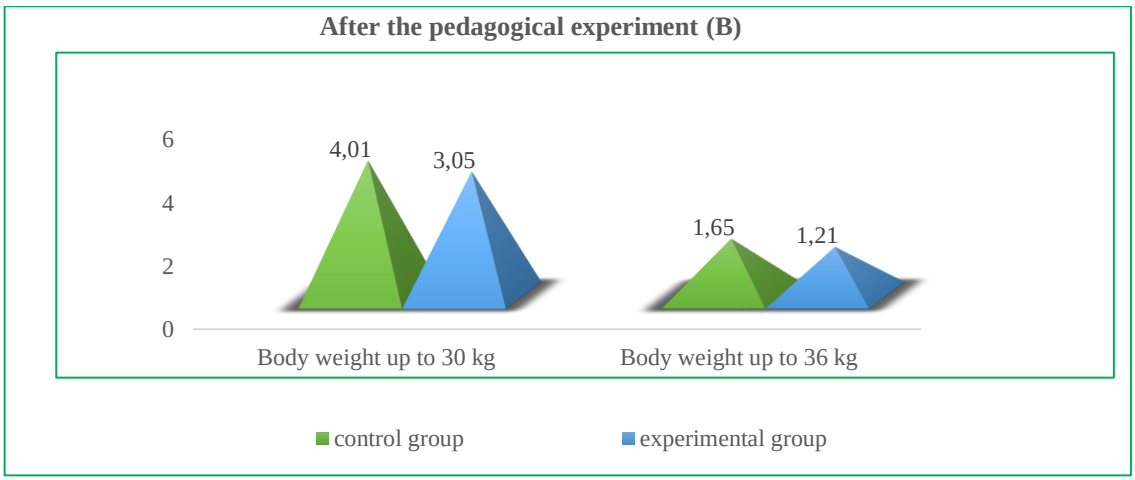


Fig. 3.1. (A, B). Pre-experimental and final indicators of the coefficient of explosive endurance of taekwondo fighters 10 years

The coefficient of explosive endurance of 10-year-old taekwondo athletes of the control group weighing up to 36 kg at the beginning of the study averaged 1.79, and after the pedagogical experiment the result was 1.65. The initial and final results of the pedagogical experiment among the athletes of this experimental group were as follows: at the beginning of the study, these athletes recorded an average of 1.53, while the results of the pedagogical experiment were 1.21. Athletes with a body weight of up to 36 kg at the age of 10, involved in the initial training stage, achieved a better result than athletes in the control group.

To determine the dynamics of the development of the explosive endurance index of taekwondo fighters of 10 years of age in an organized study, the results recorded by taekwondo fighters at the beginning and end of the pedagogical experiment are as follows. Thus, a comparative analysis illustrates the results before and after the study of 10-year-old taekwondo wrestlers weighing 30, 36 kg, explosive endurance index in the initial preparatory, control and experimental groups (Fig. 3.2. (A, B)).

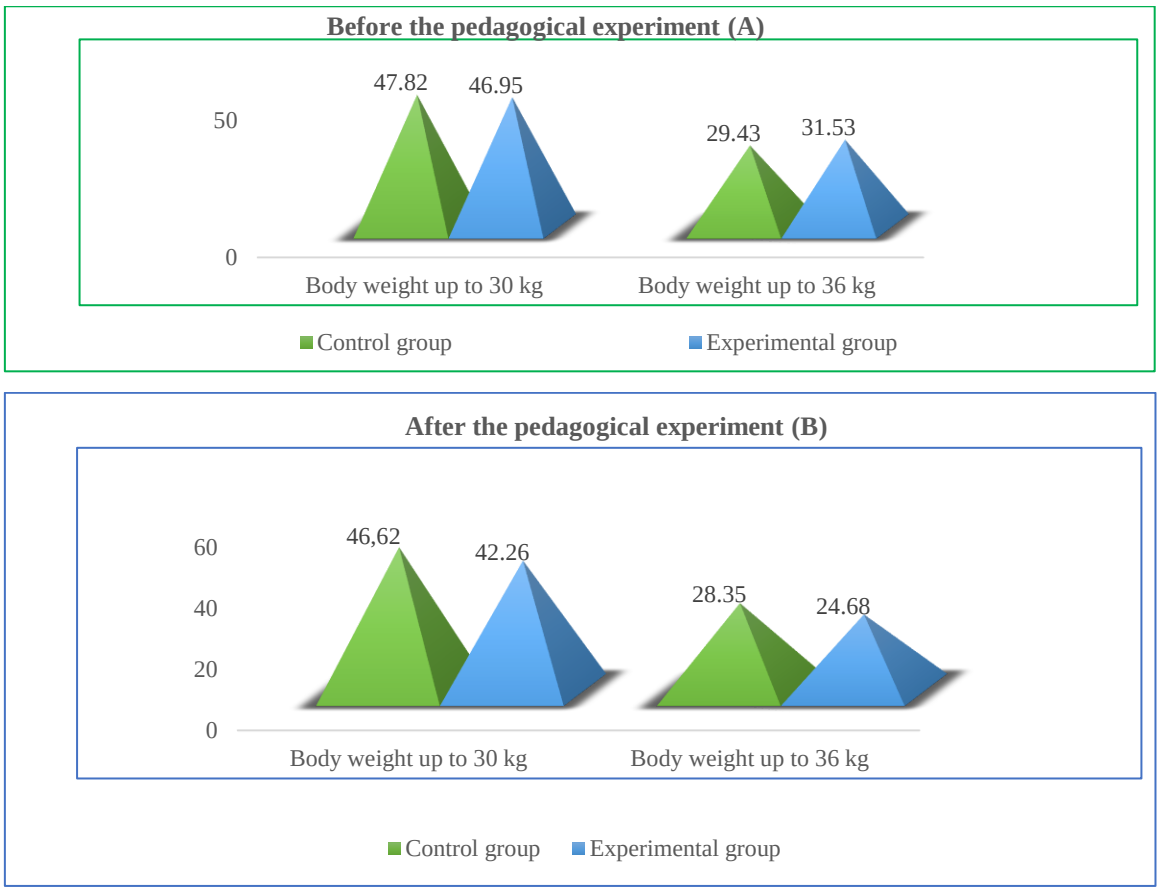


Fig. 3.2. (A, B). Pre- and post-experimental indicators of the explosive endurance index of 10-year-old taekwondo athletes.

Athletes in the control group, formed from 10-year-old taekwondo fighters at the stage of initial training, showed an average of 47.82 results at the beginning of the pedagogical experiment, while at the end of the experiment this figure averaged 46.62. If the results of the pedagogical experiment in the experimental group were 46.95, then at the end of the study it was found to be 42.26, which is higher than that of the athletes in the control group.

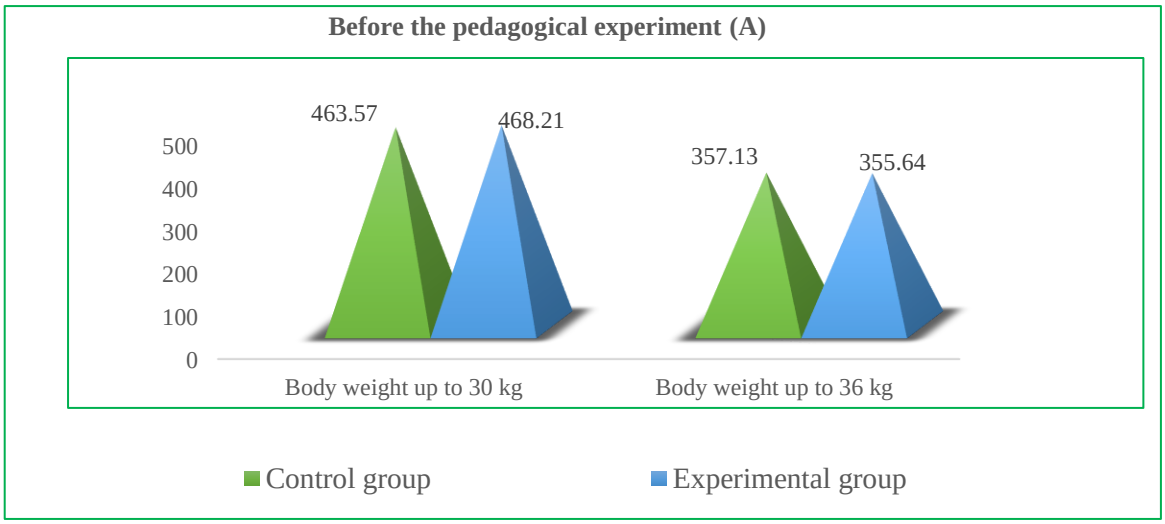
The results of 10-year-old taekwondo athletes weighing up to 36 kg in the initial training group in terms of explosive endurance index at the beginning of the study were 29.43, at the end of the study - 28.35. Taekwondo athletes of the experimental group initially showed an average score of 31.53, which after the pedagogical experiment was 24.68.

According to the results presented by the taekwondo fighters, it can be said that the taekwondo fighters of the experimental group had a higher growth rate of the explosive endurance index than the taekwondo fighters of the control group..

In order to determine the dynamics of the level of physical fitness of 10-year-old taekwondo athletes at the stage of initial training, the plan also included determining the dynamics of the creatine phosphate performance index, the results of which are as follows. When summing up the results of the scientific and methodological analysis of the pre- and post-pedagogical results of taekwondo classes, it became clear that the average indicator of the creatine phosphate performance of taekwondo is as follows.

According to his data, the average creatine phosphate index of working capacity of 10-year-old athletes weighing up to 30 kg was 463.57 at the beginning of the study and 458.18 at the end of the study for athletes in the control group. In the athletes of the experimental group, formed from taekwondo athletes involved in the initial training stage, at the beginning of the pedagogical experiment, the average result was 468.21, by the end of the pedagogical study, this result changed to 450.58; growth dynamics than in athletes of the control group (see Fig. 3.3. (A, B)).

The average results of athletes in the control group weighing up to 36 kg at this age were initially 357.13, and at the end of the study, the value was 356.2. (see figure 3.3).



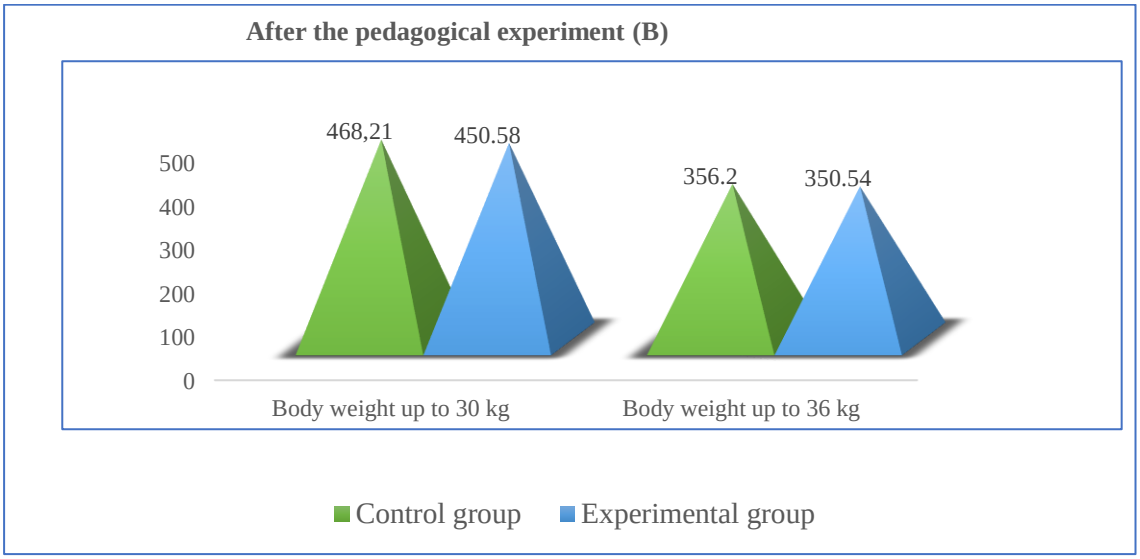
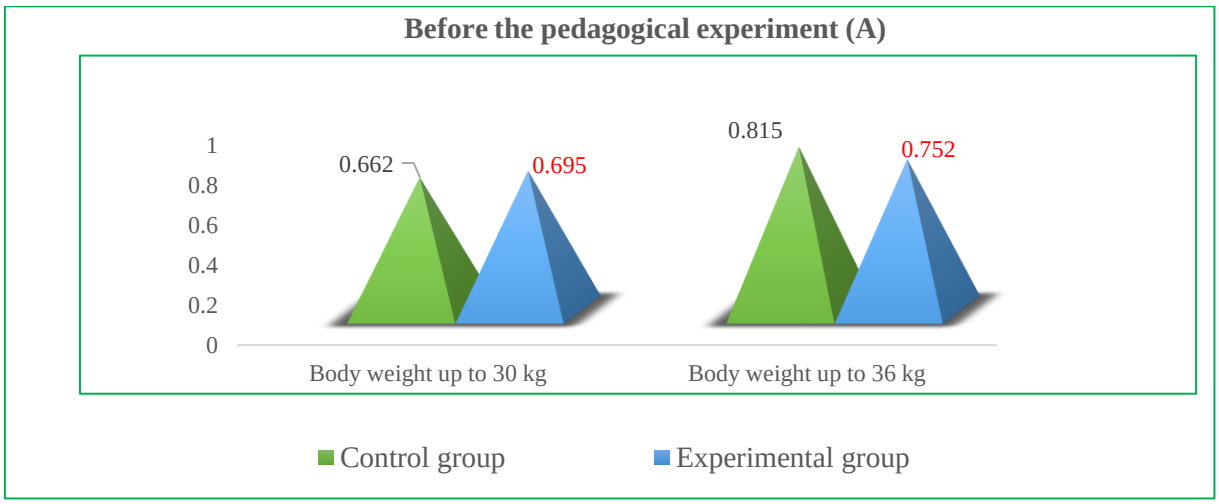


Fig. 3.3 (A, B). The efficiency index of creatine phosphate in 10-year-old taekwondo athletes, indicators before and after the experiment

In the experimental group, before the start of the pedagogical experiment, 10-year-old taekwondo athletes up to 36 kg had an average score of 355.64 in terms of the creatine phosphate performance index, this result was an indicator equal to the average result (350.54) with a growth rate (%) after pedagogical experiments.

Below is a comparative analysis of the results before and after the study, obtained from athletes in order to determine the dynamics of the development of the coefficient of speed endurance of taekwondo fighters for 10 years, involved in the initial training stage, and the indicators of the dynamics of the development of the coefficient of speed endurance of taekwondo fighters in accordance with the indicators at the beginning and at the end of the pedagogical experiment presented in fig. 3.4 (A, B) (Fig. 3.4. (A, B)).



