



V. N. OSTYANOV

**TEACHING
& TRAINING
BOXERS**

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Valentyn N. Ostyanov: PhD in sports sciences, Master of Sport in the USSR, Honored trainer of Ukraine. The author is a member of the AIBA Coaching commission and a certified AIBA trainer. As a member of the coaching team, the author has been responsible for preparing the Ukrainian National Team for 5 Olympic Games (XXVI, XXVII, XXVIII, XXIX, XXX) and now works as a senior trainer/consultant responsible for scientific and methodological support for this team preparing for the Olympic Games XXXII.

The author concentrates on the following subjects in the theory and methodology of boxing:

- Basics of teaching and training boxers (from beginners to elite groups)
- Methods and sequence of teaching boxing techniques (including combinations of technical / tactical exercises)
- The special physical fitness of boxers, means and methods of developing the physical qualities (combinations of exercises)
- Development and improvement of motor skills of athletes
- Planning and organizing yearly training cycles (for elite boxers), including detailed schedules of the Ukrainian team's training at different stages.

The book is illustrated with drawings, tables and graphs.

The Appendix presents timetables of teaching and training for all age groups in clubs and sports schools.

The original book in Russian (ISBN 978-966-8708-35-0) was published in Kiev, Ukraine by Olympic Literature in 2011 and recommended as a text book for higher sports education by Ministry of Education and Science of Ukraine.



FOREWORD

With great pleasure and enthusiasm, I would like to present this interesting work about physical and technical-tactical preparation of boxers, written with competent theoretical and practical knowledge of boxing by V.N. Ostyanov.

The very ancient origin of boxing did not provide for a competition governed by technical and organizational rules.

The fight was based on the supremacy of brute force. A bloody duel between two opponents, who created wounds and often lethal

facial and bodily fractures with rudimentary hand wraps.

Modern boxing was born in England with the Marquis of Queensberry formulating and applying first technical rules of a boxing match. The start of competitions in the ring attracted millions of fans to follow a sports show with extraordinary protagonists writing indelible pages in the world history of sport.

The entry of Boxing into the modern Olympic Games programme and the creation of the International Federation - AIBA – resulted in further technical and regulatory improvements with an aim to protect the health of athletes.

Nevertheless, protection of athletes' health cannot be attained with a simple application of the technical rules. The most important role in our sport is entrusted to the preparation of athletes by the coaches.

If it is true that sporting success depends essentially on the athlete's genetic potential, it is equally true that a talent cannot become a great champion if not nurtured through high quality technical training and adequate psycho-physical preparation. It is therefore clear that the quality of a boxer's complex training directly depends on the skills of the coach.

To perform a decisive role in the training of high-performance athletes, a coach must have knowledge of boxing technique and tactics, biomechanics, physiology, sport-specific nutrition, as well as the development and growth of athletes, psychology and motivation for sports results.

While many Olympic sports, such as athletics, swimming, rowing, judo, etc., attributed great importance to the development aspects of the coaches, boxing remained behind and anchored in empirical or outdated schemes and systems.

The Soviet Union, Cuba, the DDR and other Eastern European countries had started a highly scientific literary activity based on the rigorous application of modern training methods. For some time now, this enthusiasm for producing documents, studies, research and texts dealing with technical and athletic training topics for boxers has been increasingly rare.

It is for this reason that I felt compelled to present "Teaching and Training Boxers" as a very useful text for the technical and cultural growth of our coaches.

Valentyn Ostyanov has created a large and documented collection of data, demonstrations, evaluations, exercises, program planning and training cycles that develop and accompany the activity of a boxer from the grassroots to high performance. His personal experience as coach of the National Teams of Ukraine and lecturer at a University in Lviv, his bibliographical references that highlight the names of Degtyarev,

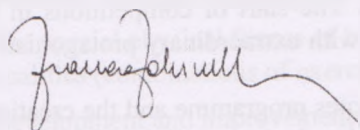
Filimonov, Gradopolov, Matveev, Nikiforov, Ogurenkov, Platonov, Yakovlev, Verkhoshansky, ensure that Ostyanov's work deserves to be carefully consulted and proposed to all those who want to improve their knowledge as Boxing Coaches.

The English version of this book allows for massive involvement of national and international structures in charge of training and updating boxing coaches.

My hope is that Coaches take a more active role in the revitalization of world boxing. To maintain and improve the sport's popularity, we will need "Stars", great champions who can attract positive media attention and loyal fans.

Coaches can take a leap in competence and knowhow, only if they have a broad and rigorous knowledge of the science applied to sport. Since boxing is a contact sport, every match must be faced at the top of physical and psychological condition and technical and tactical preparation.

I am sure that the Ostyanov's methodology of technical, physical and psychological preparation, his proposed approach to annual and cyclical scheduling of competitions, the innumerable professional tricks and helpful suggestions, can help interested coaches improve their professional skills at all levels.



Franco Falcinelli
EUBC President
AIBA Vice President

THE PRINCIPAL METHODS OF TEACHING AND TRAINING BOXERS

In the opinion of many authors, methods of teaching and training in boxing are complex and ambiguous. It is as important to explore the methods used for training beginners, as it is to research those for experienced boxers.

Most coaches complete the process of systematic teaching after learners first get acquainted with a set of techniques used in boxing exercises. Systematic teaching only continues through the initial stages of training (Ter-Ovanesians, 1992). The rest of the time is not devoted to training technique, but is used for coaching to perform in conditions close to free, or conditional fighting. On one hand, such an approach sufficiently restricts the technical and tactical arsenal of boxers and on the other, makes boxing less aesthetic.

In the absence of a planned and systematic process of training, boxing can turn into a set of chaotic techniques, the implementation of which would be based mainly on the natural abilities of the athlete, and would not be a product of the coach's creativity. A boxer with talent could succeed to an extent, but progress would be limited if he were prevented from exploring the possibilities his skills have to offer. Many talented young boxers leave the sport without achieving the best of their ability. Only a well-coordinated teaching/training process can prevent such losses.

In the process of long-term training, the athlete, teacher, and trainer are fundamentally interconnected and regarded as categories of a single educational process. Both teaching and training have specific features defined by targets, the essence of which follows from their definitions.

Motor ability – this is a consciously performed action, requiring great attention and control. It is characterized by the instability of the performing.

Motor skill – an arbitrary action, the performance of which, as well as control, is carried out automatically, and the action itself is reliable and stable.

The focus of teaching is to form knowledge, abilities and skills, whereas in training, the end aim is achieving high results via the improvement of motor skills, and the development of determination and cognitive qualities. The formation and improvement of motor abilities and skills are important in the management of motor actions.

The diagram of the formation of motor abilities and skills is demonstrated in fig. 1. The diagrams of different authors vary, but we consider this to be the optimal one, as it demonstrates how an ability to learn a new motor action is based on knowledge and motor experience, and explores the formation of visual, logical, and kinesthetic skill through learning. In the process of repeated training and the restructuring of coordination mechanisms, motor ability is developed into motor skill.

On the subject of human behavior, Sechenov and Pavlov¹ revealed in detail the mechanisms behind the nervous system's reflex activity.

A functional system arises when a set of stimulated senses (afferent synthesis) appears in the cortex of the large hemispheres of the brain, which serves as a prerequisite for the decision to

¹LM. Sechenov and I.P. Pavlov – Russian Physiology scientists

take action. So, each motor action has its beginning in the amalgamation of stimulated senses in the cerebral cortex. The afferent synthesis happens on the basis of the dominant motivation, caused by different stimulating actions from outside. The motivating stimuli cause the active analysis and estimation of the expected action.

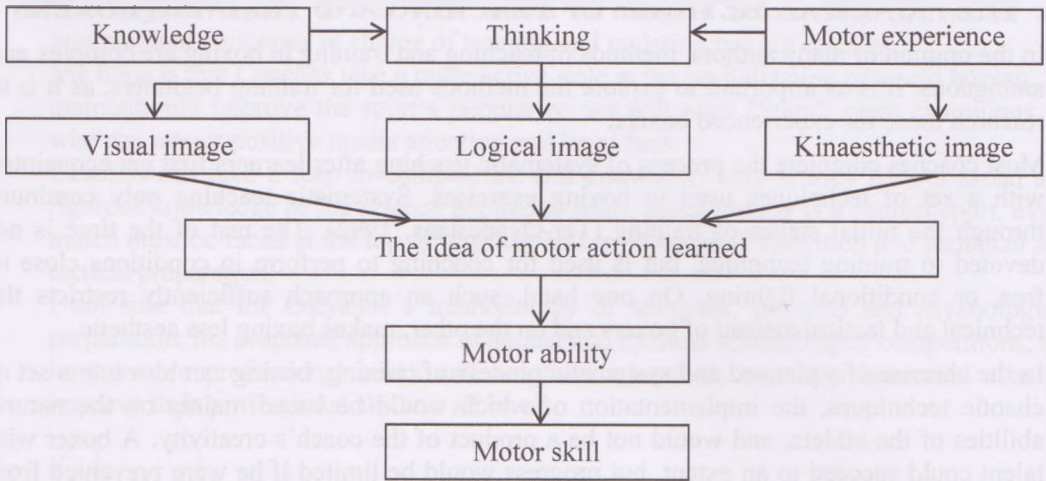


Fig. 1. The diagram of formation of motor abilities and skills (Savin, 1990)

The basis of motor skills, according to Pavlov, is the formation of a dynamic stereotype (stable pattern) of the processes of the nervous system in the cerebral cortex. In other words, the dynamic stereotype is a stable state of the functional system, consolidated as a result of repeated actions. Any movement learnt has its beginning in the creation of the conditioned reflex connections in the cerebral cortex.

Signals traveling from the central nervous system (CNS) to the functional organs switch on corresponding muscle groups to perform the movement. Movement correction results from the external (sensory organs) and internal (proprioceptors) control circuits, which transmit information to the central nervous system about the progress of the movement.

The dynamic stereotype determines all of the main features of a motor skill: the automated movement management, solidity of movements, and reliability of the actions. Well mastered, automated, and stably performed technique is in essence - motor skill. However, being a relatively inert functional formation, it cannot always correspond to changing conditions. Change, if necessary of a stable cortical dynamic stereotype, as a rule requires a lot of time and energy, and will take years of retraining. It is easier to teach correctly than to re-educate.

The ability to transfer motor skills is of great importance. Negative and positive motor skill transfers are distinguished. A positive transfer occurs when an earlier learnt skill contributes to a new one. A negative transfer occurs when the possession of one skill has a negative influence on the mastering of a new one. Most often this happens when the process of teaching a new skill is being based on the wrong initial positions, which are incompatible with the skill in their biomechanics.

A positive transfer of skill is widely used in the practice of teaching techniques. To do this, a program of preparatory exercises, adequate in their structure and content to the main movements, is chosen. In their research, Aram and Igor Ter-Ovanesians (1992) formulated the concept of teaching in sport.

This consists of 12 educational requirements, tasking the coach/instructor with the following:

- providing learners with sporting orientation;
- selection of adequate means and methods of teaching/training;
- taking into account a unity of psychological and physical in the body;
- studying sports technique as a whole and in parts;
- compliance with a rational sequence of training;
- identifying errors in movements and their causes;
- regulating and varying the environment of action;
- training sport techniques in unity with the development of motor qualities;
- combining teaching sports' exercise techniques with teaching sports' tactics;
- the athlete mastering the academic knowledge;
- ensuring continuous monitoring of learning outcomes;
- smooth learning.

Means and methods of training

MEANS and METHODS are often one and the same thing, with 'means' referring to the 'what?', and 'method' referring to the 'how?'

Means of sports' training

Means are: words, demonstrations, motor actions in the form of physical exercises, natural forces of nature (the sun, the air and water), and hygienic factors.

The definition of physical exercises refers to the motor activity of an athlete, aimed to fulfill the tasks of learning, training and competitions. Physical exercises differ in form and content. The content of physical exercises refers to the level of impact on the athlete's body. The form of physical exercise is its structure defined by ratio of temporal, dynamic and spacial characteristics (distance, position, efforts).

The form and content of physical exercises is naturally interrelated. An increase in intensity causes the qualitative change of content and the form changes together with the content.

The diversity of physical exercises is so great that there is a need to categorize them in groups and subgroups, according to various characteristics. (fig. 2).

The exercises are subdivided into main and additional.

The main ones include technical and tactical training, special physical training, and the ones that develop specialized perceptions. The exercises of technical and tactical training comprise working with a partner in conditional, free, or competitive fights, aimed at improving the coordination and structure of technical abilities for various tactical purposes.

Exercises in specialized physical training are aimed at developing and maintaining physical qualities, such as specialized endurance, speed and strength.

Exercises aimed at improving specialized perceptions are designed to improve a boxer's sense of distance, a differentiation in punches, the feeling of a partner, etc.

The additional exercises comprise the 'means', which are subdivided into 'lead-up' exercises, 'general' and 'specialized preparatory'. A wide arsenal of 'general preparatory'

exercises are directed towards physical training and the improvement of an athlete's health. Exercises from other sports, outdoor games, athletics, gymnastics, swimming, etc. can be used here. The group of 'lead-up' exercises are similar (in their coordination and structure) to competitive ones, but are not the same. As a rule, these are rotations and jumps in various combinations.

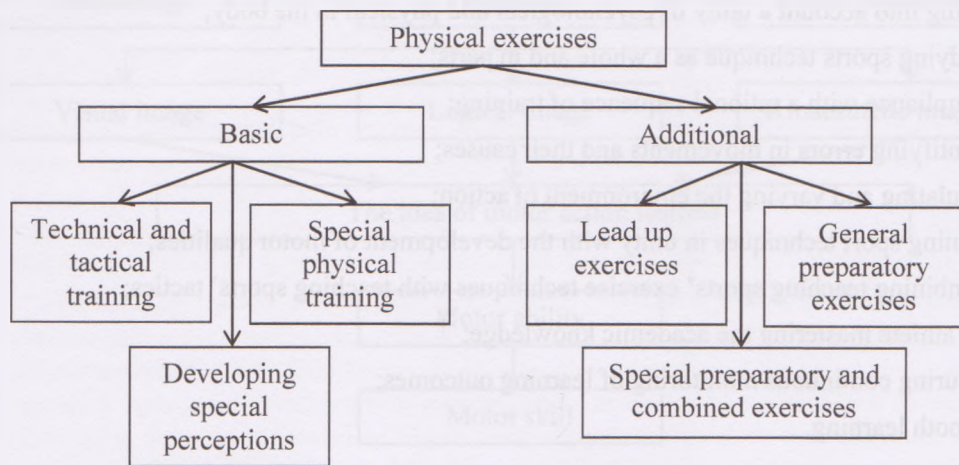


Fig. 2. The classification of physical exercises.

Methods of sports' training

The effectiveness of any educational means in many respects depends on the method of their application. Specific methods of physical education are inseparable from physical exercises. The word 'method' in sports theory usually refers to the process, or tools which a coach or instructor uses to form a range of knowledge, abilities, and skills, developing physical and mental qualities of learners.

All applied basic methods are possible to divide into two categories:

- 1) generally applied in teaching
- 2) applied in training.

Practically all methods are divided into three groups (Platonov, 2004): verbal, visual, and practical (fig. 3).

Verbal methods – a narration, lecture, conversation, analysis or discussion that creates an image of the movement.

The main problem with this method is communication: finding the appropriate words, creating a specific image. A coach or instructor should communicate with both junior and elite athletes in a simple, understandable language. Age and intellectual maturity should be taken into account. Often, a trainer/teacher is thinking of one meaning in their words, and the athlete understands a different, incorrect meaning. This in turn leads to the creation in the cerebral cortex of an incorrect, conditioned reflex of an image that prevents the correct reproduction of the movement/technique.

Visual methods are diverse. A visual, methodically correct demonstration by the trainer of an exercise or movement, largely determines the effectiveness of the training process. Also demonstrations with drawings, educational films, video recordings, etc. are used.

Practical exercise methods can be conditionally divided into two main groups (Platonov, 2004):

- 1) generally focused on mastering techniques, i.e. developing specialized motor skills and abilities and
- 2) generally directed to the development of motor qualities.

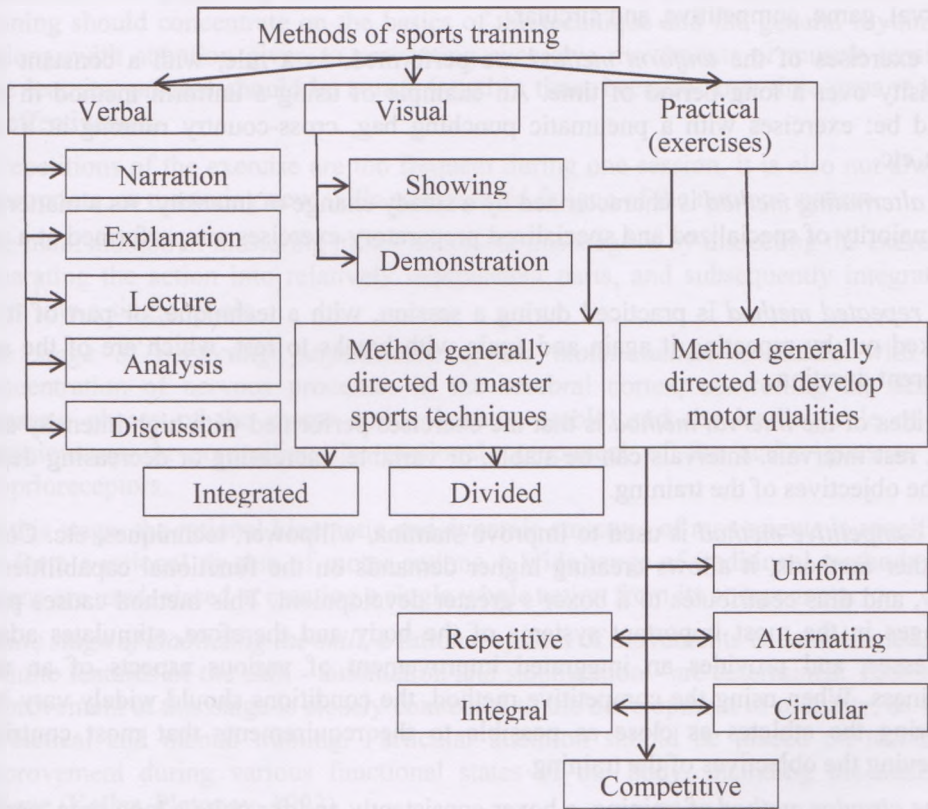


Fig. 3. The classification of teaching and training methods

One should distinguish the methods aimed at the development of sports' techniques:

- 1) methods on how to learn exercises as a whole
- 2) methods on how to learn them in smaller parts (holistic and dissected). In theory and methodology, there are different opinions about the method of learning exercises.

In practice, the following basic methods for teaching boxing techniques were systematized (Dekhtyaryev with co-authors, 1979):

- mastering the technique as a group in one line (without a partner) under the general guidance of the trainer;
- mastering the technique as a group in 2 lines (with a partner) under the general guidance of the trainer;
- independent mastering of the technique under the general guidance of the trainer, in pairs, moving freely about the training space;
- sparring under restricted conditions;
- individual mastering of the technique, working with the coach using pads or boxing gloves;

- technical sparring;
- free sparring (without restrictions on the actions of either partner).

Methods focused on the development of mobility differ in intensity and types of rest. In the practical training of boxers, the following methods are used: uniform, alternating, repetitive, interval, game, competitive, and circular.

The exercises of the *uniform method* are performed, as a rule, with a constant average intensity over a long period of time. An example of using a uniform method in practice could be: exercises with a pneumatic punching bag, cross-country running at a uniform pace, etc.

The *alternating method* is characterized by a steady change of intensity. As a matter of fact, the majority of specialized and specialized preparatory exercises are performed at a variable rate.

The *repeated method* is practiced during a session, with a technique, or part of it, and is worked out by repeating it again and again with breaks to rest, which are of the same or different duration.

The idea of the *interval method* is that the exercises performed with high intensity alternate with rest intervals. Intervals can be stable, or variable, increasing or decreasing depending on the objectives of the training.

The *competitive method* is used to improve stamina, willpower, techniques, etc. Compared to other methods, it allows creating higher demands on the functional capabilities of the body, and thus contributes to a boxer's greater development. This method causes profound changes in the most important systems of the body and therefore, stimulates adaptation processes, and provides an integrated improvement of various aspects of an athlete's readiness. When using the competitive method, the conditions should widely vary in order to bring the athletes as close as possible to the requirements that most contribute to achieving the objectives of the training.

In the *circular method* of training, a boxer consistently and for quite a long time, performs a series of simple exercises with, or without sports equipment, in a circle. Each exercise is usually repeated by the trainees with half their maximum capacity. After each lap, the athletes rest for about a minute before beginning the next lap. Boxers begin circular training after they are made acquainted with the tasks they are to work on and after determining their maximum capabilities in each type of exercise.

The *play method* aims to improve mobility under more complicated conditions. To a considerable extent, it enables the development of such skills and abilities as dexterity, speed, coordination, independence, initiative, and perceptiveness (Matveyev, 1999). Plays are very effective in team building.

Sequence and methodology of teaching a beginner

The sequence of training beginner boxers is based on the recognition that consistency is a fundamental condition for success, like in any other area.

The process of forming and perfecting technical mastery can be conditionally divided into stages (Keller, Platonov, 1993):

1. *The stage of creating* the first understanding of motor action and a determination to learn. The information given at this stage should be the most general, whilst clearly

describing the chief mechanics of the activity. Focus should be on the key moments of the action. There is no need to examine the mechanics in detail at this stage.

2. *The stage of development of the skill.* This is the primary mastery of the technique, when the ability to perform the basic structure of the movement is formed. Here takes place a generalization of motor actions. Intramuscular and inter muscular coordination associated with triggering processes in the cerebral cortex is not always rational. The training should concentrate on the basics of the technique and the general rhythm of actions, with attention given to preventing excessive movements or muscle tension. The learning process should be concentrated in time, because large time gaps reduce its effectiveness.

If repetitions of the exercise are too frequent during one session, it is also not always appropriate, as mastering new skills causes rapid fatigue of the nervous system.

The main method of mastering motor actions at this stage is by dissecting the exercise, separating the action into relatively independent parts, and subsequently integrating them into a single whole.

3. *The stage of perfecting performance of the motor action* is linked with the concentration of nervous processes in the cerebral cortex, controlling the action. Separate phases of the motor action become stable, and the leading role of the consciousness in controlling the motional component of the action goes to the proprioceptors.

At this stage, the rational kinematic and dynamic structure of movements is specified. To form a rational rhythm of motor actions, a wide range of traditional methods and means are used, aimed at creating a single whole action from its components.

4. *At the stage of stabilizing the skill*, a rational system of movements is consolidated, the definite features of the skill - automation and stabilization - are determined. Technical improvement at this stage is closely connected to the development of mobility, as well as tactical and mental training. Particular attention should be placed on technical improvement during various functional states of the body, including the state of fatigue (Keller, Platonov, 1993).
5. *The stage of achieving the variable skill* is ongoing until the athlete solidifies the motor action in a variety of conditions and functional states of the body. Because of this, specialized senses (the perception of time, distance, opponent, etc.) develop to a high level, along with a grasp of perfect movement control, using the information received from the proprioceptors.

The described stages in the development of technical mastery make it possible to divide the process into relatively independent elements and to highlight three phases in the general structure of the educational process.

The first phase is *initial teaching*. Here, a general idea of the motor action is created, an attitude to mastering is formed, the basic mechanism of movement is studied, a rhythmic structure is formed, and gross errors are prevented and eliminated.

The second phase is *in depth study*. This phase focuses upon details of the motor action, the improvement of its coordinated structure, dynamic and kinetic characteristics, and rhythm. This phase ensures that these elements correspond with the individual characteristics of the athlete.

The third phase is *consolidation and further improvement*. The skill is stabilized, the appropriate variability of actions is improved by adapting them to the individual

characteristics of the athlete, various conditions, including the maximum demonstration of the motor skills.

The first phase corresponds to the first two stages described above. The second phase is the third stage, and the third phase correlates to the fourth and fifth stages of creating and developing technical mastery.

The process of training in boxing occurs in three conditional directions.

The first direction is the regular long sequential teaching of all boxers' arsenal of punches and defenses, sequential learning of single straight punches and hooks, the series of them, uppercuts, and varied punches at middle and close range distances. The competitive experience comes later, after 3-5 years of teaching. As a rule, these boxers remain in the sport much longer and their results are usually consistent.

The second type of training differs from the more general and consistent one above, encompassing a bulk of technical means. The coach teaches quickly, with the minimum of best practice: in the delivery of single jabs, two punch combinations, single hooks, uppercuts and varied punches, focusing on the individual specific talents of the boxer. This training enables the athlete to be ready for competitions earlier. However, there is a superficiality to this approach. In some cases, allowing a boxer great competitive experience early, can have a backwards effect: restricted technical grasp of punches and especially in defenses, will often be felt in fights with higher skilled boxers.

These points are complex and disputable. Working with children, a coach should remember that a child's psyche is extremely vulnerable, and an excessive amount of challenge can break it.

Each competitive fight creates not so much physical, but mental tension, stress, and after 100 fights, the task of 'saving' talented young boxers can be rather problematic. One should take into account boxer's durability in the sport, and this is difficult to foresee. It is just as possible to become an Olympic champion at the age of 18, as it is at 30.

In practice, there is one more method of teaching beginners: teaching techniques of close boxing after the introduction of the necessary technical and tactical arsenal. After the learning and consolidation of single and two straight arm punch combinations, the learners move onto hooks and uppercuts, at close and mid-range distances. The main focus is put on the varied punches of 'in' fighting.

Training a sport's exercise (fig. 4) begins with mastering the correct stance - initial position, which creates the most favorable conditions for the start of the movement, and for performing it. Even every simple movement has a specific starting position (stance). If the stance is incorrect, the punch will be inefficient. For example, if in the initial position, the center of mass of a boxer is on the front-standing leg, then the shoulders are ahead of the frontal support. From such a position, a technically correct punch with the right hand is impossible, but with the left one, it is. In this instance, the stance does not correspond to the kinematic characteristics of the right punch, but creates the right conditions for the left one. In boxing, a certain stance can correspond to a specific punch (or defense), but not to all punches (or defenses). The boxer smoothly and quickly moves from one position to another, throwing the punches and defending simultaneously.

The arsenal of techniques available to boxers is quite extensive, and the boxer is eager to master them all perfectly. After years of training, the boxer establishes his own trademark punch, polishing and improving it. In some cases, a pronounced trademark punch does not manifest - although the boxer has perfected his skills and possesses a wide range of techniques. Strongly manifested trademark punches leading to knockouts, are inherent in

especially gifted athletes, who are not so common, but the majority possess vast technical skills. Improving them over a long period. This is why the process of coaching in boxing is one of steady development and repetition.

Technical training - the most essential component of training a boxer - is carried out all year round. Its forms and content constantly change according to the aims of the training, the trainees, and the conditions.

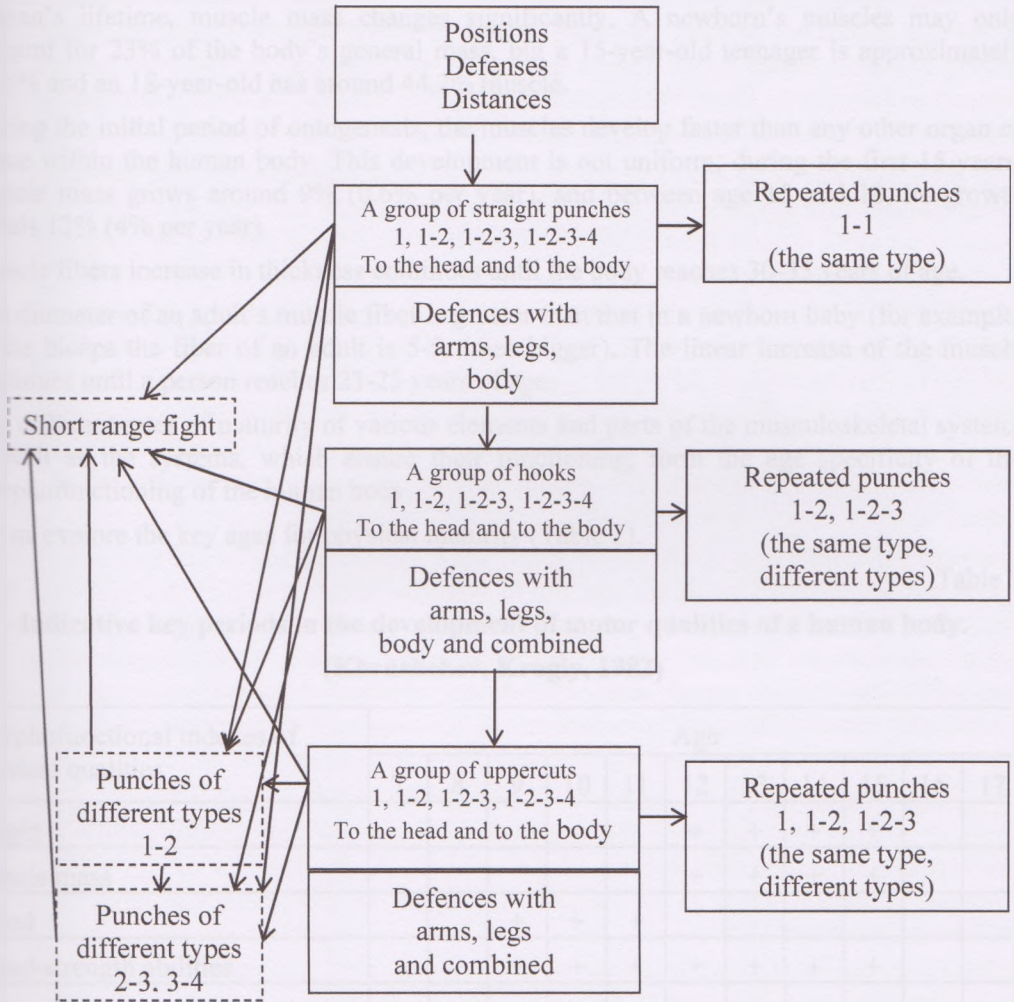


Fig. 4. Flow chart of the sequence of teaching techniques to beginners in boxing

Grasping of technique demands a great degree of attention and discipline from the learners. The first sessions should be carried out in two lines under the instruction of a coach, who teaches the learners discipline and the correct terminology. Commands should be clear, explanations short, combining narration with demonstrations using both methods: disassembled, and the whole exercise.