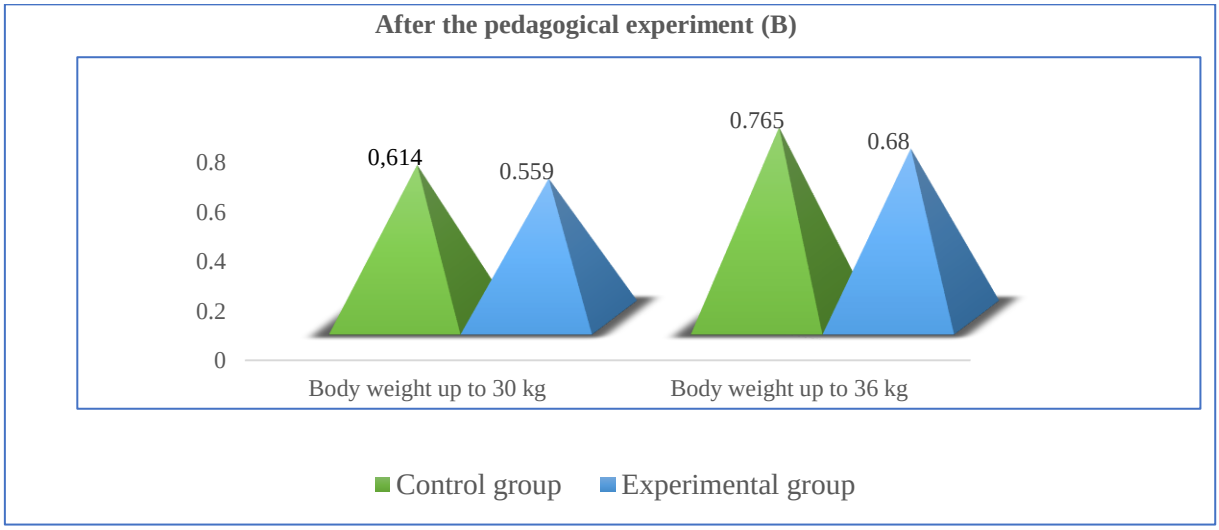


Fig. 3.4. (A, B). Pre-experimental and post-experimental indicators of the dynamics of the coefficient of speed endurance of taekwondo athletes 10 years

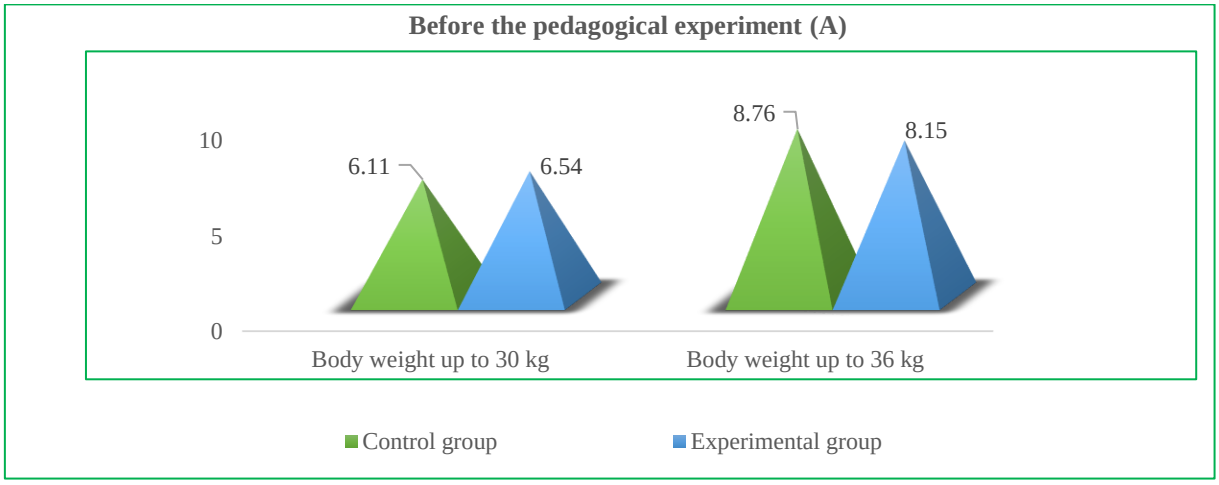
According to the results obtained at the beginning of the study, in the athletes of the control group, the average level of development of the dynamics of the speed endurance coefficient of 10-year-old taekwondo wrestlers with a body weight of 30 kg was 0.662, after the study it can be seen that this indicator increased to 0.614 points. If the results obtained from the athletes of the experimental group at the beginning of the pedagogical experiment were equal to 0.695, then this figure at the end of the study was 0.559.

10-year-old taekwondo athletes of the control group weighing up to 36 kg had an average of 0.815 at the start of the pedagogical experiment for this indicator, then at the end of the study it was found that the result was equal to 0.765.

The indicators of the dynamics of development of the coefficient of speed endurance of taekwondo fighters in the experimental group at the beginning of the pedagogical experiment amounted to 0.752, but during the last testing, the results of the pedagogical experiment showed that these athletes had a growth rate higher by 0.68 than that of the athletes in the control group.

In addition, to determine the dynamics of the coefficients of speed endurance of 10-year-old taekwondo fighters in the experimental and control groups, studies were also conducted to determine the endurance index of taekwondo fighters of this age, and the results of pre- and post-pedagogical testing are presented in fig. 4.5 (A, B).

According to the results of the preliminary testing of the pedagogical experiment of 10-year-old taekwondo athletes in the control group with a body weight of up to 30 kg, while the average speed endurance index was 6.11, it can be seen that this indicator changed by the end of the study by 5.75 . In the experimental group for this quality, the pedagogical experiment had the previous average result of 6.54, but by the end of the study it can be seen that this indicator has improved by (%) with a result of 5.15. (Fig. 3.5. (A, B)).



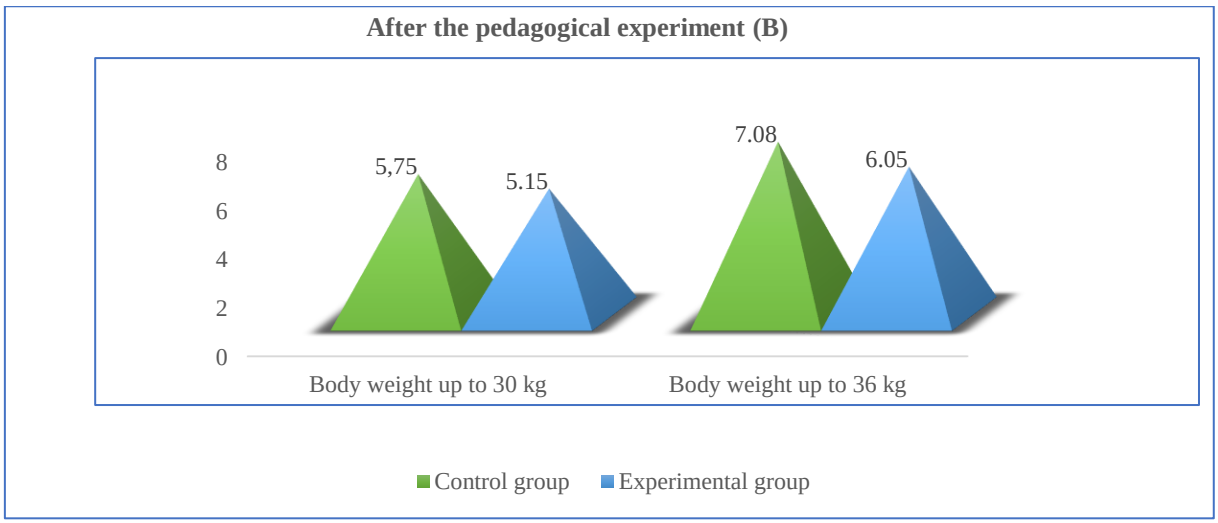


Fig. 3.5. (A, B). Before and after the experimental indicators of the dynamics of the speed endurance index of 10-year-old taekwondo athletes

In 10-year-old taekwondo athletes, who are engaged in the control group with a body weight of up to 36 kg, before the pedagogical experiment, the result was 8.76, then at the end of the experiment the average result for this indicator was 7.08. At the beginning of pedagogical experiments in 10-year-old athletes with a body weight of up to 36 kg of the experimental group who participated in the study, taekwondo athletes had an average indicator of the dynamics of the speed endurance index of 8.15, then at the end, this indicator increased and amounted to 6.05.

When analyzing the results of the dynamics of the index of glycolytic endurance of 10-year-old taekwondo athletes involved in the initial training stage, the average score of 10-year-old taekwondo athletes up to 30 kg in the control group at the beginning of the study was 98.142, then at the end of the study it can be seen that their average value has changed by 105, 15. The average performance index of taekwondo athletes of the experimental group of 10 years old with a body weight of up to 30 kg at the beginning of the pedagogical experiment was 96.16, and by the end of the study the result increased by 107.65 (Fig. 3.6. A, B).

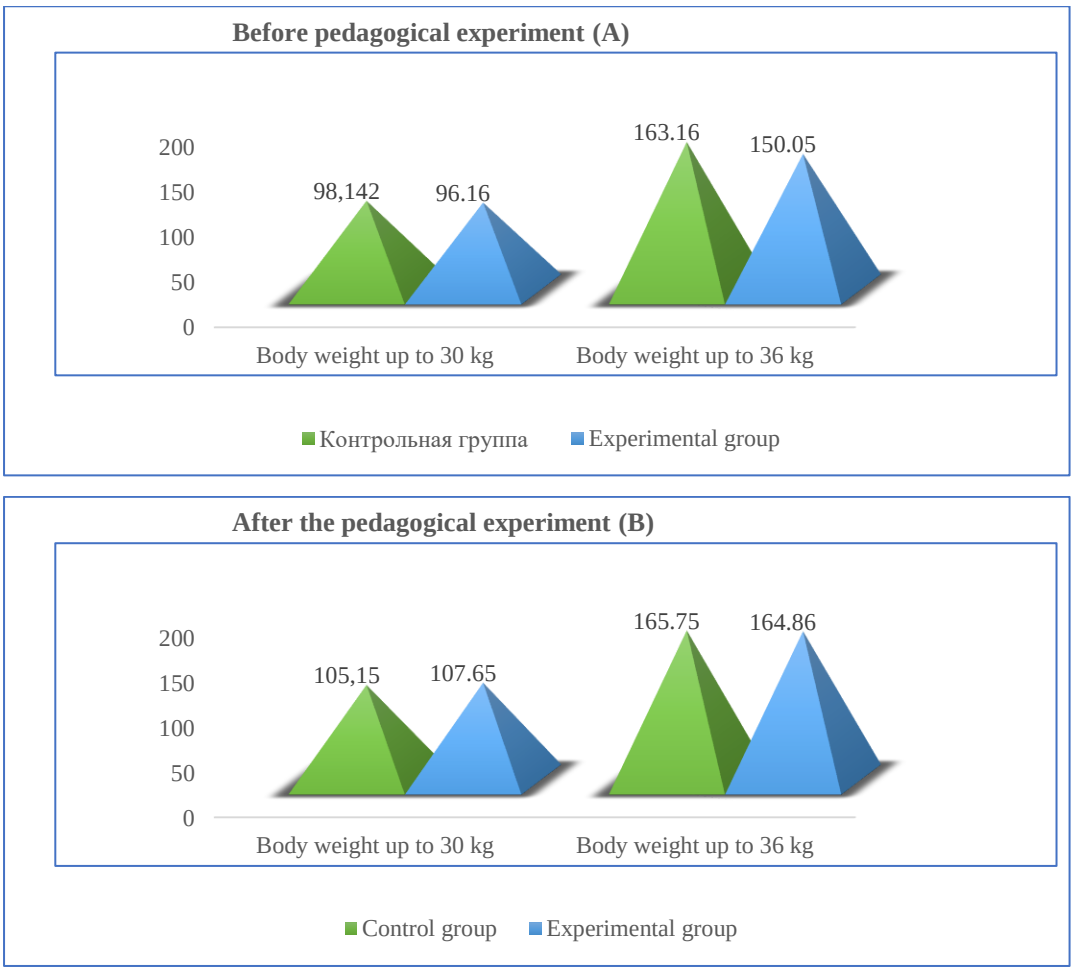


Fig. 3.6. (A, B). Before and after experimental indicators of the dynamics of the index of glycolytic endurance of 10-year-old taekwondo athletes

At the beginning of the study of the average indicator of glycolytic endurance of 10-year-old athletes with a body weight of up to 36 kg at this age, the athletes of the control group showed a result of 163.16, while the athletes of the experimental group showed a result of 150.05, which is lower than that of the athletes of the control group at the beginning experiment.

After a pedagogical experiment, when studying the indicator of glycolytic endurance in athletes of both groups, athletes of the control group showed a result of 165.75, and athletes of the experimental group showed a result of 164.86. As can be seen, in the athletes of the experimental group, the growth rate in terms of glycolytic endurance is better than that of the athletes in the control group.

One of the qualities that should determine the dynamics of the physical training of 10-year-old taekwondo athletes is the dynamics of the integral indicator

of the labor force. The results of the beginning and end of the pedagogical experiment of taekwondo fighters of the control and experimental groups are summed up and scientifically and methodically analyzed.

According to him, the average result of testing 10-year-old taekwondo athletes up to 30 kg in the control group at the beginning of the study averaged 53.94, while the results of the experimental group in this indicator were 54.45. By the end of the pedagogical experiment, the results of the control group improved by 51.05, and the results of the athletes of the experimental group by 50.24.

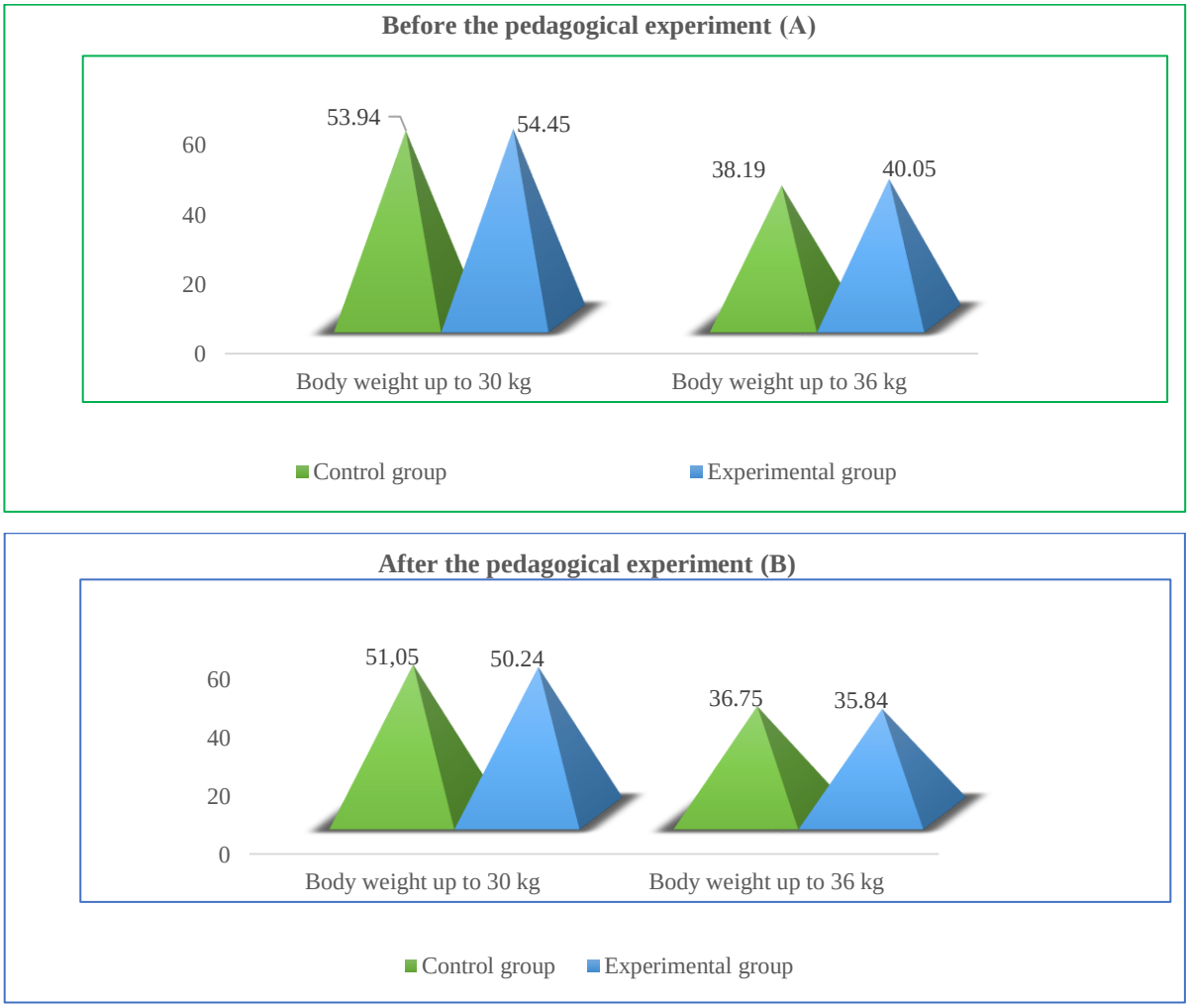


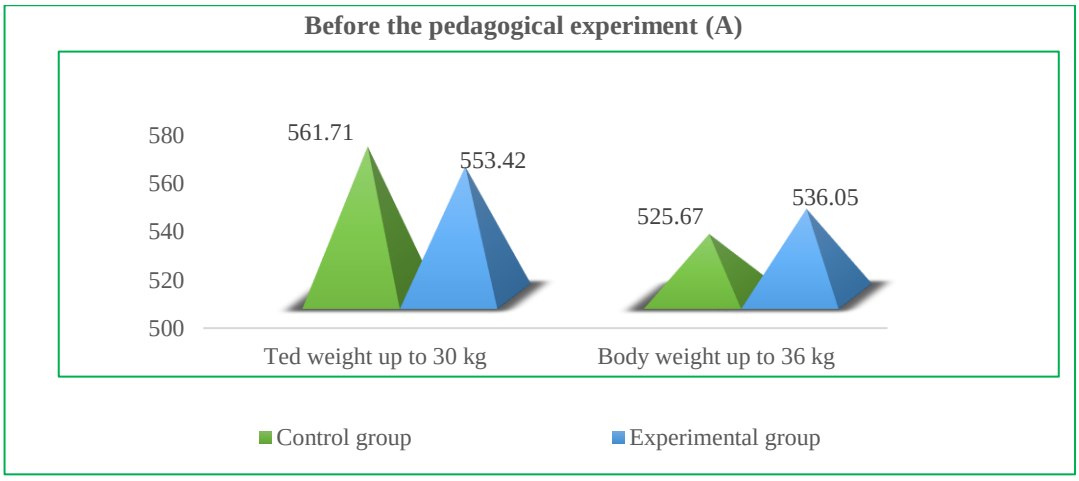
Fig. 3.7. (A, B). Pre-experimental and final indicators of the dynamics of the integral indicator of the labor force of 10-year-old taekwondo athletes

For athletes weighing up to 36 kg, the results at the beginning and at the end of the pedagogical experiment are as follows. In test samples before the pedagogical experiment, athletes with a body weight of up to 36 kg of the control group showed a result of 38.19, and athletes of the experimental group - 40.05. At

the end of the pedagogical experiment, 10-year-old athletes weighing up to 36 kg in the experimental and control groups averaged 35.84 in the experimental group, and 36.75 in the control group.

The research test, which lasted 40 seconds, included the above indicators that provide information about the level of physical development of taekwondo athletes. The integral indicator of "speed-strength" training is one of the indicators of the dynamics of physical training of 10-year-old taekwondo athletes. The data on this indicator obtained at the initial and final stages of the pedagogical experiment are as follows. According to these data, the average result recorded in 10-year-old athletes with a body weight of up to 30 kg in the control group, engaged in the initial training stage, at the beginning of the study was 561.71, at the end of the experiment it can be seen that this figure was equal to 545.84. The athletes of the experimental group in this weight category in the tests conducted at the beginning of the pedagogical experiment recorded an average result of 553.42, by the end of the study it was noticed that it had changed to 530.35.

The table shows that the results of 10-year-old taekwondo athletes of the control group weighing 36 kg during the initial testing amounted to 525.67, then at the end of the pedagogical experiment they improved to 429.18.



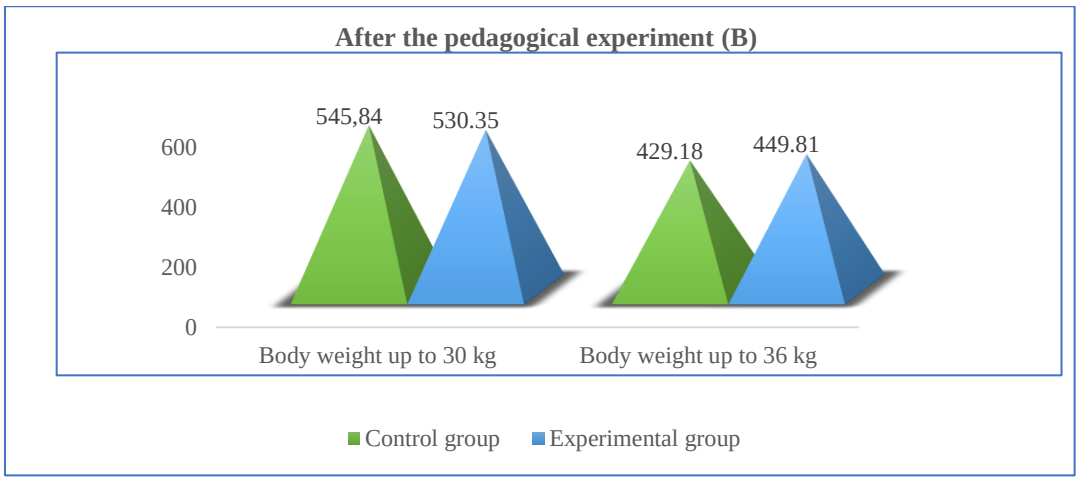


Fig. 3.8. (A, B). Pre-experimental and after-experimental indicators of the dynamics of the integral indicator of speed-strength training of 10-year-old taekwondo athletes

In the experimental group, 10-year-old taekwondo athletes at the beginning of the study had a score of 536.05, and at the end of the pedagogical experiment, with a positive growth rate, they recorded an indicator equal to the final result of 449.81.

Based on a scientific analysis of several dozen literary sources written by a number of foreign and Uzbek scientists, in order to achieve a solution to many problems that arise in this area, a special program "Hardware and software complex for measuring the blows of combatants" was developed by Doctor of Pedagogical Sciences (DSc), Professor Tajibaev Soyib Samidzhanovich and a free applicant Yusupova Nargiza Shakirovna. With the help of this device, we received complete information about the general strength indicators of 10-year-old young taekwondo fighters weighing up to 30 kg, engaged in the initial training stage (athletes applied side kicks for 5 s), we also managed to obtain complete information about general strength indicators 10-year-old taekwondo fighters of the control and experimental groups and the accuracy levels of their strikes during this time. Below, in the testing processes carried out to determine the total strength indicators of taekwondo athletes at the beginning and end of the study, a methodical analysis of data on the average results of athletes is scientifically described (Fig. 3.9 A, B).

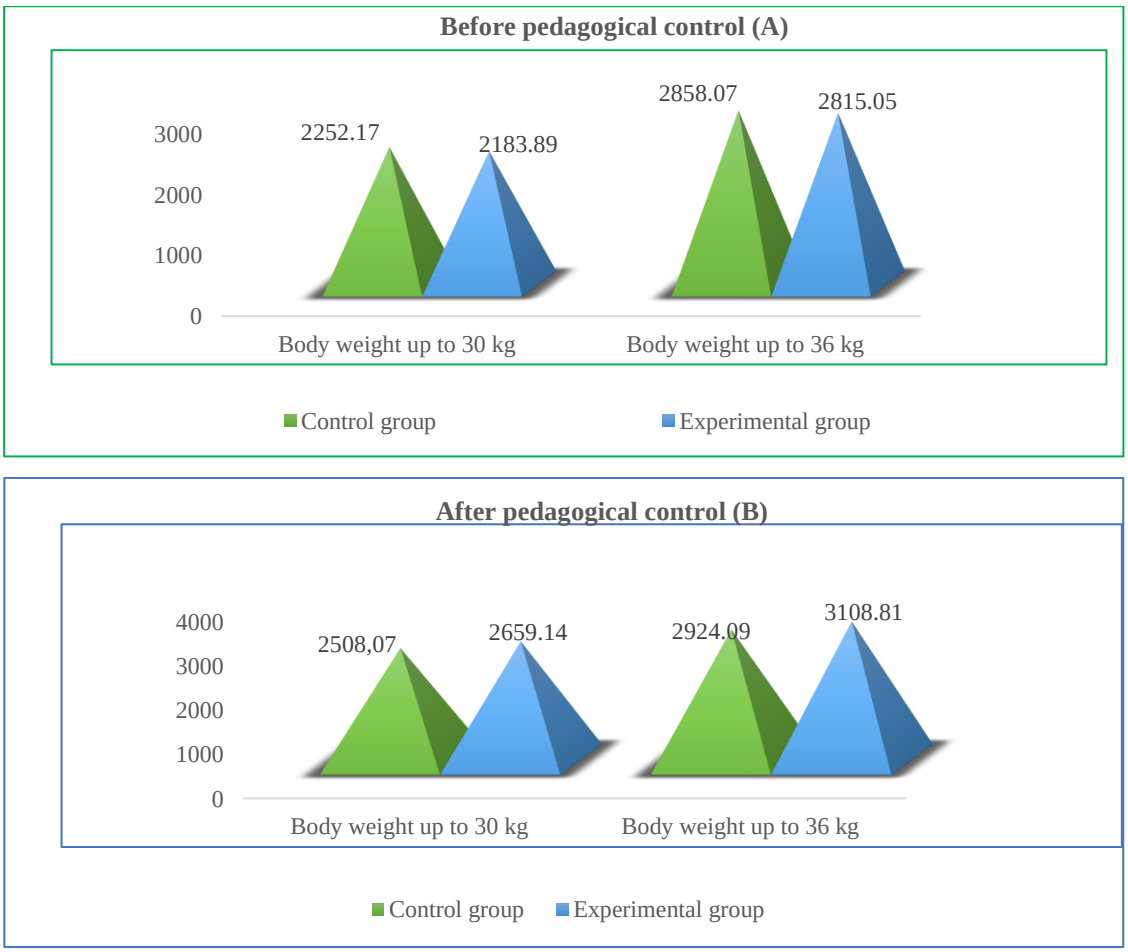


Fig. 3.9. (A, B). Pre-experimental and final indicators of the general power dynamics of the impact force in 10-year-old taekwondo athletes

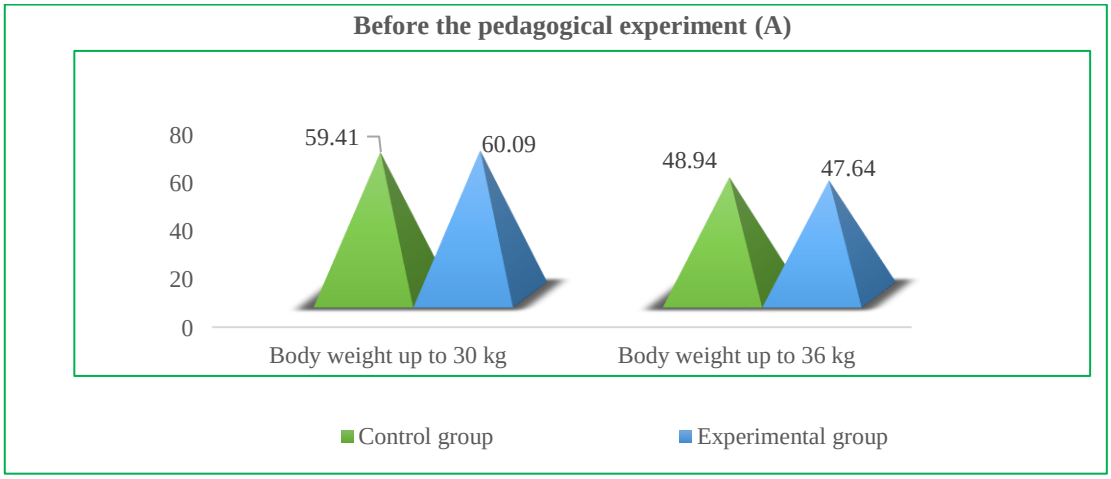
During the testing process, which lasted 5 seconds, the total strength of the blows delivered by 10-year-old taekwondo fighters in the initial training training for a given period of time was as follows. On average, the total strength of 10-year-old taekwondo athletes in the control group weighing up to 30 kg at the beginning of the study averaged 2252.17 kg.

At the end of the study, the athletes of the experimental group showed the result of 2183.89 kg, the athletes of the control group showed the result of 2508.07. The athletes of the experimental group had an increase of 2659.14 kg, which indicates that the athletes of the experimental group had higher growth rates than the athletes of the control group.

10-year-old taekwondo athletes of the experimental group weighing up to 36 kg at the beginning of the experiment on this test test showed a result of 2815.05,

by the end of the experiment this result increased to 3108.81 kg, while taekwondo athletes gained 0% increase. In the control group, the total indicator of the impact force of athletes at the beginning of the pedagogical experiment averaged 2858.07, although this result showed an average of 2924.04 by the end of the pedagogical study, it was found that the dynamics of growth in the total strength of the athletes in the control group was low.

The accuracy indicators of 10-year-old taekwondo fighters of the control group, formed from athletes involved in the initial training stage, are as follows. According to these data, the accuracy quality index of taekwondo athletes weighing up to 30 kg at the beginning of the study was 59.41 points, and at the end of the study this figure was 45.79 points. Athletes of the experimental group aged 10 years and weighing up to 30 kg at the beginning of the pedagogical experiment had an average score of 60.09, at the end of the pedagogical experiment the average score was 42.39 (see Fig. 3.10. A) , B).



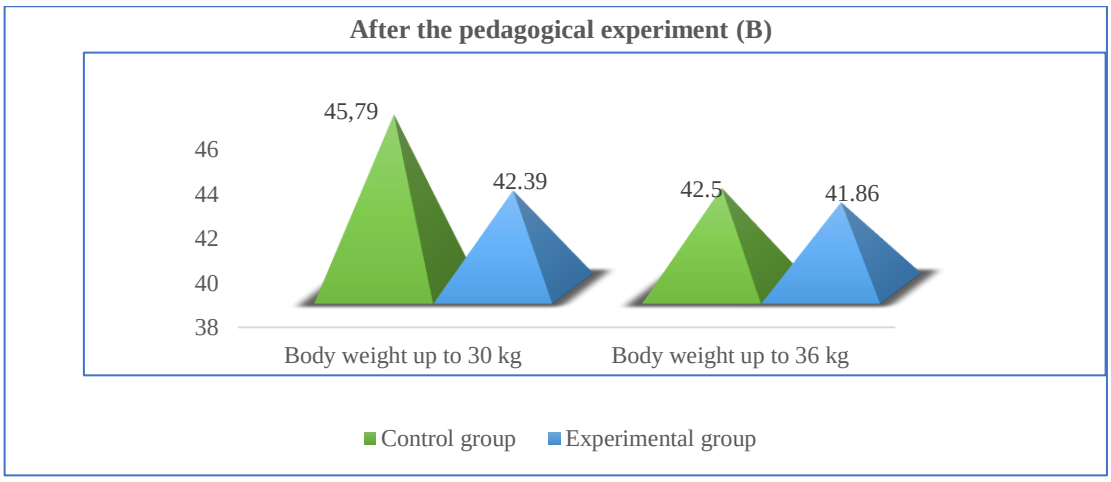


Fig. 3.10. (A, B). Before experimental and after experimental indicators of the accuracy dynamics of 10-year-old taekwondo athletes.

The results and growth rates of the indicator of the accuracy dynamics of 10-year-old taekwondo wrestlers in the control group with a body weight of up to 36 kg were as follows. According to these indicators, the athletes of the control group at the beginning of the pedagogical experiment had a result equal to 48.94 points, then the results of the final testing changed by 42.5. It is known that the results of the experimental group of athletes in this weight category were 47.64, which is an improvement of 41.86 according to the generalized data received from taekwondo athletes at the end of the pedagogical experiment..

Based on the above information, it can be concluded that for each of the 10 qualities listed above, which speak about the physical development of athletes, 10-year-old taekwondo fighters of the control and experimental groups, engaged in the initial training stage, achieved high rates of physical development, although with a large difference in most and a significant difference in the rest.

§ 3.2. Dynamics of indicators of physical readiness of taekwondo athletes aged 10-13

At the end of the study, the second results of the study were obtained, according to which the indicators of the dynamics of the physical development of 10-13-year-old taekwondo athletes are presented below in digital form and

subjected to scientific and methodological analysis. "Hardware-software complex for measuring the strikes of combatants" equipped with the software "TABO-STAR" showed the dynamics of the explosive endurance coefficient of the side impacts of young taekwondo wrestlers, which are as follows. The average indicator of the explosive endurance coefficient of taekwondo fighters of the control and experimental groups with a body weight of up to 36 kg at the beginning of the pedagogical experiment in the control group was 0.75 points, while for the athletes of the experimental group this indicator was 0.91.

It can be seen that the athletes of the experimental and control groups scored 0.9 points in the experimental group and 1.01 points in the control group after the pedagogical experiment. The results of athletes with a body weight of up to 41 kg at the beginning and at the end of the experiment were as follows: if at the beginning of the experiment the results of the experimental group were 0.93, and the control group was 0.98, then after the pedagogical experiment these results were equal to 1.03 in the control group. group and 1.04 in the experimental group. (See figure 3.11.)

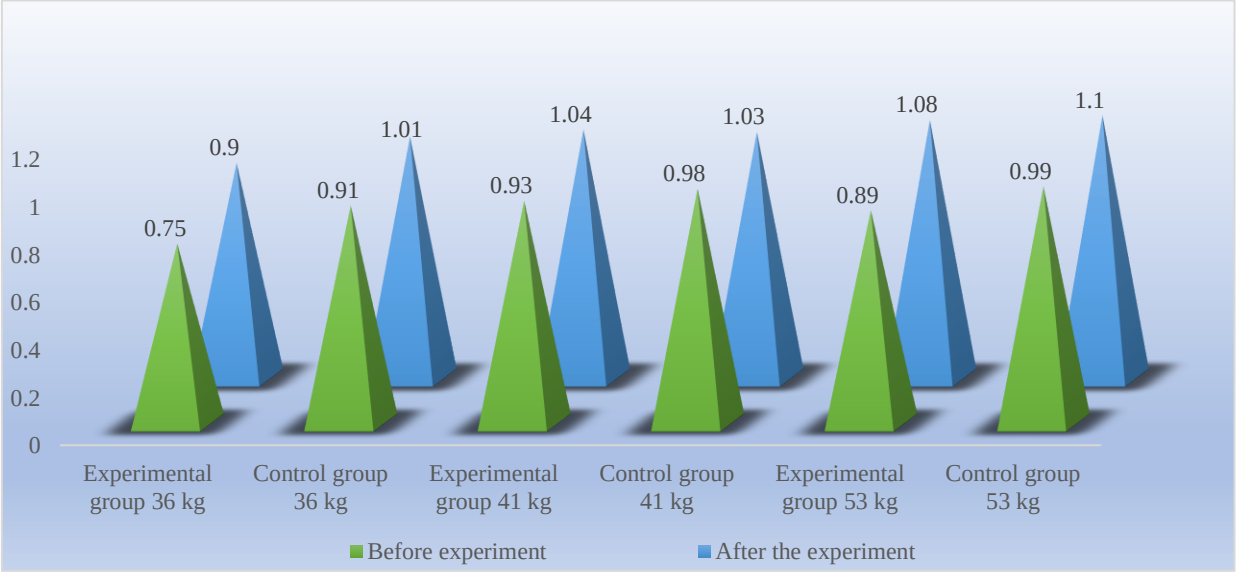


Fig. 3.11. Explosive endurance coefficient in 11-year-old taekwondo athletes before and after the experiment

It can be seen that the performance of athletes in the experimental and control groups after the pedagogical experiment was 0.9 in the experimental group and 1.01 in the control group. In athletes weighing up to 41 kg, the results at the beginning of the experiment in the experimental group were 0.93 and 0.98 in the control group.