It is advisable to begin by showing the exercise in full, creating an overall visual image, then to disassemble it into relatively independent elements and phases, explaining the individual elements, complimenting demonstration with explanation. Afterwards, the technical method should be demonstrated in full in the competitive mode.

One should remember that the coach has at his disposal less than one minute to explain and

demonstrate during round intervals. Longer explanation cause the boxer to 'cool down', diverting the attention and braking the momentum. Therefore, the coach has to focus the attention of the pupils on the main supporting elements and phases of the movement. In introductory classes this time is slightly increased.

CHAPTER 2

AGE FACTORS IN THE MORPHOFUNCTIONAL ORGANIZATION OF THE HUMAN MUSCULOSKELETAL SYSTEM

Muscle and bone provide a good indicator of the general age of a human organism. Over a human's lifetime, muscle mass changes significantly. A newborn's muscles may only account for 23% of the body's general mass, but a 15-year-old teenager is approximately 32.6% and an 18-year-old has around 44.2% muscle.

During the initial period of ontogenesis, the muscles develop faster than any other organ or tissue within the human body. This development is not uniform; during the first 15 years, muscle mass grows around 9% (0.6% per year), and between age 15 and 18, its growth equals 12% (4% per year).

Muscle fibers increase in thickness continues until the body reaches 30-35 years of age.

The diameter of an adult's muscle fiber is greater than that in a newborn baby (for example, in the biceps the fiber of an adult is 5-9 times bigger). The linear increase of the muscle continues until a person reaches 23-25 years of age.

The different rates of maturity of various elements and parts of the musculoskeletal system, as well as the systems, which ensure their functioning, form the age specificity of the morphofunctioning of the human body.

Let us explore the key ages for physical maturity (Table 1).

Table 1

Indicative key periods in the development of motor qualities of a human body. (Khrushchev, Krugly, 1982)

Morphofunctional indexes of physical qualities	Age										
	7	8	9	10	11	12	13	14	15	16	17
Height						+	+	+	+		
Muscle mass						+	+	+	+		
Speed			+	+	+						
Speed-strength abilities			+	+	+	+	+	+	+		
Strength							+	+		+	+
Endurance (Aerobic abilities)		+	+	+					+	+	+
Anaerobic abilities									+	+	+
Flexibility	+	+	+	+		+	+				
Coordinative abilities			+	+	+	+					
Balance	+	+	+	+	+	+	+	+			

Age 3 to 7 years is considered a period of predominant quantitative improvement of all levels of movements that a child has. Anatomically, all of them are ready by the third year of life to start utilizing their capabilities.

In the age of 6-12 years, the rapid development of the biodynamics of the movements of a child occurs and, above all, their coordination. At this physiological age, interests and inclinations begin forming toward certain types of physical activity. The correct training approach is important to develop general physical potential with an accentuated increase in its coordination component. Increasing coordination abilities is the most appropriate age-related feature of the development of a person's physical potential during this period. The main focus should be the development of movement coordination and the acquisition by the child of any possible motor experience.

Middle school age (12 - 15 years)

After ten to eleven years comes a period of major, complicated influence on all spheres of life. This is an age immediately preceding puberty, and the period of maturation itself, up to its almost full completion by 14-15 years. It is quite difficult to characterize this period of passing to biological maturity, but it coincides with middle school (the ages of 12-14 for girls and 12-15 for boys).

On one hand, the levels of motions development persistently continue to be enriched and filled with the skills to get at their disposal the first "higher automatisms" - the basis of movement skills. During this time it is possible and necessary to begin a more structured work program to teach children to work with their hands. At this age, it is easy to awaken the taste for action, sports, and if you catch a child's focus and interests, you can achieve a lot.

On the other hand, harmony between levels of coordination, which seem to have already been achieved, seem to go astray and this is not the child's fault. Their body goes through a huge shift in the work of all endocrine glands and of its complex internal chemistry.

This is a restructuring of the entire metabolism, which is experienced as a shock. During this period, the maximum growth of the entire body, and its individual organs, goes on. It is characterized by increased oxidative processes, pronounced endocrine shifts and acceleration of puberty. It is important to take into account the metabolic rate of the body during this period, as well as the maximal growth of the body as a whole and that of its individual parts. Oxidative stress, intensification of endocrine shifts, growth spurts and sexual maturity should also be taken into account. Intensive growth and the increase of all body dimensions are known as the second growth jump (Bernstein, 1991), or "second involvement".

During this period, the child develops his own unique personal style and behavior; this, in essence, results in clumsy and loose movements, slowdown of motor reactions, a temporary sharp decrease in dexterity and even strength. It is well known that during this period the mental life of a teenager often experiences a break-up, sometimes reaching nervous disorders that completely disappear further in life.

As all motor disorders during this period are transient and unrelated to disorders of the central nervous system, it is not necessary to stop training or studying. On the contrary, unless directed by a physician, it is especially important to proceed with active training. Systematic work is useful and will have a beneficial influence on motor skills and the mental health of the teenager.

It is thought that during this stage of growth, motor skills individuality is developed, which is inherent as that of an adult person. For adolescents, deterioration of motor coordination is characteristic, when the intensive development of speed and speed-strength qualities goes on (Lyubomirsky, 1979).

There are the significant differences in the development of the bodies of boys and girls. In boys, the maximum body growth rate in length is noted at 13-14 years and among girls at 11- 12 years. During this period, the body proportions change rapidly, approaching those of adults. It is necessary to stress, that long tubular bones of extremities in teenagers along with vertebrae grow mainly in length, but not in width. At this age, the ossification of wrists and other bone metacarpals during this period, as a rule, are completed, while the zones of the ossification in the intervertebral disks only start to appear, that is why the spine (spinal column) remains very flexible.

The main focus of physical education of adolescents is to form interests in systematic sports or recreational training. It is aimed at the development of speed and speed-power qualities. An important element of physical education in this period is to form a fighting, sporting nature, an ability to mobilize him or her to overcome difficulties, not to succumb to setbacks, work hard to achieve the goals.

Adolescence is the period of maximum growth of the whole body, the stage of biological and social maturation of the personality. During this period, the growth of his self-consciousness occurs, and the transition from a specific way of thinking to an abstract one takes place. The second signal system is developing rapidly. The concentration of excitement and braking processes is increasing; the inhibitory function of the cerebral cortex of the brain becomes more effective, its control over the emotional reactions increases. A teenager acquires better ability to inhibit particular actions, is less easily influenced, but imbalance and emotionality increase. All this is manifested in mood swings, conflicts with others and adults. These features of the psyche of adolescents of this age should be considered when planning physical loads and exercises.

In the implementation of physical education of adolescents it is necessary to take into account some features of the morphofunctional organization as well. So, excessive muscle loads, as factors accelerating the process of ossification, can slow down the growth of tubular bones in length, which negatively affects the balance of the growth rate of the child. An impaired posture can result in changes in the functions of various organs and systems, if one does not exercise constant control over the teenager's posture and does not ensure the strengthening of the muscles controlling it.

It is during the teenage years that the most successful developments of physical potential take place, including the increase of speed levels and strength. The main element of the whole complex of physical qualities is *speed*. Speed and fast strength develop most intensively during adolescence. This gives us a reason to assert that in this physiological age it is advisable to pay attention to the training of speed qualities at the beginning and in the middle of adolescence and speed-strength - at the end of this period.

Secondary and senior school age (15 – 18 years)

This period between 15 and 18 years old, on the whole, is characterized by the highest level of development, an increase in physical potential. Intensive growths in strength indexes, endurance and motor coordination are noted. The process of maturation is accompanied by a change in personal mental attitudes and motivations, which requires special attention to the formation of new stimuli for physical improvement. The process of maturity should be accompanied by mental and motivational challenges.

The main directions in the developments of physical potential during this period are the gaining of higher levels of strength and endurance, and improved coordination in movement exercises including sports (Bogen, 1985)

During adolescence, the development of the central nervous system is completed. A high level of perfection of the analyzing-integrative activity of the cerebral cortex is achieved. Mobility of nerve processes increases. At the same time, there continues to be a certain imbalance between the excitation and inhibition ratio. The development of the second signaling system reaches a very high level among boys and girls.

The most important tasks for the physical improvement of young men and woman are: strength and endurance training, perfection of techniques of punches and development of defenses, as well as mastering of new kinds of movements and actions.

The muscle system development in senior school children is the result of an increase in the diameter of muscle fiber. Muscle mass is clearly growing. The muscles become elastic, their ability to shorten and relax is large enough, and nerve regulation is largely mature.

At this age there are some new peculiarities in the growth and development of the body. The bones of young men and women become thicker and stronger, although the process of ossification is not yet completed. This does not apply only to long bones, the ossification of which almost ends by 17 - 18 years. The cylindrical bones of boys and girls up to 17-18 years get thicker and firmer, and growth up until this period, as a rule, is complete. At the age of 15-16, the process of ossification of the upper and lower surfaces of the vertebrae, thorax and its intergrowth with the ribs begins. Strength of the spinal column increases. Increased development of chest continues.

By the age of 17-18, the process of coalescence of the pelvic bones ends, but their complete ossification occurs much later - in the middle of the third decade of life. In adolescence, the ossification of the foot and hand is completed. The young person's body growth lengthwise slows down, but growth in breadth begins to accelerate.

At this age, the differences in the formation of boys and girls bodies form. Boys' legs are longer than those of girls, the body is shorter, the thorax longer and narrower, the shoulders wider, the pelvis narrower, and the center of mass is higher.

And 18-year-old's heart volume is similar to that of an adult. In young men, the nervous regulation of the activity of the cardiovascular system becomes perfect, and due to an increase in the tone of the vagus nerve, the heart rate at rest reaches that of an adult. In girls, this figure is even higher. Arterial blood pressure during this period is within the normal range. At the age of 15, there is a sharp increase in blood pressure in girls. By the age of 17, the sex differences in this indicator are smoothed out, and by the age of 18, the level of diastolic pressure becomes higher in boys.

The frequency of breathing of boys and girls, compared with adolescents, does not change significantly, its depth increases noticeably, and the minute volume of breathing approaches the level of an adult. In a similar way, the ratio of indexes of the LC (lung capacity) in young men and women is close to the level of adults. Anaerobic capacity significantly increases. The marginal level of oxygen debt required for further work is close to that of adults. In boys by the age of 16, and in girls by the age of 15, a certain stabilization of the level of maximum oxygen consumption is observed.

At this age, the barrier functions of the blood are less developed than in adults; the production of antibodies and non-specific resistance factors are still insufficient. The body resistance to the adverse effects of the environment, the immunological and adaptive mechanisms are still imperfect. At the end of this period of senior school age, the formation of the ratio of the endocrine system's elements' activity becomes characteristic of adults.

During the first half of the person's thirties, the morphological and functional maturity of motor apparatus, and the systems providing it's functioning, is completed. At this time, the

skeleton's ossification is complete, the muscle system is formed, the development of the central nervous system is finishing, and the processes of excitation and inhibition are balanced. Within the circulatory system, the oxygen capacity of the blood and the oxygen preservation in arterial blood are at a maximum. During intensive muscle work, the breathing rate reaches capacity.

Methodical rules for using training loads

The effectiveness of motion techniques and physical ability in the development of young athletes is determined by the methods of coping with physical loads (volume, direction, intensity of physical load, rest intervals etc.)

One can agree that the children are not miniature versions of adults. From a physiological point of view, the body of a young sportsman is different to that of an adult. Is it necessary to pay special attention to this while planning a program of preparation for young athletes? It is well known that via strength physical training, the strength qualities improve and the aerobic and anaerobic ability of young athletes significantly increase. In principle, teenagers adapt well to training regimes of adults, but preparation programs for children and teenagers ought to be worked out for each age group carefully taking into account all factors of their biological development.

The sports training course programs for young athletes have some methodical and organizational particularities:

1. Training during the first years should not be directed towards the achievement of high results (In the initial stages of the preparation of young athletes).
2. Training and competitive loads ought to correspond with the functional abilities of the growing body.
3. The reliable foundation of a young athlete's success lies in the accumulation of knowledge, skills and abilities, in technical and tactical understanding and the development of physical abilities.
4. With age and improvement, the percentage of general physical training decreases and the percentage of special training increases. From year to year the volume of training loads increases.
5. Preparation includes the organization of regular training sessions and competitions. Over the years of training, young athletes must master techniques and tactics, gain experience and special knowledge, improve physical and moral qualities.

The effectiveness of training is largely determined by the duration and methods of performing physical exercises: sports equipment, the volume of loads and intensity, rest intervals, etc. As an example, indicative plans of training for different age groups are given in the Appendix (Tables 1 - 10):

- Initial training, age 10-11 years - Tables 1, 2
- Age 12-15 years - Tables 3, 4, 5, 6
- Improvers, age 16-17 years - Tables 7, 8, 9
- Higher sportsmanship, age 18 years and older – Table 10

The natural peculiarities of age development of physical abilities are an integral part of the development of the growing body on the whole. Periods of active formation of strength, speed, endurance, agility and flexibility are replaced by periods of stabilization, slowdown.

The physical qualities of a man: strength, speed, dexterity and endurance, are collectively

known as 'psychophysiological qualities'. Strength is almost entirely the physical quality of the organism; it relies directly on the volume and quality of muscle mass, and only in a minor way on the other circumstances. Speed is already a complex one, which includes something from both physiology and psychology. The most complex quality is endurance. It relies upon cooperation of almost all systems and structures of the body. It requires a balance in the activity of the functioning organs, along with the metabolism (namely cardio-respiratory supplying organs, excretory and endocrine systems) and, finally, balance in the central nervous system.

The most characteristic feature of a growing organism is the heterochronic nature of the development. It is a well-known fact that if one system of the body which, for example, is needed for development of speed develops earlier, than the other, for the development of strength, develops later. In the process of the body's growth, one can define three periods: acceleration, then deceleration and relative stability. Due to this, means, methods and forms of organizing exercise change. The basic aim of the training process is development of strength, speed, endurance, flexibility and dexterity in young athletes and learning the technique of movements. It is important to stress that a long period of stable results directly depends upon the complex approach to physical preparation of young athletes in the early stages.

One very important principle is that physical development must precede the mastering of technique and movement. This is true of many sports, but every sport has its own individual features. This methodical approach is valid for cyclical sports, where a sport results directly depend on the physical properties of the muscles taking part in a competitive exercise. On the other hand, this approach is not necessary relevant to sports where results depend not only on the physical, but also on technique and tactics. It must be emphasized that during youth, intensive development of both general and specific physical abilities of young athletes are developing in parallel and at each stage one direction or another dominates. In adolescence, great emphasis should be placed on the intensive development of general and special physical qualities, which should be based on the previously achieved mastery of proper coordination of movements.

Unfortunately, children aged 7-10 years are the least enrolled into the system of organized physical education. Therefore, coaches in the initial stage of sports training (10-12 years) often impose impractical requirements on adolescents who, in essence, have not benefited from the most favorable age for accumulating good coordination experience. As a result, the mastering of the technical elements of exercise becomes time consuming. Under such conditions, a shortage of training time hinders the development of physical abilities. All this dramatically reduces the efficiency of sports training and does not contribute to the effective physical improvement of young athletes.

Normally, children are accepted into sports schools at the age of ten. This period 7 - 11 years is a sensitive one in the development of motor coordination in children. From this age on, the development of the coordination continues until the age of 14, but not significantly. At this age, teenagers are already able to make movements of great coordination complexity. They are not inferior in this respect to the young men. Consequently, it can be argued that learning technique of movements can most effectively be carried out at a younger school age, that is, in groups of elementary training. The basis for method of selective perfection is the combination of natural age development in physical ability and educational training loads.

Strength

The mechanisms involved in the development of strength are the same for both adults and children with one exception: the increase of strength in prepubertal children occurs without any significant alteration to the size of their muscle. Studies of the mechanisms contributing to the increase in strength in boys of prepubertal age allow us to conclude that the basic factors in developing a child's strength during training are as follows:

- improvement of motor skills coordination;
- increase in motor units activation;
- other unexplained adaptive reactions of the nervous system.

The increase in strength in adolescents is mainly a result of adaptive reactions of the nervous system, an increase in muscle size and the efforts applied. The level of strength depends on body mass, testosterone concentration, the level of the development of the nervous system and the differentiation of slow and rapid shortening muscle fibers. The initial increase in strength during puberty is largely due to hormonal changes and changes in neuromuscular structures.

The analysis of data on the ontogenesis of strength qualities allows us to conclude that the greatest increase in the strength indicators exerted in various movements occurs between the ages of 11 and 16. Among boys, the strength increase occurs faster than it does among girls. Many authors have noted the unevenness in the development of strength in children, adolescents and young people and the presence of significant individual fluctuations.

The time range we have outlined (12-18) years is very conditional, but it may well indicate the approximate boundaries of the period of intensive development of strength. However, it cannot be expected that this process manifests itself equally in all movements associated with strength qualities. Strength qualities are directly dependent on muscle strength and the ability to apply it.

Adaptive changes occur in muscles as a result of strength training: an increase in the number of activated fibers involved and a change in the intensity of chemical reactions in muscles. These changes require additional supply of proteins and glycogen oxygen to the muscles, which are provided by the transport function of the cardiovascular system. The blood distributes oxygen, amines, lipids, carbohydrates and enzymes. The latter stimulate the absorption of these energy resources by the muscles.

The effectiveness of strength training fits into the following principal structure: **regime – means - method**. Here, it is necessary to take into account the fact that traction strength in the muscle depends upon the position of each part of the body to each other, and the whole body's position in general, to support. Therefore, when choosing strength exercises, it is important to make sure that it is precisely those muscles that we intend to develop will work. For example, a jump into a depth with landing on a supporting leg, and a further jump forward (with the imitation of a jab), is more effective for boxers than a jump upwards after landing in the same movement.

Knowing the above features of strength qualities, one can purposefully select the necessary and useful exercises to successfully implement training of the strength qualities in an athlete.

Speed

Age patterns are also inherent in the development of speed. There are both elementary and complex forms in the manifestation of speed abilities. Speed abilities may be manifested in

a solitary single movement, as a speed of execution of individual phases of a movement, a frequency of movements, speed of reaction, etc. In practice, one often deals with a complex manifestation of various speed abilities of whole movements.

The speed of movement depends, first of all, on the speed of muscular tension, which provides muscular traction. The speed of muscle tension is determined by the mobility of the nervous processes and biochemical reactions in fast-twitch muscular fibers. These processes can be traced to excitatory contractile albumen activation, the intensity of which is determined by the speed of the connection between calcium and troponin, and the activity of actomyozine fermentation. During this reaction, the adenosine triphosphate acid is spent, its resources are continuously restored due creatine phosphate and glycolytic phosphorylation.

A variety of general preparatory, special preparatory and competitive exercises are used to increase speed capabilities. The higher the qualification of an athlete, the more competitive and special preparatory exercises are used.

The duration of individual exercises in the process of speed training is determined by their nature and the need to ensure a high level of an athlete's speed abilities. When improving individual components of speed abilities (reaction time, speed of a single movement), the exercises should be short: less than a second. When serial work - up to 5-8 s.

The time allocated to speed exercises for a child shouldn't exceed 5-8 seconds, for teenagers it should be 10-15 seconds.

The speed of muscle contraction is significantly influenced by the strength component of the movement. Therefore, it is important to pick up such loads for speed training, that the weights do not impede making a quick movement, and that biomechanical characteristics of the exercise are as close to the competition as possible.

The basic rule of speed training is to do exercises at a speed close to the maximum. The movement must be well mastered, brought to automatism.

Exercises for speed development most often consist of a series of repetitive movements with maximum speed and are performed again after the full recovery. The duration of rest ought to ensure that motion speed remains consistent.

During the first years of a child's life, speed is mostly developed through games, but later on it is perfected through classical speed training; i.e. repetitive speed-based exercises with loads.

Endurance

For endurance, a high level of balance is necessary in metabolism in the directly working organs. These organs are supplied with food by the circulatory system, which also removes waste from them, as well as the digestive and respiratory systems. Lastly, good balance is necessary in all controls and regulation - the central nervous system. In essence, a body that shows endurance should encompass three conditions: to ensure sufficient energy reserves, to use energy effectively, and finally, to expend it efficiently to have what to spend. The sportsman should be able to give all at the right moment, without allowing any bit of energy to linger. Finally, he must skillfully and prudently spend it in order to cover as much useful work as possible (high coefficient of efficiency). Put simply, the characteristics of endurance can be described as follows: to have a lot, to expend generously, and to pay miserly.

Endurance training involves the sequential implementation of continuous, repetitive, variable or interval physical activity with a given intensity.

The development of endurance in children and adolescents can occur by including the endurance tasks in the framework of individual exercises in the following areas: the development of general endurance and the development of special endurance. The development of general endurance pursues two main tasks: creation of prerequisites for the transition to an increase in training loads and the transfer of endurance to selected forms of sports exercises. With age, endurance changes unevenly, but constantly upwards.

For athletes specializing in speed-strength sports, the process of developing general endurance is complicated. The work aimed at the development of aerobic capabilities should be carried out in a volume that ensures the effective performance of this specific work, but does not create obstacles for the subsequent development of speed qualities and the improvement of speed techniques. The main emphasis should be placed on improving performance, when doing general training and various additional exercises aimed at developing speed-strength qualities, anaerobic abilities, flexibility and coordination abilities.

To get to a high level of special endurance, an athlete needs to achieve a joint use of separate skills and abilities required by the competitive activity's conditions.

In the early stages, the athlete is not yet able to withstand the required pace of the fight. However, it is necessary to do a high volume of work with such intensiveness. This contributes to the development of competitive technique, increases efficiency of work, and produces a rational coordination of motor and vegetative functions. Various variants of the interval and continuous methods are widely used to develop these specific qualities (Platonov 2010).

Working on the development of special endurance, the main method uses special preparatory exercises, close to competitive ones - in form, structure and impact on the functional systems of the body, as well as a combination of exercises of various lengths, when performing a separate task.

For example, when developing special endurance, boxers use a wide variety of exercises to simulate the whole range of functional and technical-tactical skills, such as: working with a partner, working on punching bag and on pads, imitation exercises, working with different weights, running at different distances, etc. These exercises can be performed in different pulse modes and with different technical and tactical means, depending on the tasks. Diversity in the methods of developing a boxer's endurance includes differing intensity, duration and direction of exercises, varying coordination, work and rest regimes. Combined, these promote endurance and speed-strength qualities, as well as coordinative ability and flexibility.

UNDERSTANDING TECHNICAL SKILLS IN BOXING

Techniques of physical exercises are a rather extensive and broad concept. Various authors interpret it in different ways. We do not intend to clarify, or detail this concept in this chapter. We strive to avoid unnecessary details and on the contrary, would like to simplify general theoretical principles of the approach to this subject.

Muscular motor action consists of two interrelated aspects: the task of movement and the way to solve this task. Methods of performing motor actions, which help solving the task of movement effectively, are called the techniques of physical exercises (Matveev, 1999).

Each technique is a specific motor skill, which has a certain biomechanical structure determined by corresponding kinematic, dynamic and rhythmic characteristics. When analyzing the technique, one distinguishes the basis of it, its defining parts and details.

The basis of technique refers to a necessary set of specific movements and coordinated actions of all body parts in the physical space and the time.

The defining element of technique is the key action required to solve the task of movement. For example, punching is a result of the synchronized work of the 'pole' points in the kinematic chain between the supporting foot and the wrist of the punching hand.

Details of technique are secondary elements that do not influence the basis of mechanics for the movement. For example, a position of the fist at the moment of impact.

When talking about the technique of motor actions, most coaches keep in mind the 'big picture' of how to do it. Often this picture is subjective. Therefore, the question of choosing objective criteria when determining the technical mastery is very important. Unlike *technique*, the concept of *technical mastery* should be considered as a characteristic of preparedness in the athletes (Savin, 1990).

What are the criteria of determining technical mastery of boxers? According to experts, they include: versatility, efficiency and perfection of technique. For boxers, in our opinion, the most significant is **the strength and efficiency of punches**.

Strength is a concept used to describe interaction of an object with other objects in the surrounding world. Studying the relationship between strength and motion, Isaac Newton (1642 – 1727), formulated three laws of motion. These are the laws of inertia, acceleration, and action-counteraction.

The law of inertia - each body continues to maintain a state of rest, or uniform motion in a straight line until it is forced to change its state under the influence of external forces.

According to the law of *acceleration* (Newton's second law), the acceleration of an object is dependent upon two variables - the net force acting upon the object and the mass of the object.

In sports theory, strength refers to the mechanical impact of one body on the other. Numerically, strength is calculated as multiplication of body mass by its acceleration (Newton's second law):

$$F=ma$$

It is an equation describing Newton's law of acceleration. Generally speaking, it is the connection between cause and consequence. The left part of the expression (F) can be regarded as the cause, representing the impact on the moving object. The right part presents the consequence, representing the result of kinematic effect.

According to Newton's third law, which concerns *action-counteraction*, an action is equaled by a direct counteraction. The force affecting the object defines this interaction. It is not the case that one object has an action on the other and that the other replies with counteraction. The objects interact simultaneously, and this interaction results in a force.

Let's consider a boxer performing an attacking punch in a jumping movement, with a subsequent step back to exit from the fighting distance. When jumping, the athlete impacts the ground (support), and respectively the ground reacts to him with the reacting force. According to the law of action-counteraction, the impact the athlete has on the ground and the counteracting force of the ground on the athlete are equal, but their directions are opposite. The result of this interaction, as indicated in the law of acceleration ($F = ma$), is that each body (i.e. the boxer and the ground), experience an acceleration depending on their mass.

If an average force is equal to 1500 N and the athlete's body mass is 75 kg, he will experience an acceleration of $20 \text{ m} / \text{s}^2$ (Enoka, 1997). However, due to the large mass of planet Earth, the Earth's acceleration will be negligible.

In general, the analysis of targeted human motor activity is a very complex problem, the study of which requires consideration of a large number of variables.

The two most important criteria points for the correct technique in punches for boxers are **the strength and efficiency**.

In theory, efficiency is understood as the rational use of energy when performing movements and actions, as well as the level of inclusion of the necessary muscle groups into the punching action. A punch can be performed putting in the mass of the arm and shoulder girdle, by only putting in the mass of the arm, or even using the mass of the arm, body and legs. Paradoxically, the more muscle groups involved in the punch, the more economical it is for the body in the period of time, and for the fight in general. The reason is that under time pressured conditions, during the high density of competitive combat, the heart rate reaches 220 beats/min and higher, and in the emotional and physical intensity, the small muscle groups of the arms are subject to rapid fatigue. This fatigue tends to set in slightly more slowly for the larger muscle groups (those in the legs and the body).

Using the above-mentioned criteria, let us try to establish which actions can be considered technically correct and which are not.

According to Newton's second law, the power depends on two components: mass and its acceleration. Let us assume that two boxers are of approximately the same weight. We shall focus on the mechanism behind the moment of force accelerating this mass. In practical terms, the mechanism is the pushing off by the supporting foot. The more powerful is the explosive action of the foot at the moment of performing the punch, the greater the acceleration of the body mass. Thus, one of the key factors in increasing the force of the boxer's punch is the powerful pushing off from the ground with the supporting foot. A punch, which includes almost all of the body parts, muscle groups, and is accompanied by a powerful push off, can be considered to be more powerful than a punch which has fewer, or none, of the specified characteristics.

Punching in boxing depends on many factors: physical, mental, morphological, etc. Therefore, the degree of variations in their technique is very high.

Every punch in boxing is a combination involving forward movement of the whole body relative to the support and rotational movements of the whole body, and the body parts in the various joints around various axes. Depending on the form of the punch (jab, hook, or uppercut), forward or rotational movement prevails.

The combination of linear and rotary movements in one plane is called a plane movement. It includes a rotation around the moving point. If such a movement occurs in more than one plane, then we are talking about the three-dimensional movement. In most cases of human movements, the parts of the body experience linear and rotational displacements (Enoka, 1987).