According to this indicator, the dynamics of the index of explosive endurance of 11-year-old taekwondo fighters of the experimental and control groups with a body weight of up to 53 kg was studied, based on the results recorded at the beginning and end of pedagogical experiments. In the athletes of the control group at the beginning of the pedagogical experiment, the average indicator was 0.99, while in the experimental group the results were 0.89.

The results of testing the explosive endurance index after the pedagogical experiment were 1.08 in the experimental group and 1.1 in the control group. According to the indicators of the development of the dynamics of the coefficient of the index of explosive endurance of taekwondo fighters in all three weight categories, the athletes of the experimental group showed a high rate of development.

The results of 11-year-old taekwondo athletes in determining the level of development of the explosive endurance index were as follows. Thus, the average explosive strength index of 11-year-old taekwondo fighters of the experimental group with a body weight of up to 36 kg before the study was 17.89. The average indicator of the control group before the pedagogical experiment was 18.17. The results of these indicators after the pedagogical experiment show that in the control group this indicator was 20.05, and in the experimental group it was 19.55.

In the control group up to 41 kg, which was defined as the next weight category, the initial results of testing the pedagogical experiment of taekwondo athletes were 21.71, and the initial average value of the index of explosive endurance of the experimental group athletes was 20.15.

The results of the level of development of the dynamics of the index of explosive endurance of athletes of this weight category after the pedagogical

experiment amounted to 23.33 in the experimental group, while the results of the taekwondo athletes of the control group amounted to 22.81 (see Fig. 4.12).

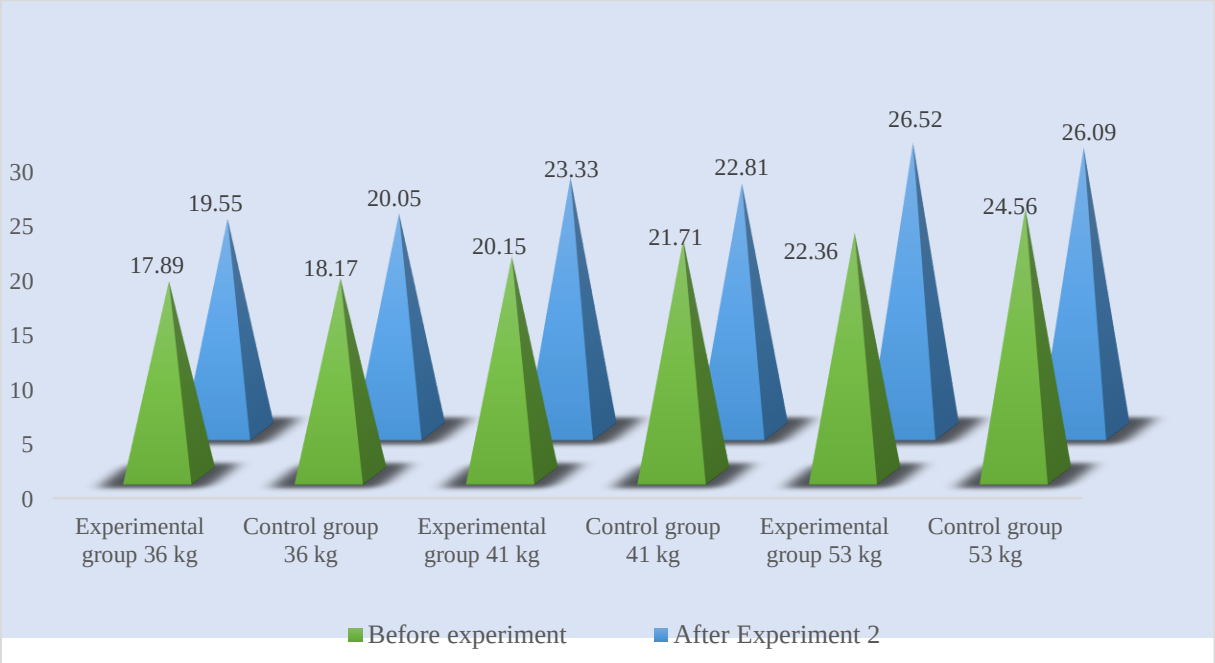


Fig. 3.12. Explosive endurance index of 11-year-old taekwondo athletes

The results of a comparative analysis of testing conducted at the beginning and at the end of the pedagogical experiment in the experimental and control groups in terms of the explosive strength of 11-year-old taekwondo athletes up to 53 kg are as follows. At the beginning of the pedagogical experiment, the results of 11-year-old taekwondo fighters of the control group were 24.56, and for the athletes of the experimental group, the figure was 22.36. At the end of the study, in the last test taken from 11-year-old taekwondo athletes weighing up to 53 kg, the athletes of the experimental group scored 26.52 points, and the athletes of the control group - 26.09.

Based on the results of the dynamics of the development of explosive endurance indicators of 11-year-old athletes in the control and experimental groups within the framework of an organized pedagogical study, it can be concluded that 11-year-old athletes in the experimental group have a higher development rate than 11-year-old taekwondo athletes in the control group.

In order to determine the dynamics of the level of physical fitness of 11-year-old taekwondo athletes with a body weight of up to 36 kg, involved in the initial stage of training, during an organized study, the plan also included the determination of the dynamics of the creatine phosphate index, and the results were summarized. With a systematic scientific and methodological analysis of the data, during the exercise, the average indicator of the dynamics of the creatine phosphate index of working capacity was on average 303.61 in the athletes of the control group, respectively, the average value of the initial indicator of the experimental group was 277.22 (see Fig. 3.13).

The results of the athletes of the experimental group by the end of the study averaged 376.58. Athletes of the control group showed a result of 356.42, with a passive growth rate compared to the experimental group in the final development of pedagogical experiments.

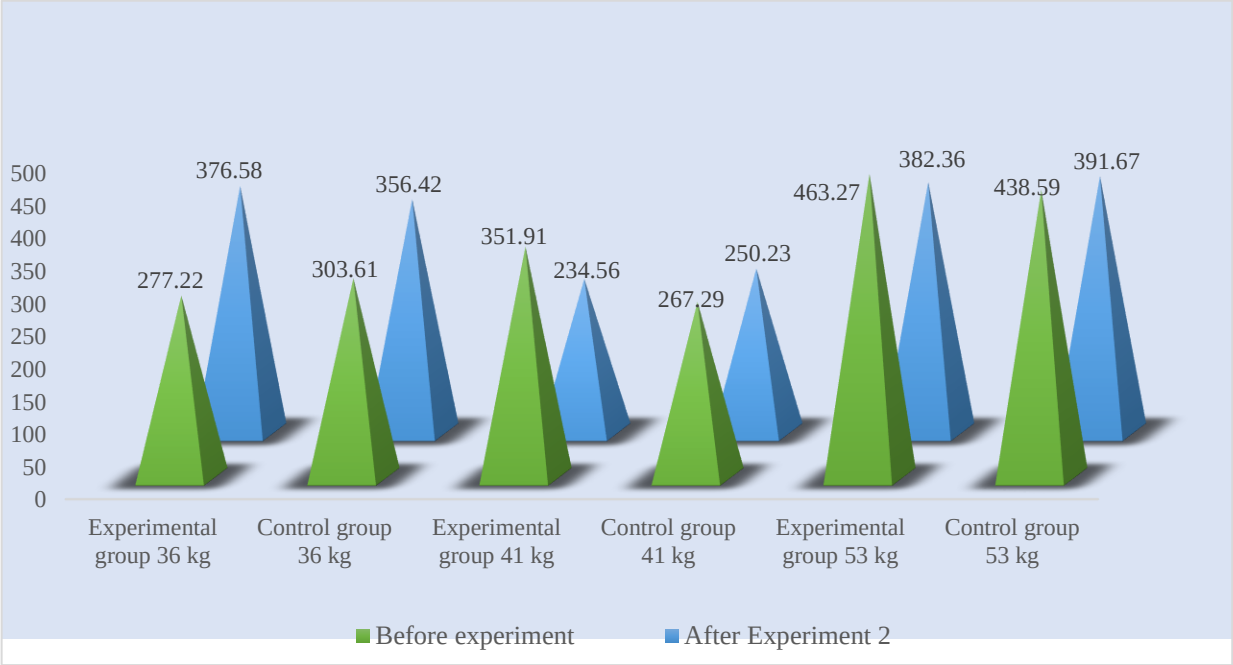


Fig. 3.13. Dynamics of indicators of the creatine phosphate index of taekwondo fighters aged 10-13

Athletes in the control group with a body weight of up to 41 kg at the beginning of the experiment recorded a result of 267.29, while the result of the experimental group was 351.91. After the study, it can be seen that these indicators

improved by 250.23 in the athletes of the control group and by 234.56 in the athletes of the experimental group..

For athletes weighing up to 53 kg before the pedagogical experiment, these figures were 438.59 in the control group and 463.27 in the experimental group. After the pedagogical experiment, it was found that the results of the athletes of the experimental group were 382.36, and the results of the athletes of the control group were 391.67.

According to the results of the study of the dynamics of the coefficient of speed endurance of young taekwondo fighters of 11 years old, the analysis of the dynamics of the coefficient of speed endurance at the beginning and at the end of the pedagogical experiment was carried out. The results of the "Hardware-software complex for measuring the strikes of combatants" equipped with the "TABO-STAR" software in terms of the performance of side impacts in a set time are given below (see Fig. 3.14).

According to him, the athletes of the control group weighing up to 36 kg scored 0.41 points before the experiment, and the athletes of the experimental group scored an average of 0.35. After the pedagogical experiment, it can be seen that these indicators have changed to 0.39 in the control group and to 0.31 in the experimental group..

The results of athletes weighing up to 41 kg before the experiment were 0.76 in the control group and 0.81 in the experimental group. After the pedagogical experiment, it was noted that these indicators changed to 0.72 in the control group and 0.71 in the experimental group, and the athletes of the experimental group showed a high growth rate.

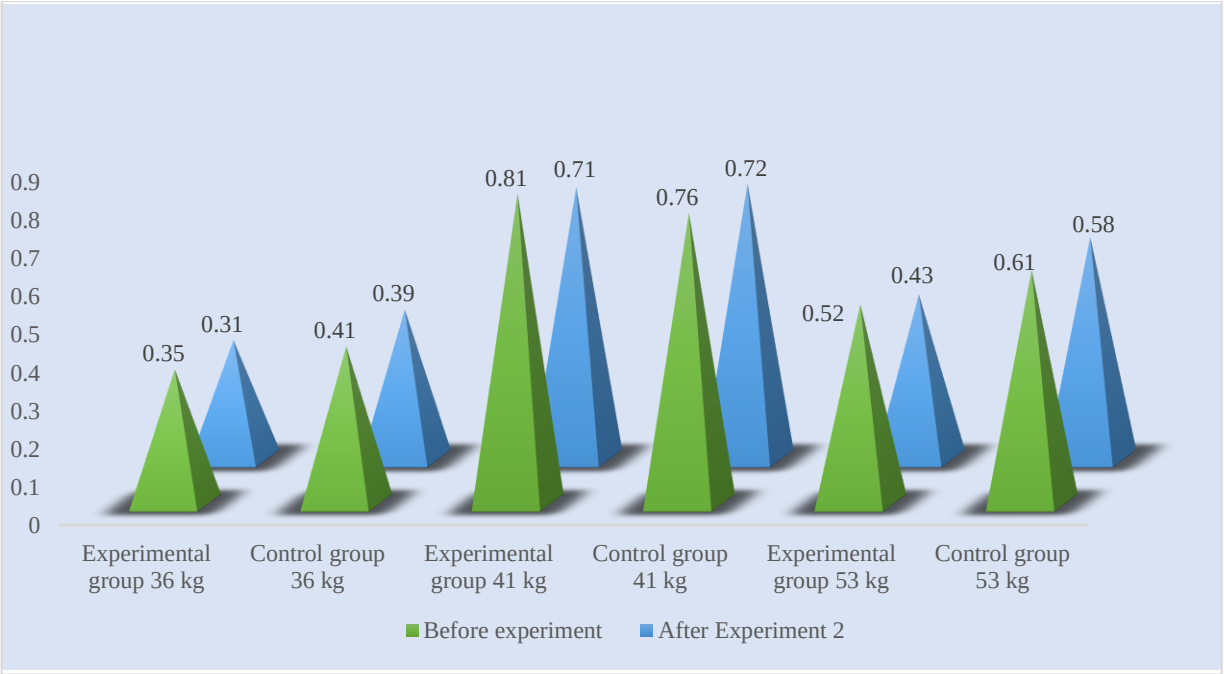


Fig. 3.14. Indicators of the dynamics of the coefficient of speed endurance of taekwondo fighters 10 years

In 11-year-old taekwondo wrestlers, who weighed up to 53 kg, before the experiment in the control group it was an average of 0.61, in the experimental group - 0.52. It can be seen that these indicators changed after training to 0.43 in the experimental group and to 0.58 in the control group.

According to the dynamics of the coefficient of speed endurance of 11-year-old taekwondo fighters in the experimental and control groups at the stage of initial training, the results at the beginning and at the end of pedagogical experiments are as follows.

Before the start of the study, taekwondo athletes weighing up to 36 kg in the control group had an average score of 4.61 for this indicator, while at the end of the study this result was 6.11. The average result of the experimental group before the experiment was 3.45, and at the end of the experiment - 5.08. Athletes in the control group weighing up to 41 kg before the study had a score of 4.35 more than their peers, but at the end of the study this figure increased to 6.19 (see Fig. 3.15). The indicators of athletes in the experimental group before the pedagogical study were 7.08, and at the end of the study - 8.36.

The presented results of taekwondo athletes 11 years old up to 53 kg - both before and after the study, showed that if the average test result of athletes of this weight category at the beginning of the study was 2.65 in the experimental group, then after the study this figure improved to 3.84. The control group recorded a score of 2.53 before the pedagogical experiment and 3.13 after the experiment.

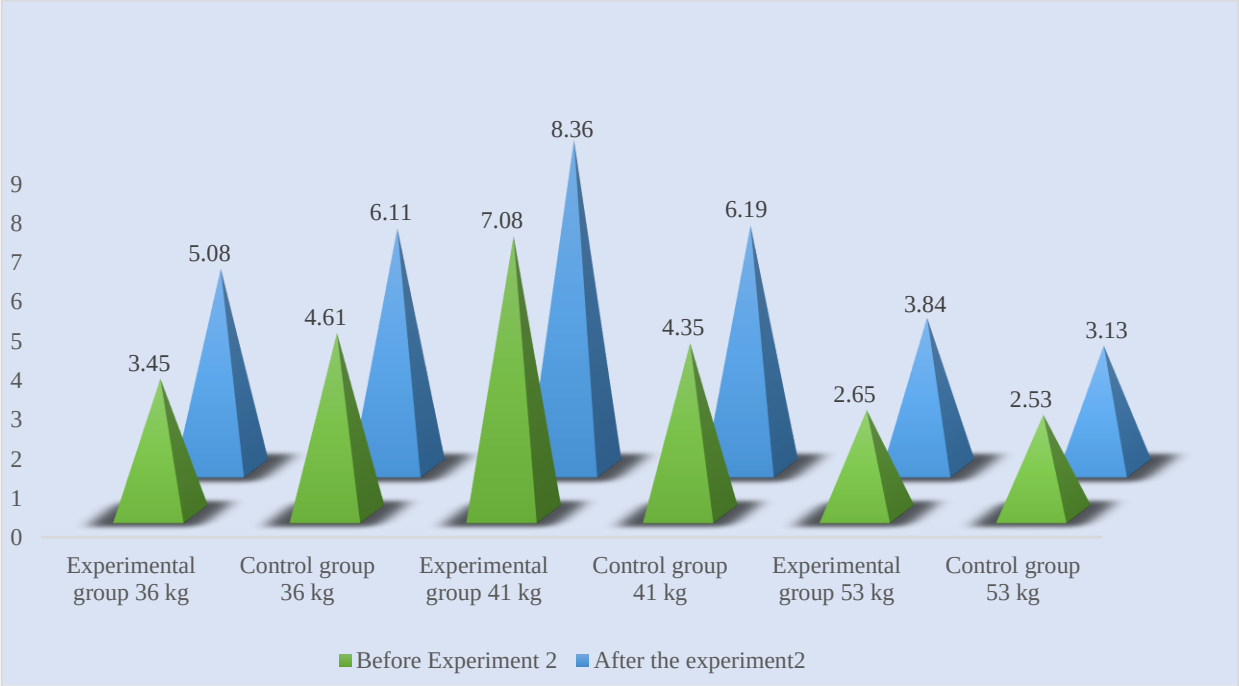


Fig.3.15. Indicators of the speed endurance index of 11-year-old taekwondo athletes

The results of 11-year-old taekwondo wrestlers with a body weight of up to 36 kg in determining the index of glycolytic endurance and the integral performance indicator during testing conducted at the beginning and end of the pedagogical experiment are as follows. In athletes of the control group, according to the index of glycolytic endurance, the initial average value was 6.11, and according to the integral index of working capacity - 26.85. Athletes of the experimental group scored 5.08 points on the glycolytic endurance index and 25.96 points on the integral labor force index.