Body movements include the turning of body parts around the axis of joints. These actions are caused by external forces and muscle activity. Misbalances of these forces are what causes rotations. The ability of a force to cause rotation is associated with the concept of torque, or moment of force about an axis.

The torque is always determined relatively to a specific axis. So, to discuss the rotational effect when activating a group of muscles, one must specify the axis relative to which rotation would occur. The torque is the result of a force and a distance - shoulder of the force. Rotating effect can be changed by changing any of these factors individually, or in combination.

Many anatomical structures are able to change the shoulder length of the torque of the corresponding muscle.

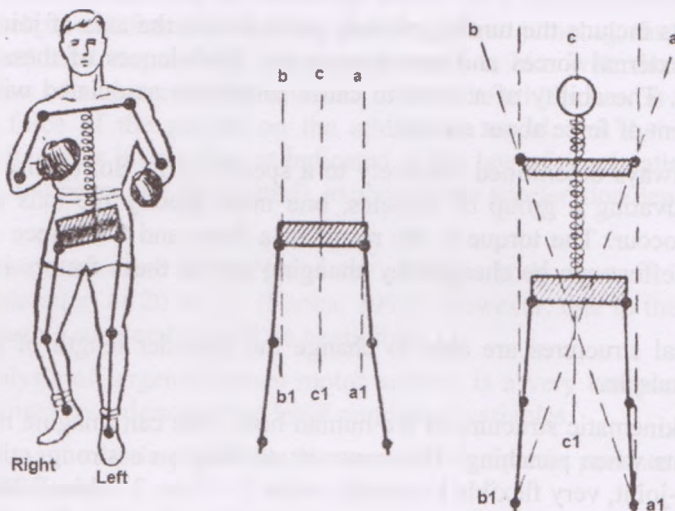
Examining the kinematic structure of the human body, one can imagine rotational axis and supporting points when punching. The boxer is standing on a strong, still base – the ring floor. The three-joint, very flexible kinematic series (1 - foot, 2 - shin, 3 - hip) runs from the floor, facilitating a complex progressive-rotational motion to the rigid intermediate supporting base of the body – pelvis (Klevenko, 1968). In this case, we are interested in the rotational movement of the pelvis around one of the vertical axes (there can be several, Fig. 5):

- standing on the left, frontal foot – rotation around the left-side axis $a-a_1$ going through the left supporting foot and the left hip joint;
- standing on the right foot – rotation around the right-side axis $b-b_1$ going through the right foot and the right hip joint;
- standing on both feet – rotation around the central axis $c-c_1$ going through the middle of pelvis.

When punching, the efforts from feet and pelvis are passed through the flexible connecting vertebral column to a relatively rigid supporting base: shoulder girdle with its muscle groups. Rotational movements of the body parts from the pelvis to the shoulder girdle can take place around the central axis $c-c_1$ (approximately the axis of the spinal column), around the left axis $a-a_1$, (the left hip joint - left shoulder joint) or the right $b-b_1$ (the right pelvis joint - the right shoulder joint), - Fig. 5.

Movements can also be performed around the diagonal axis: $b - a_1$, $a - b_1$, various intermediate variants are possible. The pelvis and shoulder girdle can be regarded as relatively rigid supporting bases, separate from the legs and arms, which can work both independently and together. The shoulder girdle has a greater degree of mobility in different directions and around different axes of rotation. Moreover, the left shoulder can move independently of the right one and vice versa, since they do not have a rigid bone connection between them, with the exception of the clavicle.

Thus, when punching, the efforts and the body part movements are passed from the foot to the shin and hip, then to the pelvis, from the pelvis to the shoulder girdle and further, through the arm, to the arm's punching area - the fist. Therefore: a) pushing off with the supporting foot gives the initial speed to the body and arm mass, and ensures its further increase; b) the movement of the fist to the target accompanies the rotational movement of the body and provides defense to the boxer. The direction of movements of the body and arm must coincide, otherwise, according to the laws of mechanics, the force will decompose and the speed of the fist will start decreasing.



.Fig. 5. Boxer's body rotation axes (Klevenko, 1968)

The techniques of movements, punches and defenses

The concept of boxing technique includes mechanics of movements: punches, defenses, moves and other actions of boxers. They differ from the usual paired exercises. They help to develop and fix the dynamic stereotype and can be performed individually, or as a group in a line, in front of a mirror, or with a coach on pads.

The main tasks, when perfecting athletes' technical skills are (Keller, Platonov 1993):

- achieving high stability and rational variation of specialized skills which are the basis of the technique of a particular sport;
- the consistent transformation of learned techniques into effective competitive actions;
- perfecting the structure of motor actions, their dynamics, kinematics, rhythm, taking into account the individual characteristics of the athletes;
- improving the reliability and effectiveness of technical actions of athletes in extreme competitive situations;
- perfecting the technical skills of athletes based on the requirements of the competitive activity and taking into account the progress in sport science.

Above, we already outlines some questions on boxing technique. Further on, we are going to talk about the basic technique that meets certain criteria (strength, economy etc.), which is the basis of the technical arsenal of boxers and without which an effective performance in competitive activities is impossible (Keller, Platonov 1993).

The punching action of a boxer consists of several conditional phases. Let's try to understand them:

1. The shift of the body weight to the foot pushing off the ground. This movement will allow the boxer to use the force of reaction from the support when punching most efficiently. According to Newton's third law, 'For every action there is an equal and opposite directed reaction'. Practically, the stronger the foot acts on the support, the stronger the support acts on the foot. The load on the supporting leg prior to the start of the movement should be moderate, but at the same time sufficient to maximize the effect of pushing off.

2. Pushing off with the supporting foot and moving forwards simultaneously, sending the arm to the target, and rotating the body around one of the axes. The arm motion should start simultaneously with pushing off, or earlier. This ensures that the necessary muscle mass is included in the punch and gives the boxer the opportunity to defend with his own fist. Landing of the feet on the support should be slightly ahead of the moment when the fist strikes, in order to avoid a 'punch in flight'.

At the same time, one should remember and take into account the effect of decelerating the muscles of the arm during the execution of the punch. The research (Chkhaidze, 1980) confirmed this effect, when studying ballistic shock movements, pointing out that the pre-impact decelerating of the final link in the kinematic chain does not reduce its speed.

To give an extra strength to the punch one should increase gloved hand's mass somehow. To do it, the boxer's elbow and wrist joints should remain fixed. Then the weight of the forearm, shoulder and even the body is added, which is called 'to include the body weight into the punch'. What is equally important, is that this fixation of a single rigid arm gives the end link of the kinematic chain (the fist) a necessary rigid torque, which in turn includes the antagonist muscles in the action. Experiments have shown that before the fist connects to the target, the deltoid muscle switches on, and it is an antagonist of muscles inflicting the punch. Studies of the bioelectric activity of the synergists and especially the antagonists' muscles showed that when unprepared people were chopping with a hammer, both synergist and antagonist muscles were active long before the collision. When specially trained people did the same, the antagonist biceps were activated just before the collision, whereas the synergist triceps activated simultaneously with it.

3. Exiting from the fighting distance. Immediately after the fist reaches the target, and the left front-standing foot lands on the support, the boxer sharply pushes off with this leg and steps back. The hand returns to its original position along the same trajectory following the movement of the body.

There are two ways to move in boxing: usual steps and jumps. In the early stages of training the usual steps are used. Later on, all actions should be performed jumping. The transition from step to jump should occur naturally and smoothly. The length of the jump can vary from 10-30cm in the long-range to 2-5cm in the short-range. Each punch in boxing should be accompanied by a powerful pushing off with the legs giving acceleration to the body mass. Jumps are performed by alternately pushing with the left and right, or both feet in the forward-backwards and sideways directions. The feet should be shoulder width apart and should not close together or slide apart. The body weight consistently shifts from one leg to another. The degree by which the bodyweight shifts depends on many factors: the strength of the punch, the tactical focus of the action, etc.

An example: the straight punch with the right hand to the head with subsequent exit from the fight distance. At the moment of impact, the body weight shifts slightly to the left front-standing leg, this is followed by a springy pushing off with this leg from the support, and

then the exit from the distance. In this case, the left leg works as a 'stopper'. Another example: the straight punch with the right hand to the head is followed by tilting to the left and the development of the attack. At the moment of impact, the body weight shifts to the left front- standing leg. Then the tilting body goes downwards, loading the left leg sufficiently. This is followed by a powerful push off with this leg, unbending the knee and pelvis joints and the subsequent development of the attack with the left, less often right, hand.

There are three forms of punches: attack, counterattack and encounter. They are inflicted from the long, mid, or close range distances. They can be searching, accented, single or in series.

Each variant is very specific, so there is no reason to discuss them all in detail.

An analysis of techniques of leading masters in boxing indicates a range of individual features/ characteristic to every boxer. This individuality can occur in the manner of tilting, or rotation of the body, in the position of feet in the stance, whilst punching, or in the positioning of the fist at the moment of impact, etc. Therefore, the basic, or typical technique should not be regarded as something permanent and unchanging. When improving skills of boxers who have mastered the 'school', i.e. basic techniques, it is possible and necessary to develop new types and variants of punches.

Below we describe certain types of single punches, their combinations (two-punch), and their series (more than two). Punches in our descriptions are performed in the long distance and typical, or basic technique, moving in normal, or jump steps, from the left-sided stance, and of the right-handed boxers. The technique of the left-handed boxers has its specifics and is described by Ogurenkov (1959).

The stance is a universal initial position, convenient for creating defenses, moves and punches. Individual physical, psychological and technical characteristics of the boxer influence the stance, as well as the technique as a whole.

Learning the stance starts during the first lesson. From the main gymnastic position, learners rotate the toe of the right foot to the right by 90-120 degrees. Then the right foot is placed on the toe and turns into the position parallel to the left foot. After that, a half-step back is taken to a balanced body position. In this position, the boxers do several jumps up fixing the position of the feet at the landing (the feet are in parallel).

Arms. From the hands down position (fists are clenched, the thumbs cover the phalanges of the index and middle fingers) the left hand is raised to the level of the eyes, the elbow angled at around 90-120°. The elbow does not press against the stomach, but is 5-7cm forward defending it. The right fist is up level with the chin, defending it. The boxer is twisted half way towards the opponent, the left shoulder is touching the chin, the head lowered down, the back bent and shoulders relaxed. The body weight is evenly distributed over both feet.

Movements. There are two main types of movements in boxing: the normal step and jump. Beginners are usually taught the normal step. Then teaching should proceed to jump-step movements. In teaching movements, one should adhere to a rule called 'step principle': 1) the feet are always apart, 2) the distance between feet should be kept shoulder width apart (as far as the left foot has advanced, the right foot should be pulled up to it, and vice versa).

A single step (forward-backward, fig. 6). From the boxing stance, the body weight shifts slightly to the right leg. Pushing off with the right foot from the support, the boxer steps forward with the left leg. The right foot is pulled to the left at the same distance and the body weight shifts to the left leg. Pushing off with the left foot, the boxer takes a step back

with the right one. The left foot pulls up to the right at the same distance that the right one has advanced. Body weight shifts to the right leg. These are the following stages in one step movements: 1. the body weight shifts to the supporting foot, pushing off with the right foot in any direction (forward, backward, left, right, in a circle, left or right). 2. the body weight shifts to the opposite foot, pushing off from the support in any given direction.

Multiple step movements (two, three and four steps). It is advisable to learn these movements through 'in a square', 'on corners', and 'in a circle' exercises. The aim is to teach learners to transfer body weight from one leg to another, pushing off with the supporting foot in any given direction.

The movement 'on corners' (forward-backward-left-right, fig. 7). This exercise can be divided into 4 conditional phases by the direction of movements and weight transfer from one leg to another:

1. Starting from the boxing stance, the body weight shifts to the right leg, pushing off with this leg and stepping forward with the left one. The body weight shifts to the left (front-standing) leg.
2. Pushing off with the left foot, the boxer steps back with the right foot and shifts the body weight to the right leg.
3. Pushing off with the right foot, the boxer steps left, and the body weight shifts to the left leg.
4. Pushing off with the left foot, the boxer steps right, and shifts the body weight to the right leg.

The same way, but in the opposite direction, the movement 'in corners' to the right is performed

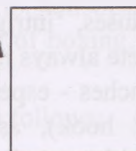


Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9

The movement 'in a square' to the left (fig. 8): 1 - Starting from the boxing stance, the body weight is shifted to the right leg. Pushing off from the support, the boxer steps forward with the left leg. The body weight stays on the right leg. 2 - Pushing off with the right leg, the boxer steps left with the left foot, and the body weight shifts to the left leg. 3 - Pushing off with the left foot, the boxer steps back with the right leg, the body weight stays on the left leg. 4 - pushing off with the left foot, the boxer steps right with the right leg, the body weight shifts to the right leg. The same way, but in the opposite direction, the movement 'in a square' to the right is performed.

The movement 'in a circle' to the left (fig. 9): Moving in a circle to the left, the boxers push off with the right foot stepping left with the left leg. The body weight remains on the right leg. Once again, pushing off with the right foot. Movement in a circle to the right is performed in the same way, but with pushing off with the left foot to the right.

All these movements should be taught in a line, and later on, in pairs.

Such exercises give the first skills of reading a partner and distance. In all movements, legs should not cross over, come closer to one another, and should not be on the same line. The feet should be shoulder width apart, sufficiently to keep balance. The boxers move on the

toes (on the fronts of the feet). The center of body mass has minimal up and down movements along the axis.

A more detailed classification of movements in the ring, based on supported and unsupported phases of movements, as well as different sequences of exercises, was presented by Oskolkov and Levitan (1986). The authors define two main types of movement: walking and jumping. By 'walking', the authors refer to ordinary, added and crossed steps. By 'jumping', they refer to jumps.

After mastering the movements, it is usual to start studying punches in pairs. It is better to do this in two lines having divided the learners into attacking and countering groups. Exercises in two lines would enable the coach to identify errors and show how to correct them.

At the initial stages of training, the beginners also learn defenses. As a rule, a complex exercise is given. For example, number 1 attacks, number 2 defends and counter attacks, then the numbers change. Punches are studied in attacking and counterattacking forms. Attacking and defensive actions are performed with a 'jump', or normal step. The 1st and 2nd numbers are trying to maintain their distance. When the 1st number attacks, the partner takes a step back and vice versa. There is a constant change of distance and attempts of both partners to keep it.

Single punches

Left straight punch to the head

Jab is the most popular punch in boxing. Attacks are usually started and finished with jabs. The left hand blocks the opponent's attacks, keeps him under pressure and at a distance. It fills in pauses, 'intrigues' cunningly, and keeps the distance. Skillfully using the left hand, the athlete always has an advantage over an opponent who underestimates the importance of left punches - especially jabs. A left hand punch can be both searching and a knocking out (left hook), as well as deterring the attack of the opponent, and provoking him to initiate actions. A need for a tactical left hand punch is of great importance for the technique. Large muscle groups can be used or only small ones: for searching blows, or to fill in the pauses. These punches can be done when the body weight concentrates on the front-standing foot, when on the back standing foot, or when evenly distributed to both feet (fig. 10, 11).