The results of pedagogical experiments of athletes in these areas show that the index of glycolytic endurance in the control group changed by 4.61, and the index of integral performance - by 21.53. After the pedagogical experiment, the athletes

of the experimental group recorded a glycolytic endurance index of 3.45 and an integral performance index of 20.41 (see Fig. 3.16-17).

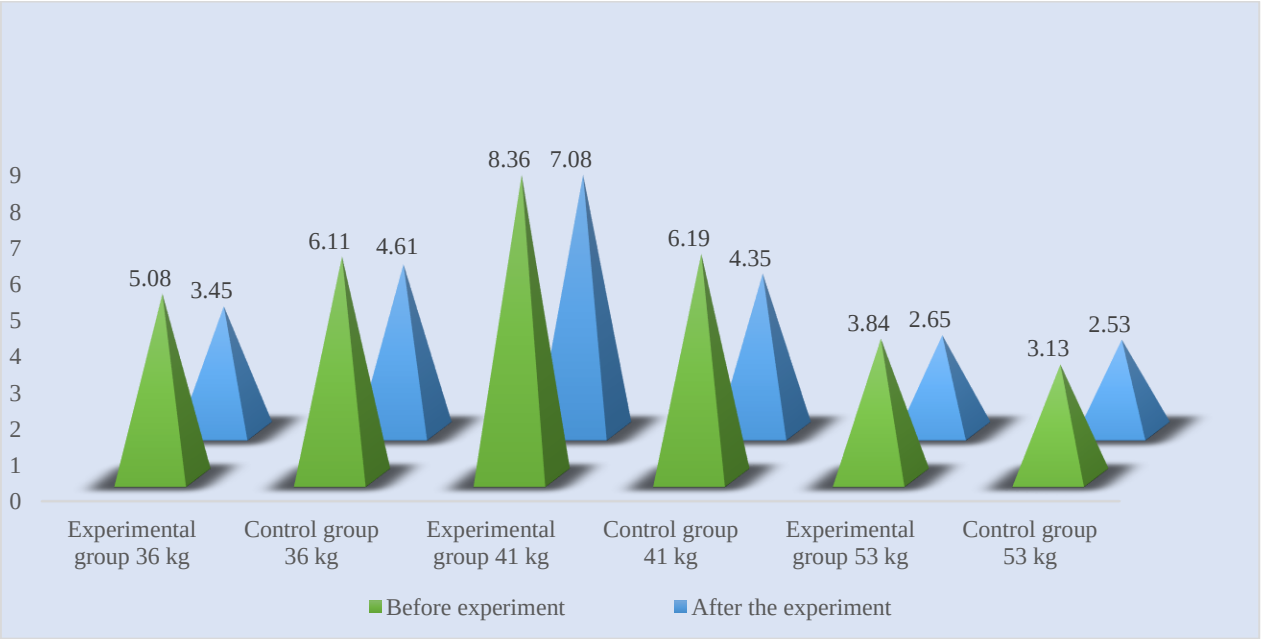


Fig. 3.16. Dynamics of the glycolytic endurance index of taekwondo athletes aged 11

In taekwondo wrestlers weighing up to 41 kg, the results recorded at the beginning and end of the study in both directions are as follows: the average score of the first test in terms of glycolytic endurance at the beginning of the pedagogical experiment in the control group was 6.19, in the experimental group - 8.36.

The results of athletes on this indicator after the pedagogical experiment changed, in the experimental group they amounted to 7.08 points, while in the control group it was 4.35. The integral labor force index before the experiment was 35.73 in the control group and 33.94 in the experimental group. At the end of the study, it was found that the integral labor force index of 11-year-old taekwondo athletes in the control group was 29.14, and in the experimental group - 27.91 (see Fig. 3.16-17).

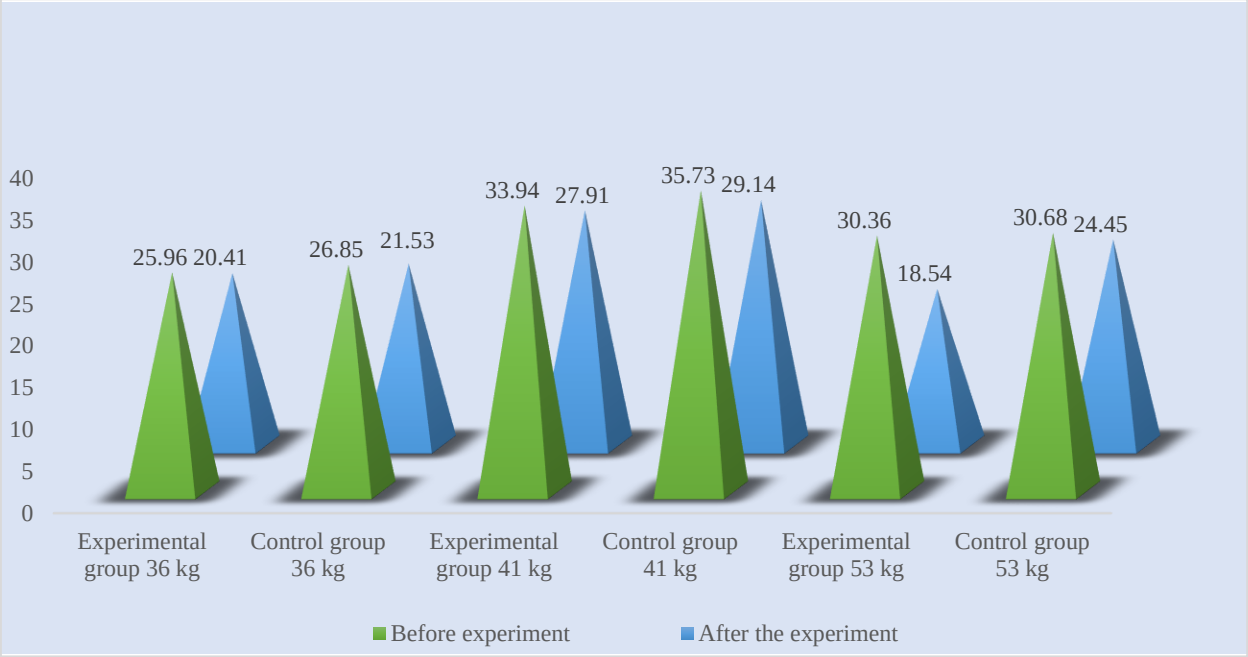


Fig. 3.17. Indicators of the dynamics of the integral labor force index of 11-year-old taekwondo athletes

The results determined by testing the glycolytic endurance index and the integral performance index of taekwondo athletes weighing up to 53 kg at the beginning and at the end of the study are as follows. The results recorded at the beginning of the pedagogical experiment for the athletes of the control group were 3.13 and 30.68, while for the athletes of the experimental group, the results were respectively equal to 3.84 and 30.36. At the end of the experiment, the taekwondo fighters of the control group scored an average of 2.53 in the glycolytic endurance index and 24.45 in the integral labor force index. Athletes of the experimental group scored 18.54 points for the integral labor force index, and 2.65 for the glycolytic endurance index.

At the beginning of the pedagogical experiment, the results of the dynamics of the integral index of speed-strength training, recorded by 11-year-old taekwondo athletes of the control group with a body weight of 36 kg, amounted to 361.94, by the end of the study, the growth rate was 357.45. The results of the taekwondo athletes of the experimental group at the beginning of the experiment were 345.75, and after the experiment - 319.18. At the beginning of the pedagogical experiment,

the result for athletes with a body weight of 41 kg in the control group was 362.03, and for athletes in the experimental group - 367.75 (see Figure 3.18).

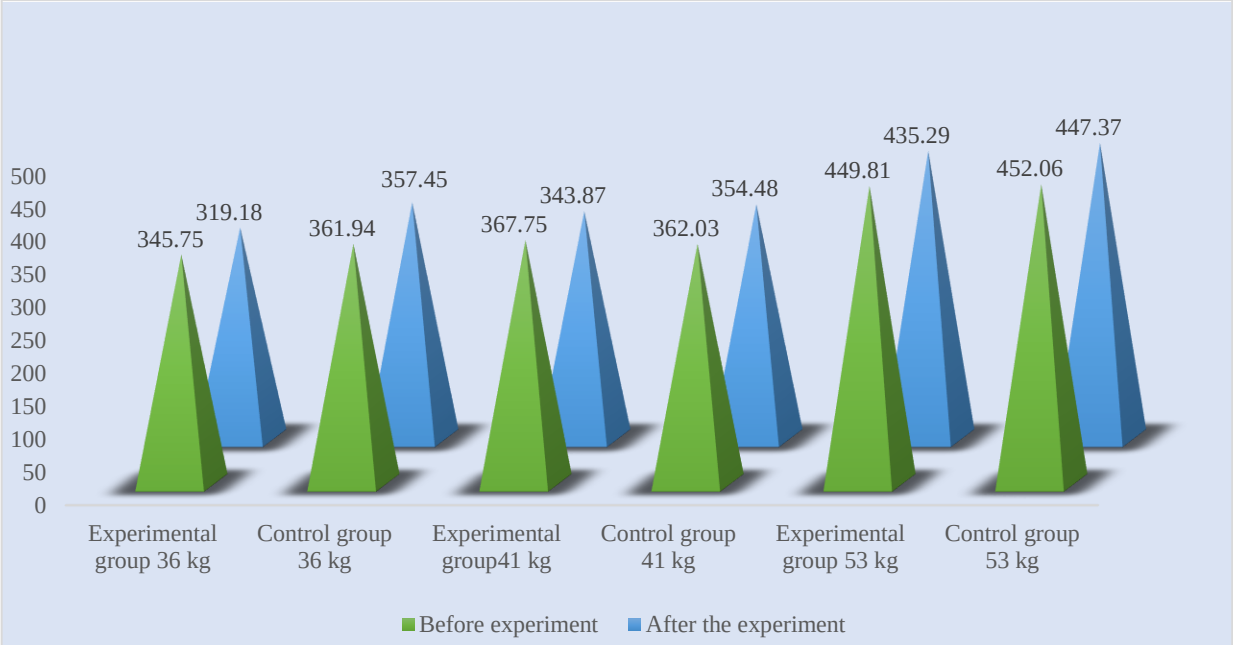


Fig.3.18. Indicators of the dynamics of the integral index of speed-strength training of taekwondo fighters 11 years old

After a pedagogical experiment on the dynamics of the integral indicator of the speed-strength training of athletes, the experimental group showed a result of 343.87, while the athletes of the control group scored 354.48 points.

Preliminary results of the study showed that the integral indicator of speed-strength training in 11-year-old athletes weighing up to 53 kg differs from the results recorded by taekwondo fighters of other ages, in the control group the average result before the pedagogical experiment was 452.06, and in the experimental group this indicator was 449.81. In this weight, the data of taekwondo athletes after the pedagogical experiment for this indicator amounted to 447.37 in the control group and 435.29 in the experimental group.

The average values of the total strength of 11-year-old taekwondo athletes for this short period of time before and after the study are as follows. Athletes in the control group with body weight up to 36 kg showed an average of 3647.67, athletes in the control group up to 41 kg - an average of 3547.74, and athletes up to

53 kg - an average of 3170.85, but athletes in the experimental group with body weight up to 36 kg showed an average of 3316.65, athletes weighing up to 41 kg - 3612.58, and athletes up to 53 kg - 3041.58 (see Fig. 3.19).

After the pedagogical experiment, the indicators of 11-year-old taekwondo athletes with a weight category up to 36 kg in the control group amounted to 3812.25, and in the experimental group - 3853.74. Athletes in the control group with a body weight of up to 41 kg had an indicator of 3609.21, and in the experimental group the result was 3723.2. In 11-year-old taekwondo athletes weighing up to 53 kg at the stage of initial training, the total strength was 3391.26 in the control group and 3471.56 in the experimental group.

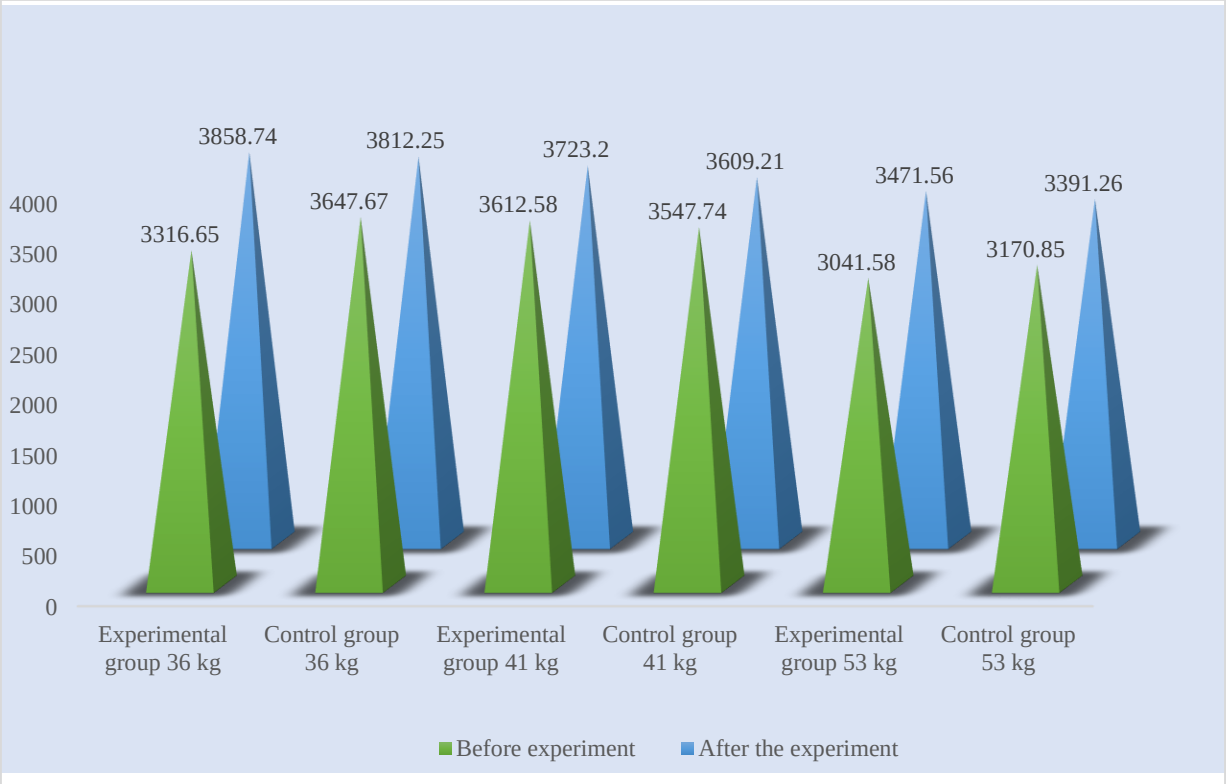


Fig. 3.19. General strength indicators of impact force in 11-year-old taekwondo athletes

According to the results of testing to determine the level of development of the quality of accuracy in taekwondo, conducted among taekwondo practitioners in the experimental and control groups before and after the end of the pedagogical experiment, the average results recorded by taekwondo practitioners of the

experimental group with a body weight of up to 36 kg at the time of the start of the study were 45, 79, and the results of the athletes in the control group were 24.08. Athletes in the control group with a body weight of up to 41 kg at the beginning of the pedagogical experiment had a score of 42.5, and the experimental group had 51.41 points for the same indicator. At the beginning of the pedagogical experiment, athletes of the control group with a body weight of up to 53 kg showed a result of 51.41, and athletes of the experimental group showed a result of 53.33 (see Figure 3.20.).

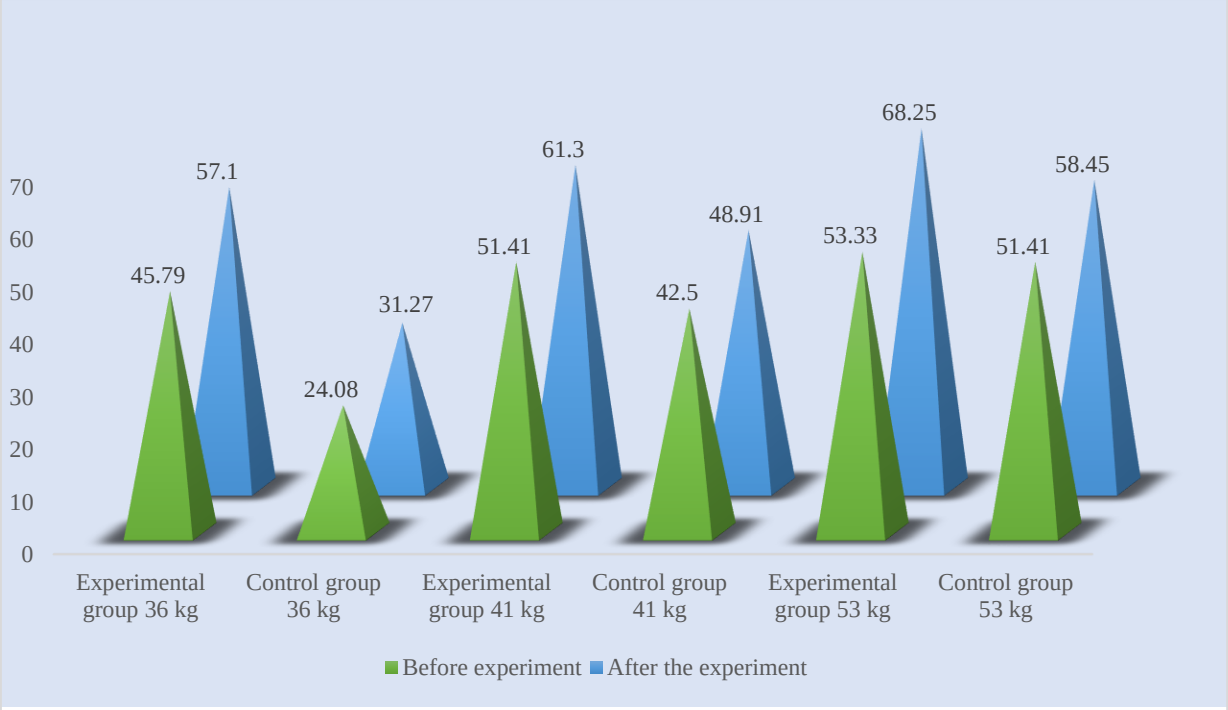


Fig. 3.20. Accuracy indicators of taekwondo 11 years old

After the pedagogical experiment, the indicators of 11-year-old taekwondo athletes are as follows. The average score of taekwondo athletes weighing up to 36 kg in the control group increased to 31.27, and in the experimental group - to 57.1. Athletes in the control group up to 41 kg improved their performance to 48.91 and athletes in the experimental group to 61.3. And the final results of the study, reflecting the accuracy levels of 11-year-old taekwondo athletes in the weight category up to 53 kg, are as follows: the athletes of the control group scored 58.45, and the athletes of the experimental group scored 68.25.

§ 3.3. Dynamics of indicators of physical readiness of 12-13 year old taekwondo athletes

In the course of the study, using the innovative technology developed by us, it was found that when summing up the results of 12-year-old taekwondo fighters, taekwondo fighters also gave the following results for a number of indicators. In children of the experimental group of 12 years old with a body weight of up to 36 kg at the beginning of the study, the explosive endurance coefficient was 1.75, and by the end of the study it improved to 1.65. It can be seen that the coefficient of explosive endurance of taekwondo wrestlers weighing up to 41 kg was 1.90. The following study showed that taekwondo athletes weighing up to 53 kg have an average explosive endurance coefficient of 1.34. The 12-year-old taekwondo wrestlers with a body weight of more than 53 kg selected for the final weight category had an explosive endurance coefficient with a score of 1.03 (see Fig. 3.21).

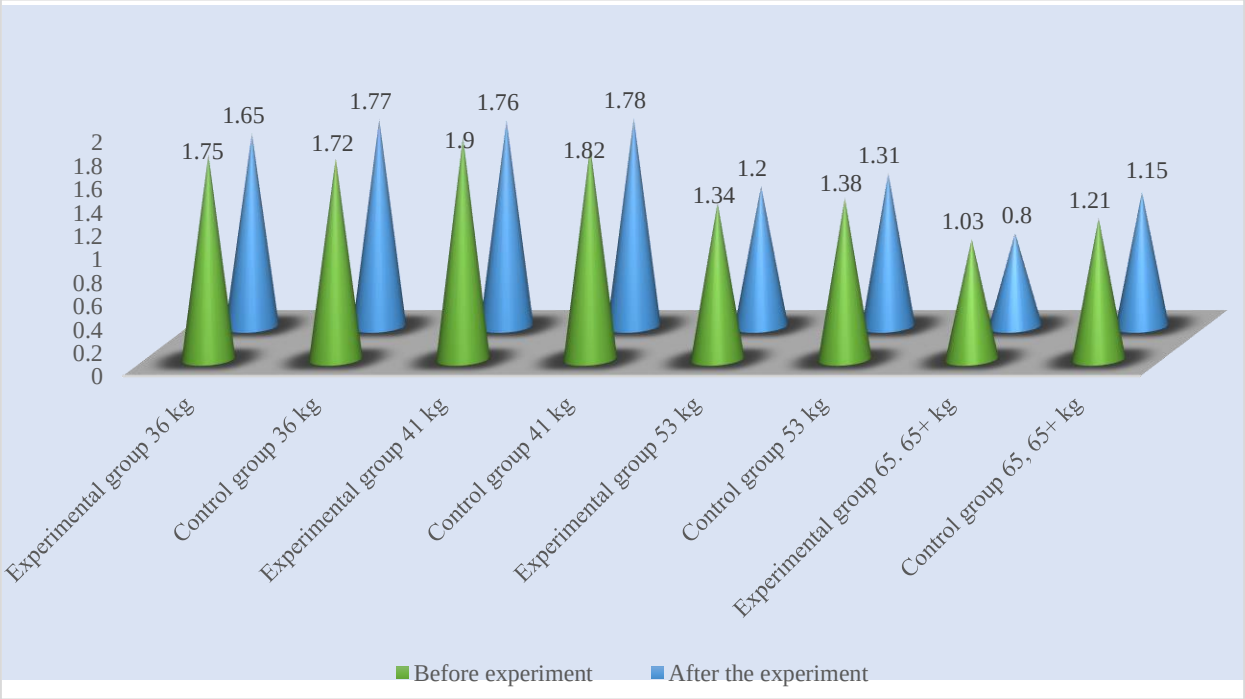


Fig. 3.21. Explosive endurance coefficient of taekwondo fighters 12 years old

When determining the index of explosive endurance, the results of 12-year-old taekwondo athletes looked as follows. According to these data, the average explosive strength of the taekwondo fighters of the experimental group up to 36 kg was 21.8. According to this indicator, the average result of 12-year-old taekwondo athletes weighing up to 41 kg was 27.75, and the rate of development of the index of explosive endurance of athletes weighing up to 53 kg showed a result of 15.41. And by mathematical and statistical analysis, it was found that the average score of the study was 8.12 for individuals with a total weight of up to 53 kg and a body weight of more than 53 kg.

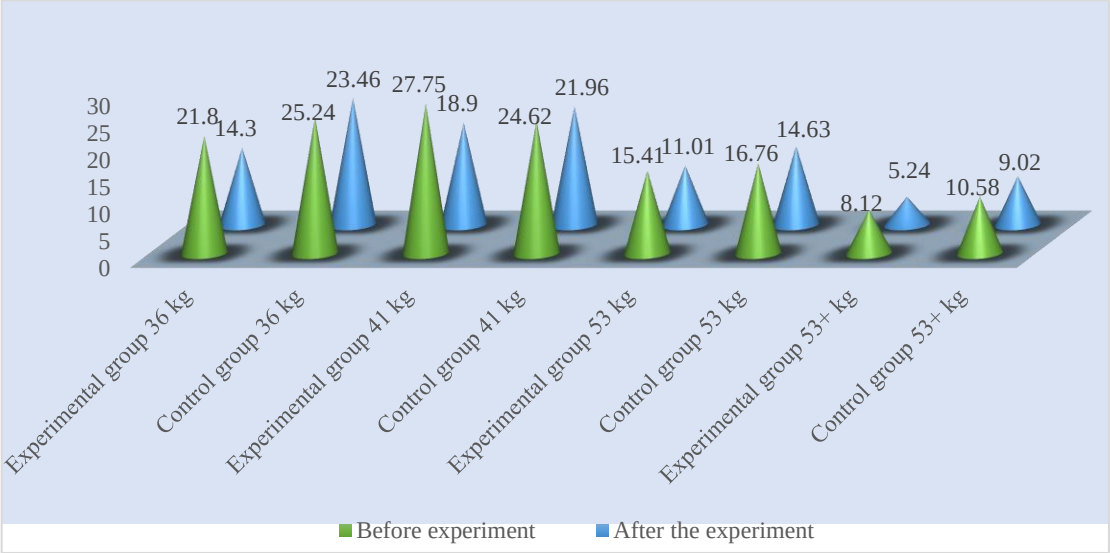


Fig. 3.22. Indicators of the explosive endurance index of taekwondo fighters 12 years

In 12-year-old taekwondo fighters weighing up to 36 kg, the average indicator of the dynamics of the creatine phosphate index of taekwondo fighters' working capacity was 152.57, while the index of creatine phosphate dynamics of taekwondo fighters weighing up to 41 kg was 376.58 with a significant difference from the body weight of their 36-kg peers . While the results of athletes weighing up to 53 kg at this age showed a result of 230.84, and athletes with a maximum weight of 53+ kg and above had a result of 89.28. Studies have shown that there were significant differences.

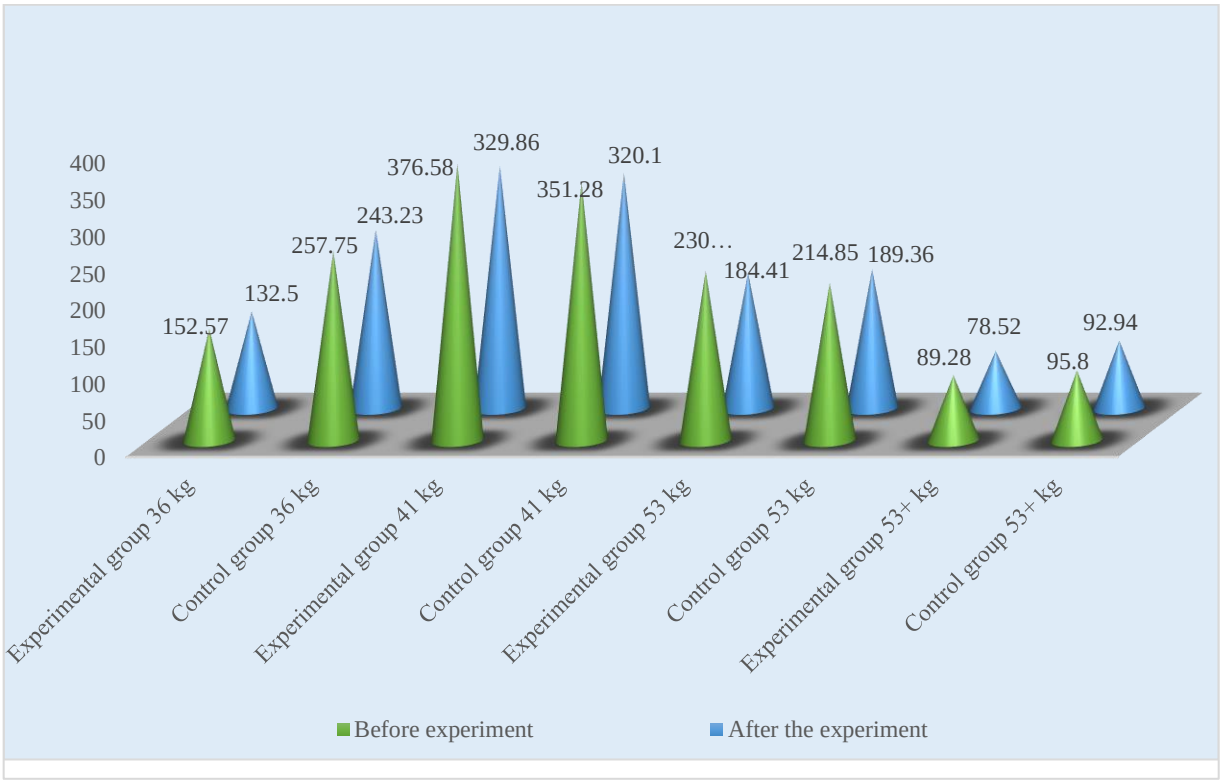


Fig. 3.23. Indicators of the dynamics of the creatine phosphate index of working capacity of taekwondo athletes for 12 years

The following results were obtained, in which the dynamics of the development of the coefficient of speed endurance of taekwondo fighters 12 years old, engaged in the stage of initial training, differed sharply from each other. According to the results obtained, the average result of 12-year-old taekwondo athletes up to 36 kg was 1.37, while the results of athletes up to 41 kg showed a significant difference of 0.62 from the results of their peers. With an increase in the body weight of athletes, there was a decrease in the numbers reflecting the results, and the next weight category up to 53 kg showed a result of 0.43, as the weight increased as a result of a decrease, only in the weight category 53+ kg there was a change on the contrary, and the result was 0.93.

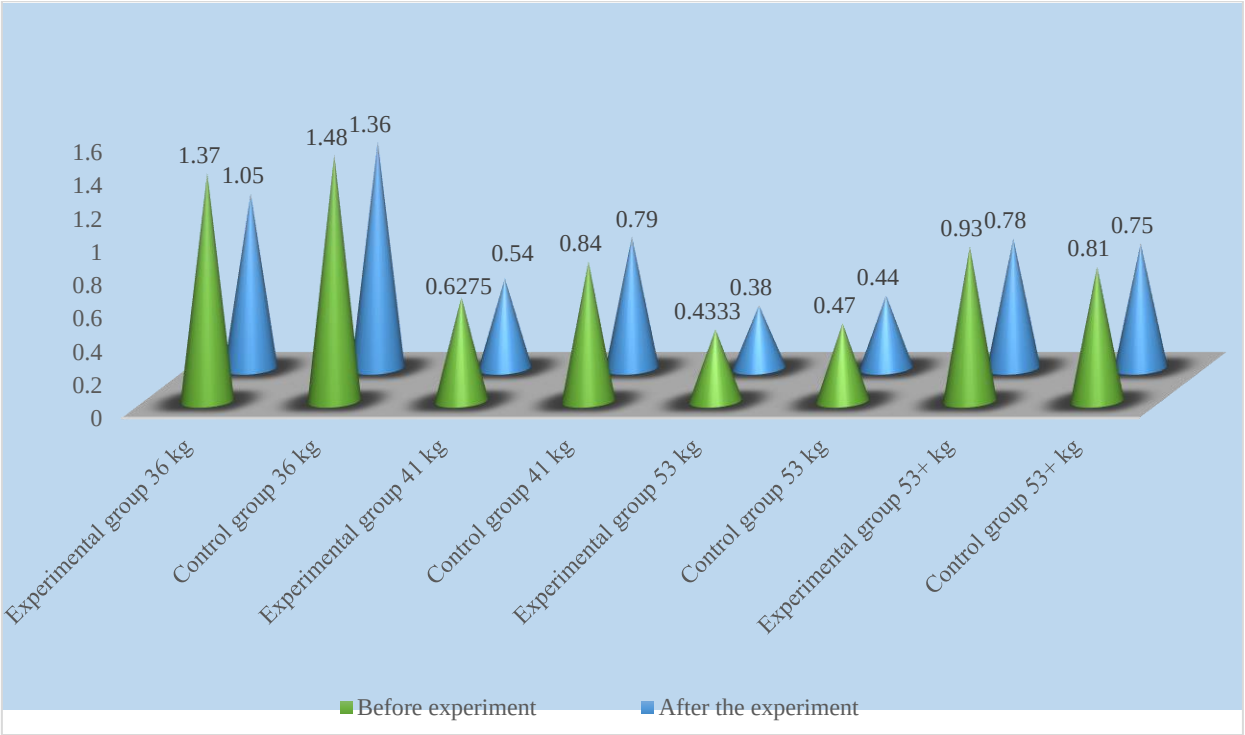


Fig. 3.24. Indicators of the dynamics of the coefficient of speed endurance of taekwondo athletes for 12 years

The index of speed endurance of taekwondo fighters 12 years old, involved in the initial training stage, is as follows. The results of taekwondo athletes with body weight from 36 to 41 kg were the highest and amounted to 17.39 and 6.19. The results of 12-year-old taekwondo athletes weighing up to 53 kg and over 53 kg were 3.13 and 5.08, respectively.