Fig. 10. The left straight to the head

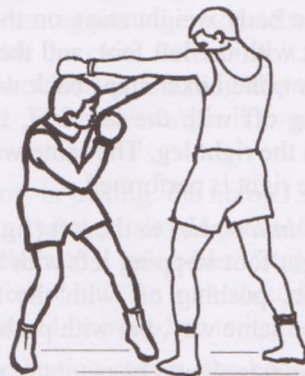


Fig. 11. The left straight to the head
(encounter form)

Throwing a jab to the head from the classic left sided stance can be divided into the following phases:

1. Before the start of the movement, the body weight shifts to the right leg.
2. Powerfully pushing off with the right foot from the support, the boxer simultaneously throws the left hand to the target and rotates the body.
3. The left leg brakes the forward movement: after the foot touches the floor, the boxer powerfully pushes off backwards and breaks out of the distance. The hand on the same trajectory returns to its original position.

Typical mistakes

- The impact is not due to the rotational movement of the body to the right around the vertical axis, but only due to the extension of the arm at the elbow joint;
- The trajectory of the fist to the goal is not straight, but with deviations down, or left, or right;
- At the moment of the collision, the fist and the wrist joint are not fixed, turning it from a punch to a 'slap';
- Stop (pause) after the punch reaches the target.

Virtually all types of punches in boxing begin by 'loading' the left, right, or both legs followed by pushing away from the support, and rotating the body around one of the axes. This way, maximum efficiency is achieved.

Right straight punch to the head

The straight right is the boxer's main weapon. According to statistical data, most knockouts are inflicted with this punch. It may be used in all forms of boxing, in all three distances, and has a high degree of variability (fig. 12-14).

From the classic stance (fig. 12) the punch is performed as follows:

1. Shifting the body weight to the right leg (preparatory phase).
2. Powerfully pushing off from the support with the right foot and jumping forward, the boxer throws the right hand to the target simultaneously rotating the body around the axis: right foot - right pelvis - right shoulder. The hand moves along the shortest path (straight line) to the target with simultaneous 'twisting' of the fist and forearm (to prevent straightening the elbow joint too much).

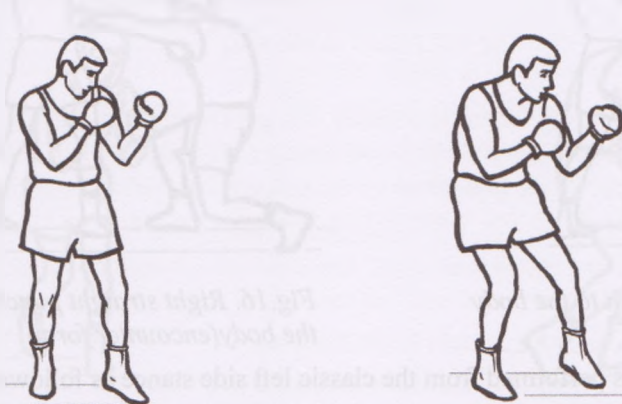


Fig. 12. The initial position before throwing the right straight punch

3. Landing on the support in a jump movement should be ahead of the moment, when the hand hits the target. The fist at the moment of impact is turned upside down.

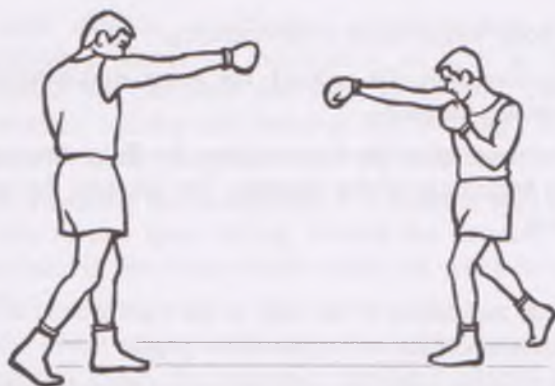


Fig. 13. The right straight punch to the head

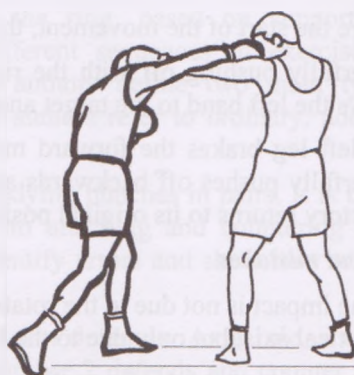


Fig. 14. Right cross to the head

Typical mistakes

- Body weight is on the front leg before the punch;
- Rotation of the body starts first, not the movement of the hand, which makes the boxer vulnerable and prevents full inclusion of the body into the punch;
- The punch is inflicted using only the weight of the shoulder girdle;
- Premature tilt of the body when punching;
- The athlete passively remains in the fighting distance after the punch.

Right straight punch to the body

The right straight punch to the body is not used as often as the left one. This is not due to its low efficiency, but more likely, is a result of boxers' ignorance of its potential. Accurate punches to the body churn the opponent's breathing and are relatively safe to perform. As a rule, the punch is thrown in a long-range attack, less often in an encounter form, and rarely in a counter attack. It is advisable to attack using this punch at the ropes of the ring after a convincing trick. The punch is most often performed in two variations (fig. 15, 16).

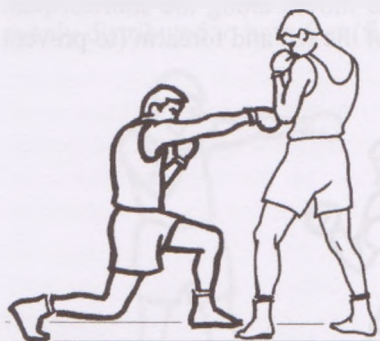


Fig.15. Right straight punch to the body

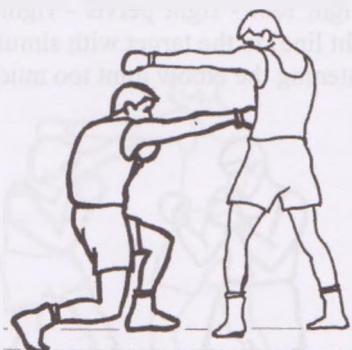


Fig.16. Right straight punch to the body(encounter form)

V a r i a n t 1. This punch is performed from the classic left side stance as follows:

1. Jumping forwards, the boxer imitates a jab to the head, and the body weight is on the right leg.

2. With a repeated push with the right foot and simultaneous wide lunge forwards with the left one, the right hand moves to the target through the shortest path, from top to down. A sharp forward tilt of the body increases the speed of the punch. The center of mass of the body drops down.

3. Powerfully pushing off backwards with the front-standing foot, the boxer breaks out of the fighting distance.

Variants 2. The punch is thrown without the imitating left hand movement.

1. The body weight shifts to the right leg first.

2. Powerfully pushing off with the right foot and lunging with the left one, the hand simultaneously goes to the target, and the body weight shifts to the left leg while the center of mass of the body drops down.

3. Pushing off with the left foot, the boxer breaks out of the distance.

Typical mistakes

- The hand movement lags behind the body's forward motion;
- The center of the body mass is too high;
- The hand goes down before the punch;
- Non-synchronized legs, hands and body actions cause the breakdown of strength;
- A pause between the trick and main punches.

Hooks

Hooks are punches from the side. Unlike straight ones (which are frontal), they are performed with a rotational forward movement. Jabs are done in a forward-rotational movement. In each case, various mechanisms of muscle engagement are involved. In rotational forward movements of side punches, large muscle groups are involved, which is one of the reasons for the increase of their strength coefficient.

Left hook to the head

This punch belongs to the group of flank punches and is an effective weapon of attack and counterattack (in the counter and encounter forms). A good grasp of this punch gives the boxer a distinct advantage. According to statistical data, the percentage of knockouts caused by the left hook is fairly high. The following describes the technique for long-range distance in the attack form. One should remember that this technique is greatly variable (fig. 17, 18).



Fig. 17. The initial position before throwing the left hook



Fig. 18. Left hook to the head

The punch is thrown from the classic position as follows:

1. With a powerful push off by both feet, the boxer jumps forward (feet rotate 45-60° to the right). Simultaneously, the boxer lunges the half-bent arm (elbow at an angle 90- 120°) from left to right, parallel to the ground while rotating the body. The hand does not move independently, but only accompanies the turning of the body to the intersection with an imaginary sagittal (anteroposterior) plane. The landing of the feet on the support occurs at the same time, or slightly before the moment, when the fist reaches the target. The position of the fist at the moment of impact is the thumb on top, back side forward
2. Immediately after touching the support, the boxer pushes off backwards and breaks out of the proximity, returning the body and hand to the initial position.

Typical mistakes

- The punch is inflicted using mainly hand mass;
- At the moment of punching, the arm straightens at the elbow joint and the punch is performed almost exclusively due to this extension;
- Arm retraction (swing) before punch.

Right hook to the head

This punch is a powerful weapon in any boxer's arsenal, because it uses large muscle groups and practically the whole mass of the body and arm. The right hook is efficient when facing a left-handed boxer. It is used equally successfully in the long, mid, and short-range distances. It is variable to a large degree (Fig. 19, 20). As this punch is risky in the conditions of a competitive fight, the percentage of its use is not very high.

We shall discuss two variants of using this punch in the long distance, attacking form, from the left-sided stance.

V a r i a n t 1. To increase safety when performing this punch, it is advisable to combine it with a cheating jab like punch, such as the two-punch combination. The combination is performed with two jumps and in two phases: the preparation and the punch itself. It is better to use it in conditions of limited maneuvering space for the opponent (in the corner or near the ropes of the ring).

The sequence of performing:

1. The preliminary shift of the body weight to the right leg.
2. Jumping forward, the boxer throws the left hand like a jab, while the body rotates to the right, keeping the weight on the right leg. On one hand, the movement of the left hand defends the attacking boxer. On the other, it is preparation for the right handed punch.

3. A repeated push off with the right foot, and another jump untwisting the body in the opposite direction (to the left), simultaneously throwing the right half-bent arm to the target. The elbow angle should be between 90° and 120° . The arm doesn't move independently, but quickly and powerfully follows the body rotation. Its trajectory is slightly upwards. At the moment of contact with the target, the fist is turned with the thumb up, back side forwards.

Variant 2 - This punch is performed from the classic position in a long-range distance, without the left hand cheating movement.

Sequence of performing:

1. The shift of the body weight to the right leg.
2. A powerful push off from the support and a jump, simultaneously throwing the half bent arm and rotating the body to the left. The length of the jump depends on the distance. The further away the opponent is, the longer the jump by both feet.

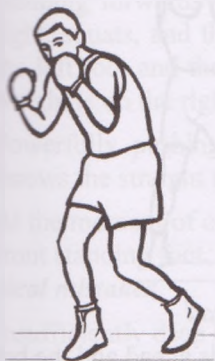


Fig. 19. The position before throwing the punch by the right hand

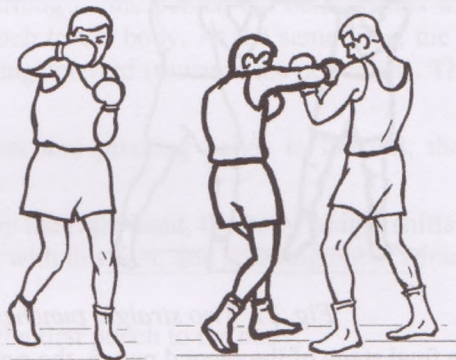


Fig. 20. Right hook to the head

Typical mistakes

- Only the arm mass is involved in the punch, which diminishes its strength;
- Only the shoulder mass is involved in the punch;
- The body rotation and forward movement are ahead of the punch, which makes the boxer more vulnerable.

Two-punch combinations: straight and other punches

Two-punch combinations are very popular among boxers and are used in all three ranges, as well as in all three forms: attack, counter attack, and encounter. The technique in different situations has its own features. The tactical direction of an action also influences the technique. For example, the second punch, which follows after the first one by the left hand, may have different time intervals depending on what is required: force or speed.

The above features are sometimes fundamental. To clarify, let us concentrate on two straight arm punch combinations to the head and body, and varied punches performed in the long-range. Others will be analyzed in the section 'The features of two-punch combinations in the close and mid-range'.

Below are typical two-punch combinations with indication of distance and form. All other important issues related to the implementation of these combinations, we will try to highlight in the section 'Methods of teaching'.

Two straight punch combinations to the head

As mentioned above, two-punch combinations have a great degree of variability. In this instance we will discuss the sequence of performing the combinations in attack form (fig. 21).

1. The body weight shifts to the right leg. Powerful push off with this foot and jump, whilst simultaneously throwing a jab to the head. The body rotates right. The body weight stays on the right foot.
2. Repeated push with the right foot with the second jump, and a simultaneous straight right punch. The body turns left around the axis: right shoulder - right pelvis - right foot. When punching, the pelvis sharply rotates from left to right and from right to left, a half-turn (approximately 30°).

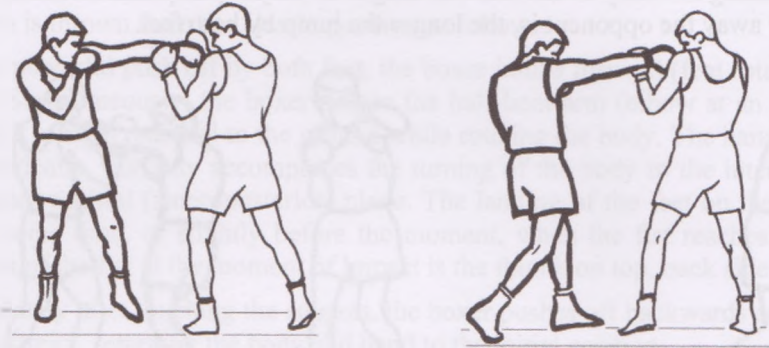


Fig. 21. Two straight punches combination to the head

3. At the final stage of the second punch, the right shoulder subtly bends ahead and the body weight shifts to the left leg. The left leg works as a 'stopper', stopping the forward movement.

The mechanics of the hand work is alternating fists at the target. The pause between the punches should be minimal.

Two phases are characteristic for the two-punch combinations. The first phase: swing and the position preparation (the first punch). The second phase: an accented punch with the right hand. Both phases are interconnected and logically derived from one another. Immediately after the second punch, the boxer exits from the fighting range.

Two straight punch combinations 'head-body' and 'body-head'

The combination: *left to the head – right to the body* is performed jumping and lunging ahead. The movements are consolidated. Conditionally, they can be divided into phases:

1. Shifting the body weight to the right leg, powerfully pushing off with this foot and jumping forwards. Simultaneously, the jab travels towards the target. The body weight remains on the right foot.
2. A repeated push off with the right foot, a lunge forward with the left one simultaneously throwing the straight right to the body. The center of body mass moves closer to the support.
3. When the right hand makes contact with the target, the body weight shifts to the left leg, simultaneously pushing with this foot off the support and subsequently exiting from the fighting range.

The pause between the punches should be minimal.

The combination: *left to the body – right to the head* can be performed in two variants:

Variant 1

1. Jumping forwards and simultaneously bending the body forwards and to the right, the boxer throws the left hand straight punch to the body. The body weight is on the right foot.
2. Simultaneously pushing off with the right foot and straightening the body, the boxer throws the straight right from bottom up to the head.
3. At the moment of making contact with the target, the body weight shifts to the left forward standing foot. Pushing off with this foot, the boxer breaks out of the range.

Variant 2

In this variant, unlike the first one, the hitting movements of the hands are combined with powerful pelvic turns.

1. Jumping forwards with a simultaneous turning of the pelvis, the boxer bends the body right, squats, and throws the left hand punch to the body. At the same time, the heel of the left foot and the left buttock are pivoting forward (towards the opponent). The body weight is on the right foot.
2. Powerfully pushing off with the right foot and pivoting pelvis to the left, the boxer throws the straight right while standing up.
3. At the moment of contact with the target by the right hand, the body weight shifts on the front standing foot, pushing off backwards with this foot, and breaking out of the range.

Typical mistakes

- Insufficiently deep bend and squat during the first punch to the body;
- The body weight shifts left during the first punch;
- Premature standing up from the bend and squat position during the second punch – straight right to the head.

Two-punch combinations of hook – straight punch and straight punch - hook

The two punch combination *left hook – straight right to the head* is mainly used in the long-range and in an attack or counterattack (fig. 22).

In the attack form, the body weight is evenly distributed on both feet:

1. Powerfully pushing off from the support, jumping forwards and simultaneously rotating the body around the vertical axis, the boxer throws the left hook to the target. The body weight shifts to the right leg.

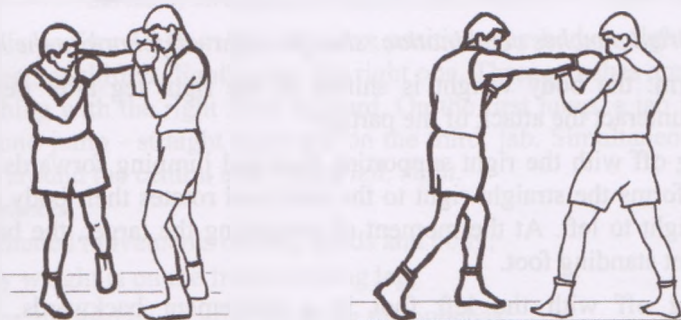


Fig. 22. Two-punch combination of varied punches: *left hook – straight right to the head*

2. Pushing off with the right foot with a repeated jump, the boxer simultaneously throws a straight right to the head and rotates the body left around the central axis.
3. At the moment the right hand makes contact with the target, the body weight shifts to the left leg, followed by a sharp push off with this foot, and exit from the fighting range.

The counterattack - after the defensive action (tilt left) - to the partner's attack:

1. A powerful pushing off with the left foot and simultaneous left hook to the target, the boxer rotates their body to the right around the diagonal axis. Body weight shifts to the right leg.
2. Pushing off with the right foot, the boxer simultaneously throws the straight right punch and rotates the body to the left.
3. At the moment the right hand makes contact with the target, the body weight shifts to the left leg, there is a sharp push off from the support, followed by breaking out of the fighting range.

Two-punch combination: straight right - left hook to the head is mainly performed from the long or mid-range distance in attack, counterattack or encounter forms (fig. 23).

The attack form: the body weight is evenly distributed on both feet, or shifted slightly to the right one:

1. Powerfully pushing off from the support and jumping forwards, the boxer simultaneously lunges the right hand towards the target and rotates their body left around the vertical axis. At the moment the right hand contacts the target, the body weight shifts to the left leg.
2. Powerfully pushing off from the support with the left foot, the boxer simultaneously throws the left hand hook. The movement is followed by the rotation of the body to the right. After completing the punch, the boxer exits the fighting range.

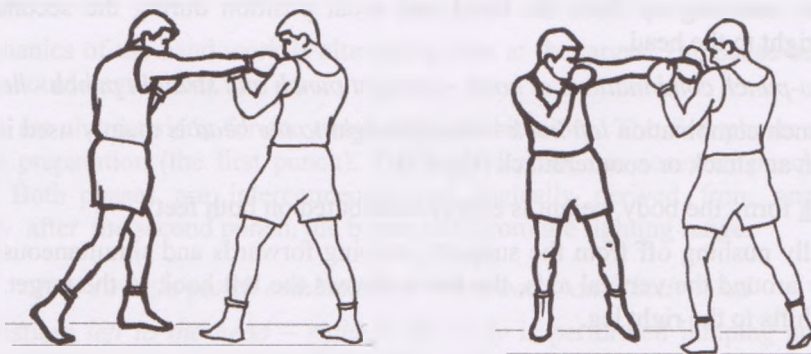


Fig. 23. Two varied punches combination: straight right – left hook to the head

The counterattack form: the body weight is shifted to the right leg after performing a defensive action to counteract the attack of the partner:

1. Powerfully pushing off with the right supporting foot and jumping forwards, the boxer simultaneously performs the straight right to the head and rotates their body around the central axis from right to left. At the moment of contacting the target, the body weight shifts to the left front standing foot.
2. Powerfully pushing off with the left foot in a movement backwards, the boxer simultaneously throws the left hand hook to the head. The movement is accompanied by the rotation of the body to the right and slight bend backwards. After completing the punch, the boxer breaks out of range.

The encounter form - the body weight is evenly distributed on both feet or slightly shifted onto the front standing left foot:

1. Powerfully pushing off the support with a movement backwards (to maintain the fighting range), the boxer simultaneously throws the right hand punch towards the target, rotating the body left. At the moment of contacting the target, the body weight distributes evenly over both feet.
2. Repeating the push off the support with both feet, with a movement backwards to keep the required distance, the boxer simultaneously throws the left hand hook to the head. The body rotates right around the axis: right foot – right hip joint – right shoulder, slightly bending backwards.

Typical mistakes

- Movements are not performed smoothly (are not compatible with each other).
- Hands are ahead of the rotating movement of the body. As a result, the punch is given hand mass only.
- After completing the attack (counterattack), the boxer is still in the fighting range.

Three and four straight punch series to the head

Series of three straight punches to the head

They are performed mainly in the long-range. The combination may be: jab, jab, straight right or jab, straight right, jab. As a rule, these series are performed in the attack form jumping, or stepping with the opposite legs. The type of movement is dependent on the individual characteristics and technical skills of the boxer. Below we will discuss the aforementioned series with the jump movements.

Series of straight punches to the head: left - left - right

1. Jumping forwards from the orthodox initial position, the boxer throws a jab to the head. The body weight remains on the right foot.
2. With a repeated push-off using the right foot and with a second jump, the boxer throws a jab and straight right. The rhythm of this combination is: a pause after the 1st punch, with the 2nd and 3rd punches together (like the combination of two straight punches). The pause between the first and second jumps is insignificant.
3. At the third punch only (straight right), the body weight shifts to the left front-standing foot. The boxer then pushes backwards with this foot, breaking out of the range.

Series of straight punches to the head: left – right - left

This series is performed from the orthodox position: the body weight is evenly distributed over both feet, or shifted slightly onto the right one. Three punches are performed with three jumps (pushing with the right foot) forward. On the first jump, a jab is thrown to the head. On the second jump - straight right and on the third, jab. Simultaneously, the body rotates three times around the central axis: *right, left, right*.

Typical mistakes

- Uncoordinated movements of feet, hands and body;
- The body weight is on the front standing leg;
- Hands are dropped down after throwing the punches;
- Hands are lagging behind the rotations of the body.

Series of four straight punches to the head

These series are performed mainly in the long range and in the attack form. Most often they are thrown stepping with the opposite foot, and less often by jumping. The percentage of these series in competitions is low. The technique is individual to each boxer, but the common principles are:

1. Coordinated work of the muscles in the feet, hands and body.
2. Series are performed without pauses, and in some cases, increasing pace in the final phase.
3. The body weight is evenly distributed on both feet.

They are performed with ordinary boxing steps with the opposite legs: jab – with the right step, straight right - with the left step, jab – with the right step, straight right - with the left step. The trajectory of punches is the shortest path from the chin to the target. Fists successively replace each other at the target (left - right, etc.)

The four straight punches series with the same side foot can be done with jumping movements only. When jumping, the boxer rotates the body around one of three possible axes (central, left side or right side), with a fast and vigorous turning of the lower limbs due to the dynamic work of the pelvis. The technique: with the first jump, the boxer throws a jab to the head, simultaneously rotating the body to the right. With the second jump, straight right to the head, simultaneously rotating the body to the left. The same cycle takes place during the third and fourth jumps. The movements are smoothly and sequentially flowing from one to the other.

Punches in short and mid ranges

Short range is the most active form of boxing. According to the kinematic characteristics, punches in this range have their own specifics. An opinion of many authors is that the short range fighting should be studied as a separate discipline.

Due to the changes in AIBA rules, some aspects of boxing technique are subject to discussion. Judging competitions using the electronic counters directs the work of a coach to train boxers to deliver single or double blows.

The rules of competitions and their interpretation by the judges has always influenced the development of boxing technique. It is necessary to distinguish the points of the rules that entail technique changes, and those that do not affect it. We need to be very careful with the first because with time they may change and their negative consequences will remain for a long time.

Short and mid-range punches can be divided into two categories (Sosnin, 1983):

1. Punches done with a wavy, whipping movement
2. Punches thrown with all links of the kinematic chain rigid (fixed) ('hard back').

In the first case, there is a successive transfer of the energy from one link to another, starting from the transfer of the reaction force of the support to the pushing off foot. The movement is very complex and requires years of training. The muscles, as if passing the baton to each other, are freeing themselves for other movements or rest. The punches are relaxed and explosive. At the heart of the wave like movement is a moment of slackness, whipping, and the effect of 'dropping the blow'. Such blows are more flexible and can be corrected, unlike the hard-fixed ones.

This second category of punches with the fixed-body kinematic chain are almost exclusive to the short range fight. The power of the punch is dependent on the ability of the boxer to 'freeze' in one moment, fixing the links of the kinematic chain in the rotational movement with the fist as the last point of this chain. The blow has the character of a short powerful movement of all parts of the muscular system, whose energy is concentrated and released in a flash.

With proper training, the punch can be of considerable strength. From 10-15cm away, it can cause a knockout. Taking into account a short trajectory of movement and the difficulty of dodging, the danger of such a punch is obvious. In contrast to the wavy ones, punches in this category benefit in terms of performance (it is faster) and strength.

Work at close range differs from that in the long range because of the conditions: low stance in the attacking and active defense positions, the cramped conditions, pushes, attacks, etc. Movements are usually short, the knees are bent, without wide 'fluttering' movements. A well balanced starting position and the ability to use rational methods of movement allow a boxer to successfully enter the short range distance and get out of it.

Uppercuts

The technique in short range will be described approximately in the same order as how it is used in practice.

Left and right uppercuts are key punches used at short and mid-range. Coordination of the uppercut movements are difficult and the technique is very variable. We do not aim to describe all the possible variants of the punching techniques from below. For example, a right blow from below can be thrown to the body, or to the head, with the transfer of body weight to the opposite leg, or to the same named leg, or even distributed to both legs.

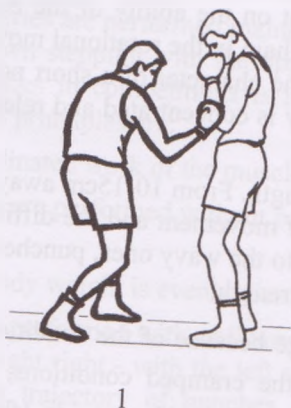
The punches can be applied on the spot (without step) or with steps: forwards, sideways, backwards and in an intermediate direction. There are smooth and rapid movements of the feet and the body, with the arm bent at the elbow. The trajectory of the fist is from the bottom up, or forwards. The position of the fist at the moment of impact is thumbs up, or towards oneself. The trajectory of the fist is vertical or forwards. The movement of the hand is peculiar, twisting the forearm forwards and upwards, elbow inwards. The angle at the elbow joint depends on the distance to the opponent. The punch is sent to the target (body, head) due to the unbending of the legs in the knee joint, and unbending and rotation of the body.

We discuss the only typical variants of these punches in an attacking form.

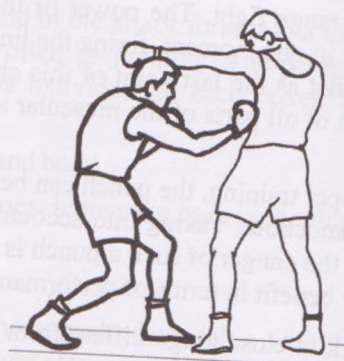
Right uppercut to the body

A sequence of performing this punch (fig. 24)

1. The body weight shifts to the right leg which bends. Simultaneously, the body rotates right.
2. A powerful pushing off with the right foot with the simultaneous rotation of the body to the left. In some cases, the body might bend backwards in addition to this. In this case, the right hand, accompanied by the movement of the body, is carried forward and to some extent, upwards. At the moment of punching, the hand is fixed in the wrist joints - the elbow - the shoulder, the fist is squeezed, and the elbow is tucked inside.



1



2

Fig. 24. Right uppercut to the body in an attacking (1) and encounter (2) forms

Left uppercut to the body

The punch is performed in this way (fig. 25)

1. The body weight shifts to the left leg, which bends. Simultaneously, the body rotates left, and the knees move closer together.
2. Powerful push off from the support with the left foot, with the body turning to the right (the pelvis moves slightly to the right). Simultaneously, the left hand goes to the target together with the rotation of the body. At the moment of impact, the fist is clenched, fingers facing upwards, elbow inside.