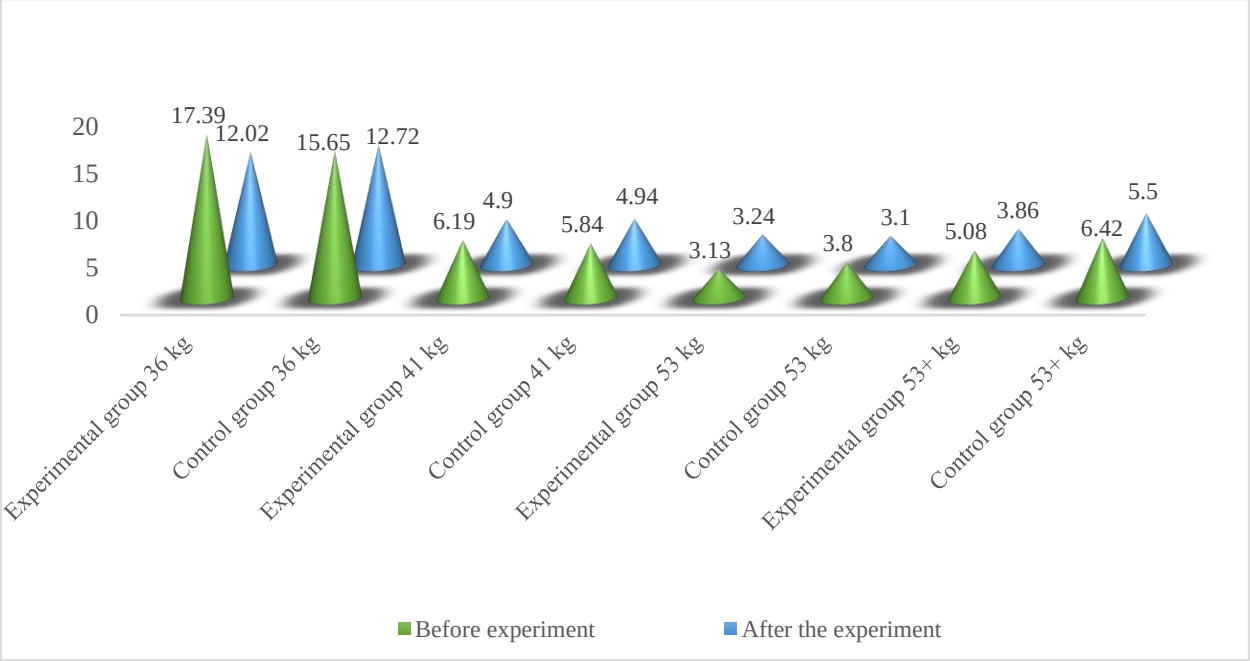


Fig. 3.25. The indicator of the dynamics of the index of speed endurance of taekwondo fighters 12 years old

It turned out that the difference between the results in terms of the glycolytic endurance index and the integral indicator of labor force, 12-year-old taekwondo fighters who are engaged in the initial training stage, differs significantly from the results in the weight categories of taekwondo fighters of other ages.

This means that if 12-year-old taekwondo wrestlers with a weight category up to 36 kg had the glycolytic endurance index and the integral labor force index of 276.31 and 39.18, then taekwondo wrestlers up to 41 kg had the following results: the glycolytic endurance index was 145.55, and the integral labor force index averaged 33.94. The results of 12-year-old taekwondo wrestlers weighing up to 53 kg at the stage of initial training were 71.75 and 18.54, respectively, in terms of the glycolytic endurance index and the dynamics of the integral labor force indicator. The results of 12-year-old taekwondo athletes with a body weight of 53+ kg were 13.19 of the integral labor force index with a glycolytic endurance index of 80.76.

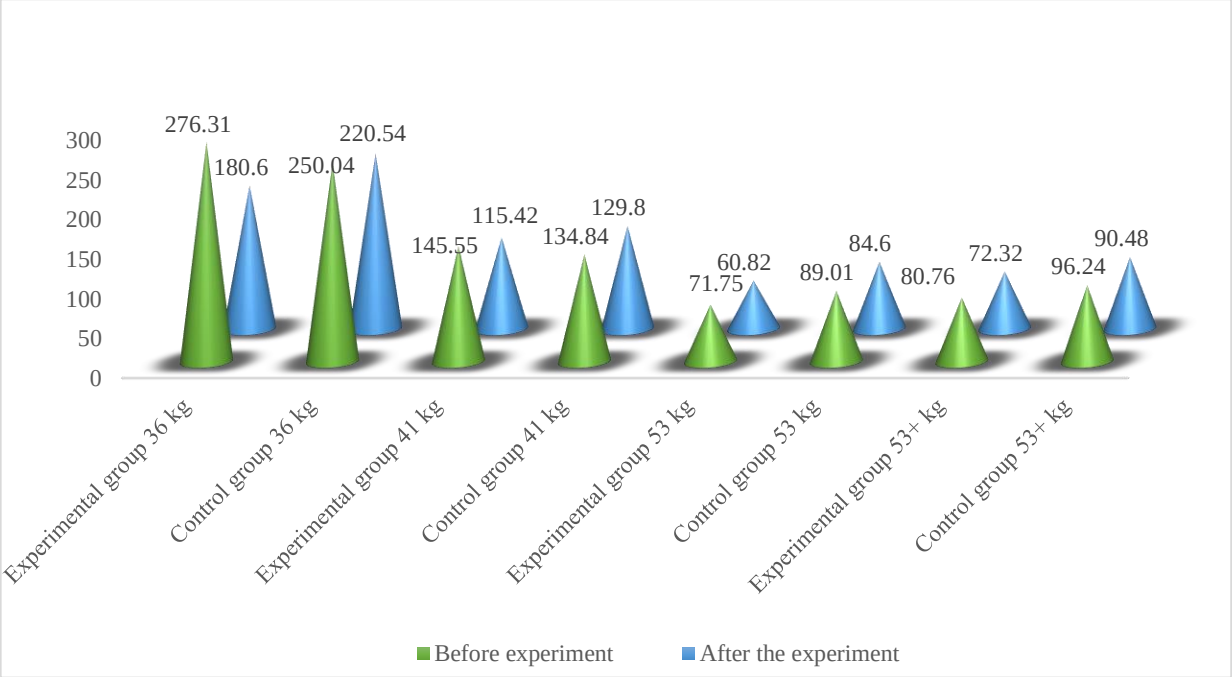


Fig. 3.26. Indicators of the dynamics of the index of glycolytic endurance of taekwondo athletes for 12 years

It turned out that the difference between the results of 12-year-old taekwondo fighters in terms of the glycolytic endurance index and the integral indicator of labor force, who are engaged in the initial training stage, differs significantly from the results in the weight categories of taekwondo fighters of other ages..

This means that if 12-year-old taekwondo athletes up to 36 kg had the index of glycolytic endurance and the integral labor force index of 276.31 and 39.18, then taekwondo athletes up to 41 kg had the following results. The glycolytic endurance index was 145.55, and the integral labor force index averaged 33.94.

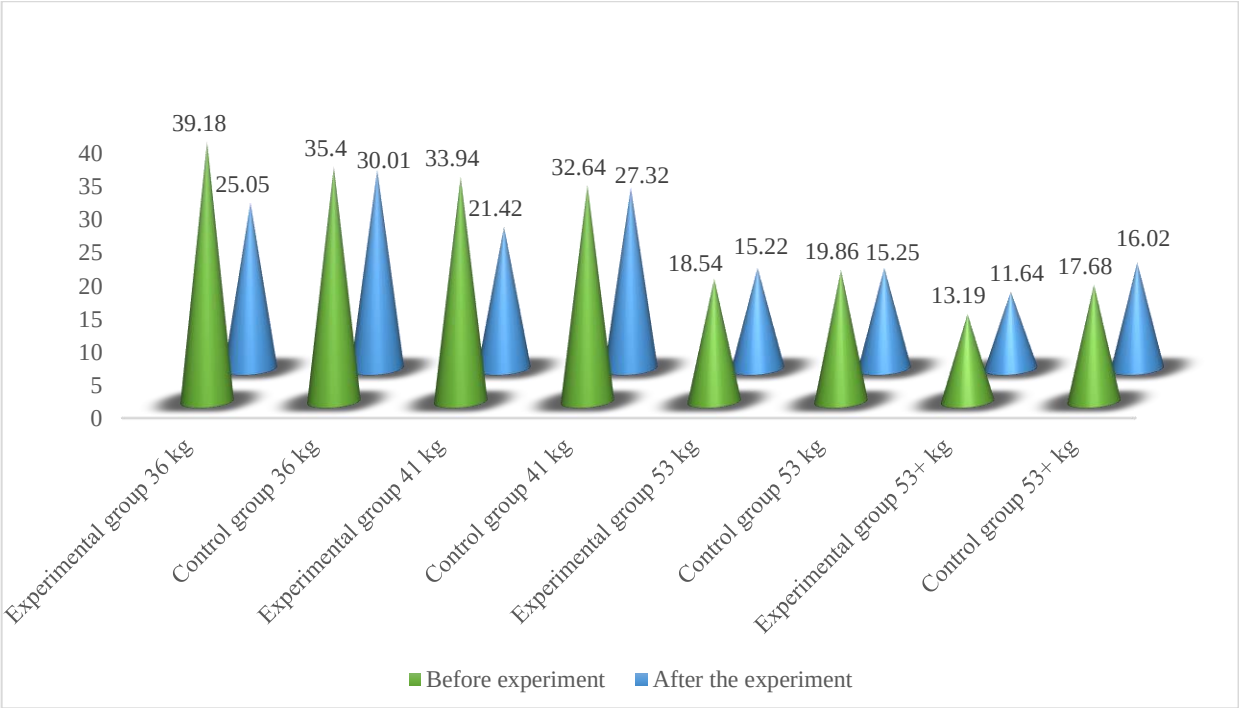


Fig. 3.27. Indicators of the dynamics of the integral indicator of the labor force of taekwondo fighters at the age of 12

The results of taekwondo fighters aged 10-13 years with a body weight of up to 53 kg at the stage of initial training were 71.75 and 18.54, respectively, in terms of the index of glycolytic endurance and the dynamics of the integral indicator of labor force. Bilateral results of 12-year-old taekwondo athletes with a body weight of 53 kg and a body weight of 53+ kg were 13.19 of the integral labor force index with a glycolytic endurance index of 80.76.

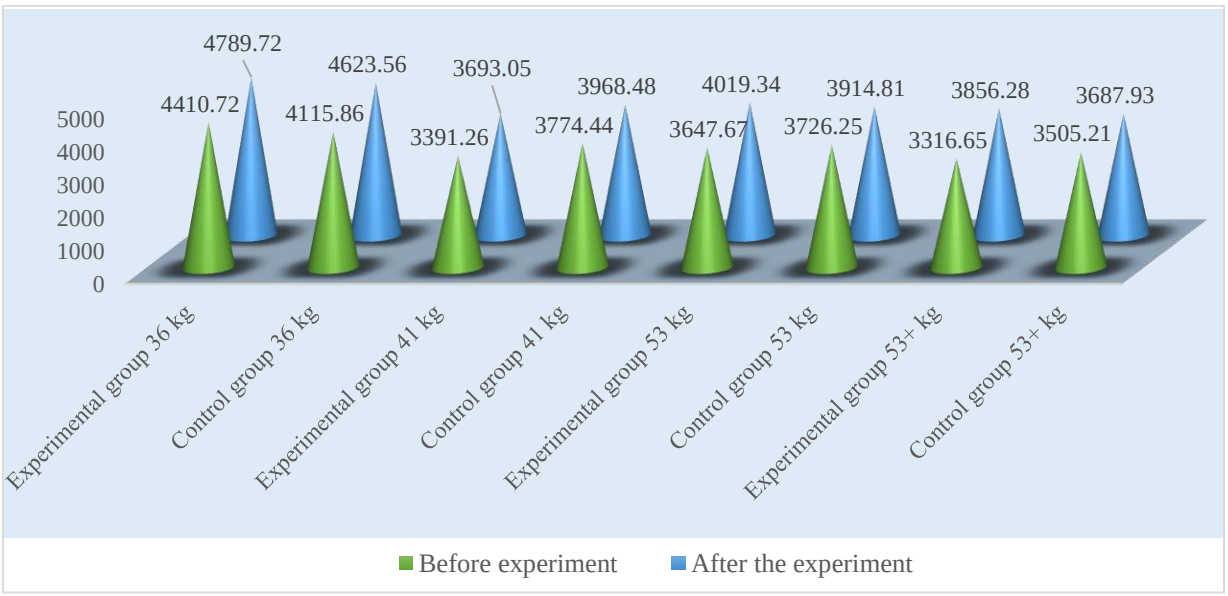


Figure 3.28. Indicators of the dynamics of the integral indicator of speed-strength training of taekwondo athletes aged 10-13

According to the results of testing the general strength indicators of physical fitness of 12-year-old adolescent taekwondo athletes involved in the initial training stage, they were as follows. According to him, the total strength of 12-year-old taekwondo athletes with an average weight of up to 36 kg showed an average of 4410.72. And taekwondo athletes up to 41 kg showed an average of 3391.26. While 12-year-old taekwondo athletes in the 53 kg weight category scored 3647.67, average results of 12-year-old taekwondo athletes in 3 weight categories were also presented.

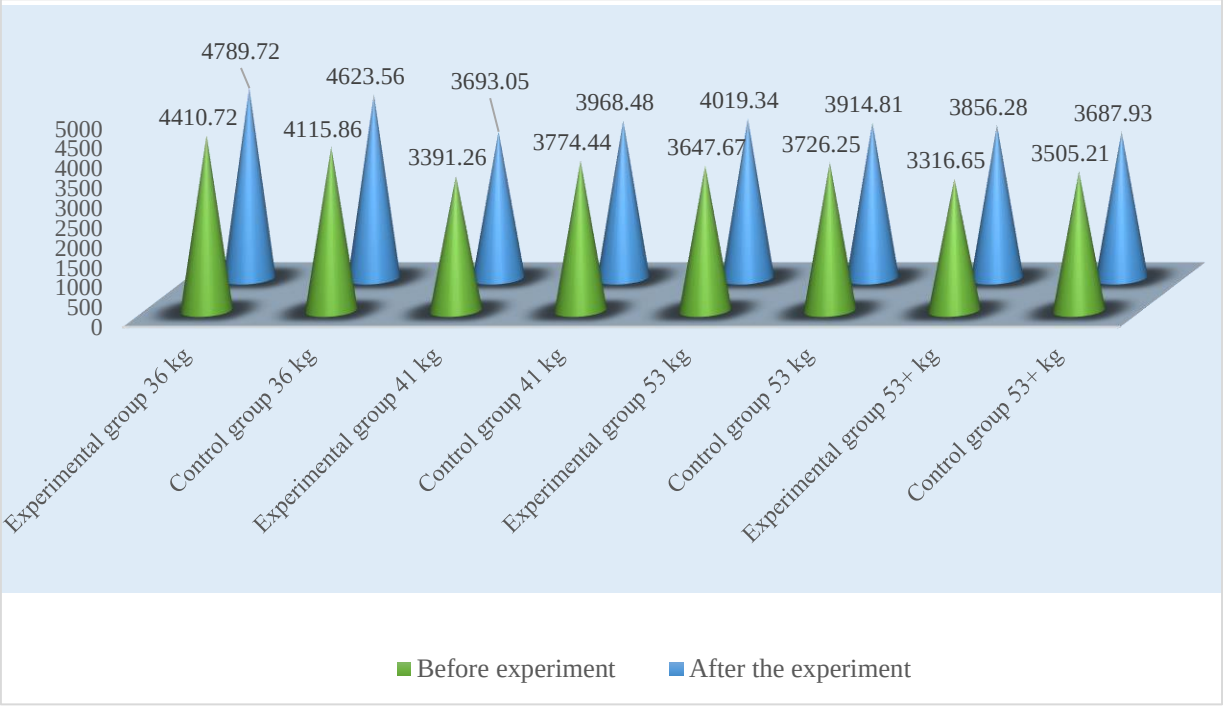


Fig. 3.29. General strength indicators of physical fitness of taekwondo athletes 10-13 years old

When determining the total performance of 12-year-old taekwondo wrestlers with a maximum weight of 53+ kg, engaged in the initial training stage, the average score according to the test results was 3316.65. The total strength of

athletes with a body weight of 53 kg, 53+ kg was 3726.2, which is the result of a test to determine the total strength of taekwondo fighters.

When analyzing the results of 12-year-olds on the basis of scientific and methodological observations and the nature of pedagogical observations, it became clear that the results showed greater differences in the results of each weight category than in athletes of other ages.

Conclusions on the third chapter

4.1. According to the “Speed Endurance Index”, 10-year-old taekwondo athletes at the stage of initial training have low indicators, and 11-year-old taekwondo athletes do not have a significant increase. By the age of 12, they have achieved a significant increase in this indicator. And by the age of 13, the pace of development slowed down again..

4.2. According to the index of glycolytic resistance of taekwondo fighters aged 10-13 years, the highest rate of development was noted at 11 and 12 years old, and the lowest - at 11 and 13 years old. According to the indicator "Explosive endurance coefficient" of taekwondo athletes aged 10-13, the best indicators for the highest indicators were in 11-year-olds, and the lowest - in 10-year-olds. According to the integrated labor force index, 12-year-old taekwondo athletes achieved the highest growth rate.

4.3. It has been established that the dynamics of physical fitness of 11-12 year old taekwondo boys involved in the initial training stage was slower than that of 11-12 year old taekwondo girls. It can be concluded that it is necessary to systematically control the level of development of the dynamics of physical fitness of taekwondo boys aged 11-12.

4.4. 13-year-old taekwondo girls have a lower level of physical development than 13-year-old boys involved in the initial training stage. The coach is obliged to regularly monitor the dynamics of the physical development of girls of this age in taekwondo.

CONCLUSION

1. The results of the analysis of scientific-methodical and special literature, carried out with the aim of studying the scientific and pedagogical foundations and features of control, and evaluating their special motor training in the system of training athletes, were as follows. Systematic introduction of motor training of athletes of various sports based on innovative technologies has become one of the most important aspects for all stages of the athlete training system.

Numerous studies have been carried out by a number of domestic and foreign scientists on the assessment and correction of special movements of martial arts athletes using modern technologies.

2. To improve the methodological foundations for the formation of the explosive motor ability of athletes of speed-strength sports, the methodology for the formation of physical performance and its assessment in qualified volleyball players, the priority of development of strength in belt wrestlers using isokinetics, exercises and methods for its assessment, the methodology for improving the pre-competitive training of highly qualified boxers and many other innovative technologies can be named. However, taking into account the pedagogical and psychological characteristics of taekwondo and the pedagogical and psychological characteristics of competitions, the fact that special simulators have not been developed to assess their special motor training and correction determines the relevance of this research work.

3. The dynamics of development indicators of various aspects of the training of young taekwondo fighters aged 10-13 years has been analyzed and the following has been established. The difference between the physical development of young taekwondo fighters aged 10 and 11 at the stage of initial training is 4.32%, and in 11- and 12-year-olds - 4.22% ($p > 0.05$), in general physical strength, dexterity, flexibility, young taekwondo fighters aged 10-11 and 12-13 - 6.65% and 4.02%, respectively ($p>0.05$);

4. In order to assess and control and correct training in special movements of taekwondo fighters, together with the Design Bureau of the Academy of Sciences

of the Republic of Uzbekistan and the Scientific and Technical Center for Pilot Production, a “Hardware and software complex for measuring the strikes of combatants” was developed (Intellectual Property Agency under the Ministry of Justice of the Republic of Uzbekistan (No. FAP 01732) 12/22/2020).

5. Using the device, it was possible to control the speed and accuracy of taekwondo fighters for 5, 15, 8, 40 seconds, 1.5 minutes of 3 rounds, 2 minutes of 3 rounds, 3 minutes of 3 rounds and single blows. An innovative special complex has been created that provides quality control and assessment of the athlete's post-signal reaction, endurance, psychophysiological (simple motor reaction) and technical readiness, while allowing to determine the explosive endurance coefficient, explosive endurance index, creatine phosphate performance index, speed endurance coefficient, speed endurance index, index of glycolytic endurance, index of integral labor force, integral indicator of speed-strength training, total power and accuracy of the impact force of athletes.

Based on the capabilities of the innovative technologies "TABO-STAR", designed to facilitate the control over the development of special movements of taekwondo athletes, it is possible to work with each athlete individually and constantly monitor his special movements and physical development.

A set of control exercises has been developed to control the special motor training of young taekwondo wrestlers, which is used in training groups of young taekwondo wrestlers. The results of 12-year-old taekwondo athletes turned out to be similar when determining the indicators of the explosive endurance index of the participants. According to the results of the analysis, the average explosive endurance index of young taekwondo wrestlers weighing up to 36 kg was 21.8. According to this indicator, the average index of young taekwondo athletes 12 years old with a body weight of up to 41 kg was 27.75, and the explosive endurance index of athletes with a body weight of up to 53 kg showed a result of 15.41. And by the method of mathematical and statistical analysis, it was revealed that the average indicators of persons with a body weight above 53 kg (53 + kg) amounted to 8.12 results.

6. The total power indicators of the impact force among taekwondo fighters increased by 14% in 10-year-olds, by 15.1% in 11-year-olds, by 15.9% in 12-year-olds, in 13-year-olds by 16.4% and accuracy indicators of young taekwondo fighters in 10-year-olds by 12.3%, in 11-year-olds it was possible to determine an increase of 13.6%, in 12-year-olds by 15.53%, in 13-year-olds by 16.8%;

With the systematic monitoring of training in special movements of taekwondo fighters 10-13 years old, the coefficient of explosive strength and endurance of taekwondoists increased by 17%, the index of explosive strength and endurance by 15.9%, the efficiency index of creatine phosphate by 15.4%, and the coefficient of speed endurance by 16, 3%, speed endurance index increased by 16%;

In the experimental group, there was an increase in the index of speed endurance by 13.11%, the index of glycolytic endurance by 13.8%, the dynamic dynamics of the integral indicator of labor force by 14.3%, the integral indicator of the final speed-strength training by 14%.

7. The indicators of athletes of the experimental and control groups in the weight category of 36 kg after pedagogical experiments were 0.9 in the experimental group and 1.01 in the control group. The performance indicators of athletes with a body weight of up to 41 kg at the beginning and at the end of the experiment at the beginning of the experiment were equal to 0.98, and the results of the experimental group were equal to 0.93, and after pedagogical experiments, these indicators were equal to 1.04 in the control group and 1. 03 in the experimental group.

8. The special boxing bag developed by us is designed not only for those who practice taekwondo, but also for those who practice boxing, kickboxing, karate, Thai boxing, taekwondo (ITF) and even mixed martial arts, and in general this device can be used for many other sports, can be used to control the development of special movements of athletes in sports.

Practical recommendations

1. It has been established that the dynamics of physical readiness of taekwondo boys aged 11-12 is lower than that of taekwondo girls aged 11-12. It can be concluded that it is necessary to systematically control the level of development of the dynamics of physical fitness of taekwondo boys aged 11-12;

2. A 13-year-old taekwondo girl at the initial stage of training had a lower level of physical development than a 13-year-old boy. The coach is obliged to regularly monitor the dynamics of the physical development of girls of this age in taekwondo.

3. As a result of the analysis of the study, it was concluded that in the early stages of training of adolescent athletes, the main attention should be paid to ensuring comprehensive physical fitness, by focusing on the targeted training of motor skills necessary for taekwondo classes.

4. Managing the development of special movements of fighters. When opening the device on the screen - in the left corner File, Edit, Exercise, History, in the right side of the screen "List of updates", "Open port", "close port", "add athlete", "delete athlete", "change data" , "start test", "view history", "general list", "signal", depending on the intended goal, one of the necessary commands is selected.

5. Before receiving the data, of course, the surname, name, patronymic of the athlete, year of birth, weight, title in the sport and other information must be included in the program, after which you can proceed to select the desired test. Each test combines the ability to identify specific indicators.

1. Test "Non-signal strike", i.e. any hit can be thrown instantly, showing the athlete's hit weight, average hit, maximum hit, and total tonnage.

2. In the "Signal blow" test, the speed of the athlete's reaction, the beginning of the blow, the severity of the blow are indicated.

3. In the test "total strength in 5 seconds" - the number of hits of athletes in 5 seconds, light hit, medium hit. Displays the maximum blow and the total tonnage

of blows and determines the dynamics of the athlete's level of aggression during sparring.

4. Test "The number of strokes in 15 seconds" - This test belongs to the category of sports exercises, i.e. work in the maximum aerobic-anaerobic state, in this test the athlete can determine the maximum speed.

5. Test "Performing 3 rounds of 3 minutes." - this test is performed in the same way as in full competitive activity.

6. Test “3 rounds of 2 min. performance "- in this test, you can check the general and special physical fitness of young athletes, determine the return between rounds, light, medium and strong blows, as well as the return from hitting a specific point.

7. In the test "Performance of 3 rounds of 1.5 minutes." you can determine the overall endurance of the athlete, physical fitness, strikes between rounds, light, medium and heavy strikes, as well as the impact of a strike on a specific point.

8. In the test "3 rounds of 1 min. performance” you can determine the general and special endurance of young athletes, physical fitness, strikes between rounds, light, medium and heavy strikes and the impact of a strike on a specific point.

9. Dynamics of indicators of general and special endurance, physical fitness, explosive endurance index, explosive endurance coefficient, creatine phosphate performance index, speed endurance coefficient, speed endurance index, glycolytic endurance index, performance-strength readiness based on individual indicators of participants.

10. The test "In a series of blows" automatically calculates the accuracy of the impact of each type of direct impact from the side and from below, the average and maximum impact and the total tonnage of impacts.

11. The Endurance test automatically determines the explosive endurance coefficient, creatine phosphate performance index, speed endurance coefficient, speed endurance index, glycolytic endurance index in the device.

12. In the opinion and conclusions of experts working in this field, the use of this equipment is very effective, based on the ability to determine the results of

tests on 100 tests included in this equipment, and the fact that the equipment does not require special conditions.

SYMBOLS

CHYSS - children's and youth sports school

CHYSSOR - children's and youth sports school of the Olympic reserve

CS - cardiovascular system

AP-arterial pressure

PBW - Per 1 kg of body weight

HR-heart rate

VCL-vital capacity of the lungs

SMA-structure of motor actions

MS-musculoskeletal system

GPT-general physical training

SPT-special physical training

EEC-explosive endurance coefficient

WSE-index of speed endurance

IGR-index of glycolytic resistance

ILFI-Integrated Labor Force Index

IISSP-integral index of speed-strength training

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APPLICATIONS

Annex 1

SYMBOLS

DYUSSH - children's and youth sports school

DUSSHOR - children's and youth sports school of the Olympic reserve

CCC - Cardiovascular system

BP-arterial pressure

KMT - Per 1 kg of body weight

HR-heart rate

Vital capacity of the lungs

SDS-structure of motor actions

ODA-musculoskeletal system

OFP-general physical training

SFP-special physical training

KVV-explosive endurance coefficient

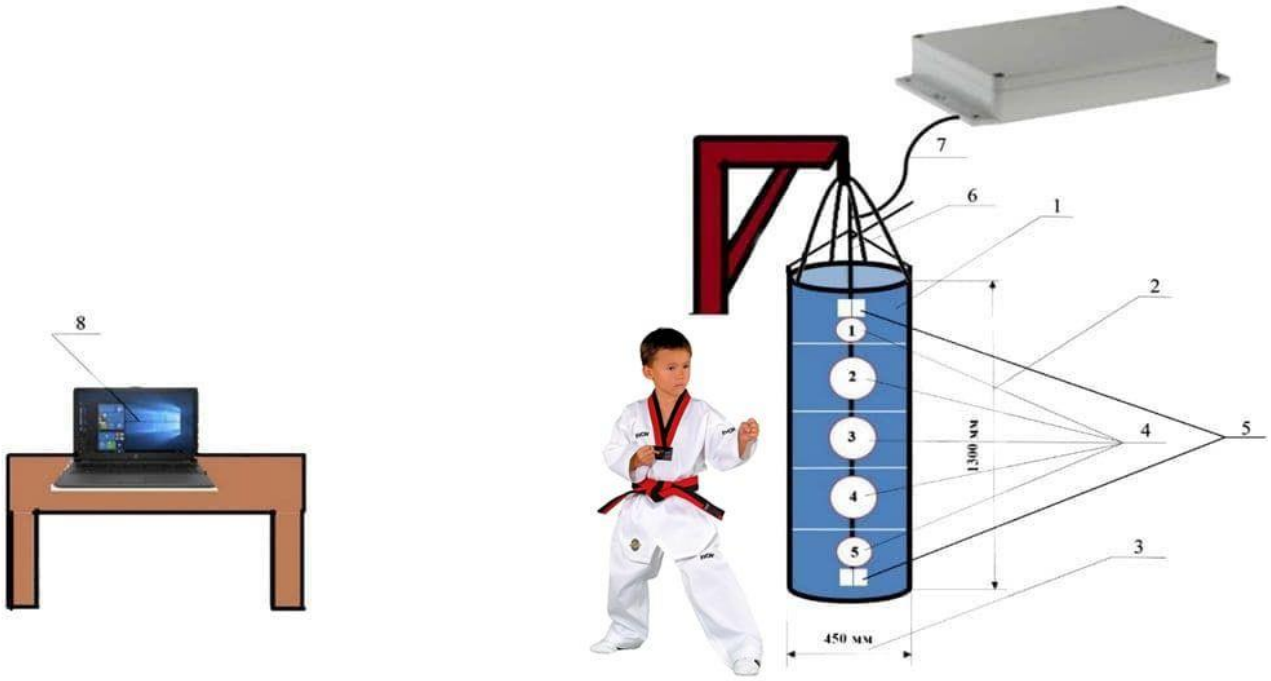
WIS-index of speed endurance

IGR-index of glycolytic resistance

IIRS-Integrated Labor Force Index

IISSP-integral index of speed-strength training

Annex 2



“Hardware-software complex for measuring strikes of combatants”.

Annex 3

Tests aimed at determining the degree of development of speed and accuracy in young taekwondo athletes

1. Pulling the bar up (times)
2. Flexion and extension of the arms in the prone position (times)
3. Run 30 meters
4. Standing long jump (cm)
5. Forward bend from standing position (cm)
6. Pulling up the legs at the crossbar (times).
7. Run for 1000 meters (min).
8. Raising and lowering legs (within 10 seconds)
9. The coin test focuses on reaction speed (time)
10. Half squat for 6 seconds (times).
11. Test with a sheet of newspaper.

Annex 4

Among the general means of physical training that contribute to the development of the speed of motor actions, the following are recommended:

1. Gymnastic exercises and outdoor sports games that set high requirements for the manifestation of speed qualities.

2. Running exercises: hip high, short run, up and down acceleration, stepping, resistance running, 3-step acceleration.

3. Several jumps or runs performed from a standing position, or a short flight run.

4. Pulling the hip to the chest with quick bounces.

5. Switching legs when jumping from a deep run.

6. For lightness of the hands, the exercise consists in imitating a blow.

7. Exercises for the abdominal muscles in the hanging on the wall of the gym are fast oncoming movements (“scissors”) of legs brought together in a vertical plane.

8. A similar exercise for stretching the muscles of the back and hips is performed lying face to face on a gymnastic bench.

Annex 5

From the arsenal of special physical training, we can recommend the following exercises that will help develop speed:

1. Perform strikes at maximum speed with rackets, paws , pillows and bags of various weights.

2. Perform part of the sparring movement at a restraining or limiting speed (half-movements: for example, bringing the knee to the apchagi).

3. An exercise with a rubber shock absorber that imitates kicks or hand strikes.

4. Exchange of exercises at maximum speed (with and without contact with an opponent) when performing exercises in pairs or several partners.

5. To imitate high-speed movements - exercises on power simulators, etc.

Annex 6
Table 1.

Mode of work and rest during the development of complex speed skills

Duration of the exercise, s.	Work intensity, % of maximum speed	Duration of pauses during exercise, s		
		Local character	normal character	Global character
Up to 1	95-100	15-20	30-40	45-60
	90-95	10-15	20-30	30-45
	80-90	5-10	15-20	20-30
4-5	95-100	30-40	50-80	80-120
	90-95	20-50	40-60	60-90
	80-90	15-20	30-40	50-60
8-10	95-100	40-60	80-100	120-150
	80-90	20-30	40-60	60-90
15-20	95-100	80-120	120-150	150-180
	90-95	60-80	100-120	150-180
	80-90	40-60	80-100	120-150

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