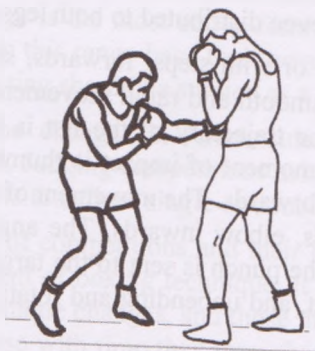


Fig. 25. Left uppercut to the body

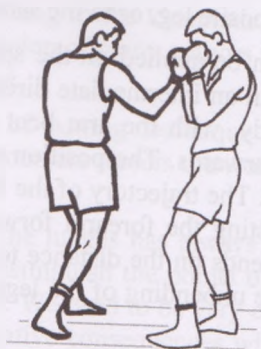


Fig. 26. Right uppercut to the head stepping left foot ahead

Right uppercut to the head

Performing this punch (fig. 26):

1. The body weight shifts slightly to the right leg, whilst slightly bending it at the knee, rotating the body to the right.
2. A sharp straightening of the right foot and rotating the body left (if necessary, the back sharply shifts backwards and to the right). At the same time, the right hand moves upwards, the fist is clenched, and the fingers are facing upwards. The sharp shift of the back moving backwards helps to increase the trajectory of the fist.

Left uppercut to the head

Preparation of performing (fig. 27, 28)

1. The body weight shifts to the left leg, bent slightly, and the body rotates to the left.



Fig. 27. Left uppercut to the head



Fig. 28. Left uppercut to the head on
the right leg step ahead

2. A sharp straightening of the left leg at the knee, rotating the body around the axis: left foot -

left hip joint. At the same time, the left hand moves from below, upwards, with an additional acceleration due to the sharp straightening of the back and rotation of the body.

The forearm is 'twisting' forward-upwards, with the angle at the elbow joint being approximately 45 degrees, the fist is clenched, and the fingers are facing upwards.

Typical mistakes

- The punch is only due to the weight of the hand;
- Bending of the body forwards is ahead of the movement of the hand;
- The hands are down before punching;
- The body is too high above the support.

Hooks

Single hooks in mid and short distances are somewhat different from those in the long range. Rotations, depending on the location of the body mass, can occur around one of the five possible axes. The angle of the bent arm at the elbow joint is approximately 45-90 degrees. The punches are performed due to the powerful rotational movement, with the maximum possible use of the muscle mass of the legs, pelvis, shoulder girdle and arm (developing considerable kinetic energy), and the support reaction force, if to use it effectively. Punches can be in attack, counterattack and encounter forms. The position of the fist at the moment of impact is with the back of the hand turned forward, thumb above. Wrist, elbow, and shoulder joints are on the same horizontal level or with the elbow slightly elevated.

With technical accuracy and timely execution, hooks reach considerable strength and are a powerful weapon for a boxer.

The percentage of hooks in short-range fighting is quite high. They are popular and effective.

Right hook to the head

It is performed from the attacking position in the following sequence (fig. 29):

1. The body weight shifts to the right leg (preparation action), the body half turned to the right and the knees are brought together in the middle.
2. Powerfully pushing off with the right foot, the boxer lunges with their right hand. The body rotates around the central axis. The hand accompanying this rotational movement goes to the target. The forearm of the attacking hand is parallel to the support at the moment of impact. The arm crosses the sagittal plane (conditionally drawn through the nose line), which crosses boxer's forearm in the middle approximately.



Fig. 29. Right hook to the head stepping forward with the left leg



Fig. 30. Left hook to the head stepping forward with the left leg

3. At the moment of impact, the body weight shifts to the left leg. Immediately after, pushing off the support and pivoting the body in the opposite direction, the attacking hand returns to its original position.

The fist and forearm of the punching hand provide a defensive function at the moment of impact. Before the punch and after it, this action is carried out with both forearms.

Left hook to the head

The punch is thrown from the attack position (Fig. 30):

1. The body weight shifts to the left leg and the body turns half way to the left, the knees are moved together inside.
2. Powerfully pushing off with the left foot, the boxer simultaneously lunges the left hand and rotates the body around the central axis. The fist, accompanying the body, goes to the target. At the same time, the boxer bends backwards slightly, enough to punch.
3. Upon contact, the body weight shifts to the right leg, with the boxer pushing off with the right foot, and returning into their initial position.

Typical mistakes

- The punch is thrown whilst the body is rotating, with the hand following through late. This leads to a decrease in both the power and the muscle mass used during punching;
- The hand is dropped, or pulled back before throwing the punch, resulting in the lowering of the head: violation of the rule “dangerous head move” and weakening the boxer’s defense;
- The force of the support reaction, when pushing away with the foot, is not effectively used.
- The links of the kinematic chain are not fixed at the moment of contact.

Short straight punches

Short straight right to the head

The short straight punches can be used effectively only at short-range. They are usually used as part of a combination and sometimes as a single punch. This punch was identified by Ogurenkov (1959). It is not easy and demands great physical and mental preparedness. It is used mainly by short range masters and has its own specific features, with a great degree of variation. It can be performed with the transfer of body weight to the left foot or right, and with a step forward by the left foot or right. Its impact is sufficiently effective and, when properly performed, reaches significant strength. The percentage of its usage with the right hand in competitions is significantly higher than with the left, since the starting position for performing it with the right hand is more convenient.

1. The body weight shifts to the right leg, whilst simultaneously rotating halfway to the right. At the same time, the right hand moves into the starting position: the forearm turns perpendicular to the floor, the fist is clenched, the back of the fist is turned back.
2. Pushing off with the right foot whilst simultaneously rotating the body to the left, the right hand moves towards the target (forward and down), and the elbow and shoulder are raised (the so-called 'hammer effect'), which increases the speed and strength.
3. In the last phase, the body weight shifts to the left leg.

Short straight left to the head (Ogurenkov 1959)

1. Pushing off with the right foot, the boxer steps to the left, shifting their body weight to the left leg, turning the pelvis and shoulder girdle from right to left.
2. At the same time, the body straightens, the left forearm turns slightly to the left, raising the fist to the level of the chin.
3. Pushing off with the left foot, the boxer steps to the right, turning the body from left to right at the same time. The body weight shifts to the right leg.
4. The left arm moving in the shoulder joint, is directed at the target. At the moment of contact the hand in the wrist joint bends forwards and the elbow is raised up (the hammer effect).

Typical mistakes

- The movement begins by rotating and bending the torso, with the hand following through late. Disintegration of forces occurs, and only the weight of the arm works and the boxer is unprotected.
- At the moment of contact, the wrist is not bent and the elbow does not rise.
- At the final stage, the body weight does not shift to the other foot.

Two-punch combinations in short and mid ranges

Both short and mid-range boxing are characterized by a series of actions, which are deemed most effective. When practicing series, there are two points of view on their execution. The first point of view is that the series of punches are performed differentially, with an emphasis on the last or first strike, with corresponding time intervals before the accented punch. The second one is that each punch in the series is executed at full strength due to the explosive effort of the muscles rotating the torso (the arm in this case only accompanies the rotational movement of the body).

The most common techniques in short range boxing are two punch combinations.

Actions are a wave like movement of the kinematic chain: leg - torso - shoulder - forearm - hand.

The distances between opponents at short range according Kuliev (1982) are as follows: the distance between the feet of the front-standing legs is 30 ± 5 cm, between the knees – also 30 ± 5 cm, between the thighs 47 ± 5 cm, between the shoulders 30 ± 5 cm. Average joint angles in the short-range are as follows: in the left knee - $165 \pm 15^\circ$, in the right one - $155 \pm 10^\circ$, in the left hip joint - $155 \pm 10^\circ$, in the right hip joint - $155 \pm 10^\circ$. Here are some specific features of two-punch combinations (Kuliev 1982):

- The body moves backwards after the first punch;
- Performing a punch by 'pushing off the support', with a consistent wave like engagement of the body links (leg, torso, forearm, hand);
- At the same time, the rotation of the body occurs with a large amplitude from right to left or vice versa with a rigid, fixed arm at the elbow joint, bending at an angle of $30-40^\circ$ at the moment of impact;
- Considerable leg strength is required to attain the necessary speed of the striking movement for both punches.

When two punches are combined in a combination, a new property arises: reduction in the time. The first punch is shorter by 14%, with the second one by 34%. The combination as a whole is also shorter by 22% compared to the time necessary to do the same singular blows one after another. For athletes of high caliber, this reduction in time is more pronounced due to the greater speed of work in all parts of the body. The two punch combinations are not the sum of two single blows, but a technique consisting of 5 relatively separate phases: setting, the 1st preparatory, the 1st main, the 2nd preparatory, the 2nd main (Kuliev, 1982). When practicing combinations, one should take into account that one movement follows from another, and the last phase of any punch (or defense) is the starting position for the next one. Movements smoothly flow from one to another.

Analyzing the method of combining two punches in a combination, the following remarks can be made: the final phase of the first punch drops out completely; the setting phase of the second punch is superimposed on the main phase of the first, i.e. finding the prerequisites for the optimal position of the second punch is simultaneous.

Two punch combinations have 5 relatively distinct phases bound together through the last position being the starting position of the next phase. In this regard, the action can be described as a system of successively connected elements (phases), in which the output from one is simultaneously the entry to another; inward and outward trajectories are identical.

Two punch combinations are used in both short and mid-ranges. Using punches to the head and body and their variations, the boxer forms various combinations. The choice of a combination, and the technique of its implementation vary depending on the opponent's position, or the likely position he will then take. Accordingly, when performing a combination of two punches, either 'head - body', or 'body - head', the boxer shifts their weight either to the leg opposite the striking hand, to the leg on the side of the striking hand, or to both legs.

The technique of each combination should be mastered in all specified options. The combination of two punches must be performed quickly, and during training, the boxer should strive to perform them automatically. In each combination, both the first and the

and punch can be accented, as well as both. The formal list of two punch combinations ('body - body', 'body - head') has 12 possible variants.

are the most typical techniques of performing the two punch combinations.

Uppercuts combination: right – left to the body

These punches are thrown from the attack position:

1. The body weight shifts to the right leg, then simultaneously pushing off with this foot, rotating the torso around the central axis, the boxer throws the punch with the right hand. The elbow angle is around 45-90°, the fist is clenched with fingers facing upwards. At the moment of impact of the right hand with the target, the body weight is transferred to the left leg.
2. Simultaneously pushing off with the left foot and with a rotation of the body, the left hand goes to the target. The angle at the elbow joint is around 45-90°, the fist is clenched (fingers facing upwards).
3. At the moment the left hand makes contact with the target, the body weight is on the right foot, or evenly distributes over both feet. After finishing the punch, the boxer returns to the initial position.
4. In the same way one performs a combination of punches *left – right to the body*, but instead ~~going~~ with the left hand.

Uppercuts combination: right – left to the head

These punches are thrown from the active defensive position:

1. Pushing off with the right foot and simultaneously straightening the leg at the knee, the body rotates left and the right hand goes to the target. The fist is clenched, fingers facing upwards, and the elbow moves inwards and upwards (twisting effect). At the final stage, the back sharply bends backwards and right, giving the fist an additional acceleration. At the moment the right hand makes contact with the target, the body weight shifts to the left leg.
2. Pushing off with the left foot and rotating the body to the right, the left hand goes to the target. The fist is turned with the fingers facing upwards, the elbow moves inwards and upwards (twisting effect). At the moment of the collision, the back tilts backwards at an angle which depends on the position of the boxer, the strength of the punch, and the fitness of the boxer's muscular 'corset'.

The uppercuts in the combination '*left – right hand to the head*' are performed similarly, but the degree of the swing in the preparatory movement (transfer of the body weight to the left leg), is somewhat greater than in the corresponding movement of the combination '*right – left hand to the head*'.

Hooks combination: right – left to the head

These punches are thrown from the attacking position.

1. The body weight shifts to the right leg. Pushing off with this foot, the boxer simultaneously rotates the body around the central axis and the right hand moves to the target, accompanying the rotational movement of the body. The angle at the elbow joint is 90 degrees. The fist at the moment of impact has the thumb facing upwards and the back side facing the front. At the moment of impact, the body weight shifts to the left leg.
2. Simultaneously pushing off with the left foot from the support and rotating the body to

the right, the left hand goes to the target. The movement of the fist follows the rotation of the body, the elbow (the arm is bent at the 90° angle) moves upwards in a rising arc to the level of the fist, and the forearm is parallel to the ground. In the final stage, the back straightens and tilts to the left. The fist at the moment of impact is with the thumb facing upwards, whilst the body weight shifts to the right leg. The pause between the blows is minimal and the fists successively replace each other at the target.

Hooks combination: left – right to the head

These punches are thrown from the attacking position:

1. Simultaneously shifting the body weight to the left leg and pushing off with it from the support, the boxer rotates their body around its central axis, with the left hand following through to the target. At the moment of impact, the body weight shifts to the right leg, the forearm is parallel to the ground, and the elbow angle is 90° (the angle of the elbow joint depends on the distance: the smaller the distance, the smaller the angle, and vice versa).
2. Simultaneously pushing off with the right foot from the support and rotating the body around the central axis, the boxer throws the right hand to the target. At the moment of impact, the forearm is parallel to the ground, the back of the clenched fist faces forward with the thumb facing upwards, and the body weight shifts to the left leg.
3. Pushing off with the left foot from the support and rotating the body around the central axis, the right hand returns following the same trajectory. The forearm of the left hand, which by this moment has returned to its original position, takes over the defense.

Typical mistakes

- The punch is performed by straightening the arm at the elbow joint.
- The free hand drops down without performing any defensive functions.
- At the moment of impact, the fist is turned backwards with the thumb to the side (not upwards, which can cause injury).

Two-punch combinations of varied punches (to the body – to the head, to the head – to the body)

The combination: right uppercut to body – left hook to the head

This combination is performed from the attacking position in the following sequence (fig.31):

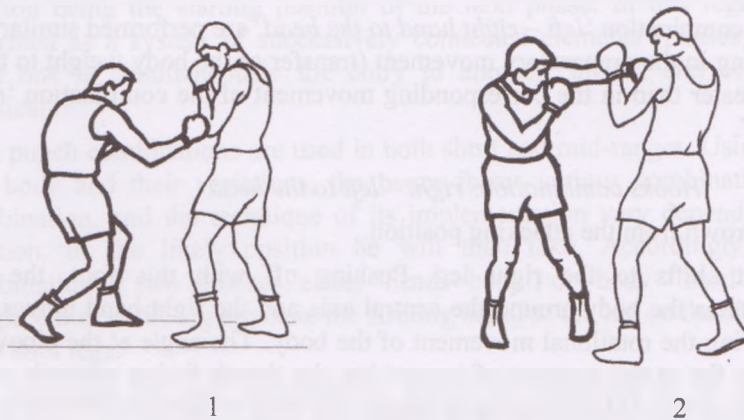


Fig. 31. Two-punch combination of varied punches: right uppercut to the body (1), left hook to the head (2)

1. Ducking down, the boxer shifts their body weight to the right leg. Then, sharply pushing off with this leg whilst rotating the torso around the right side axis, the boxer throws the right uppercut to the body. At the moment of impact, the body bends slightly backwards and the body weight shifts to the left leg.
2. Pushing off with the left foot and simultaneously rotating the body around the diagonal axis (left foot – right hip joint – right shoulder), unbending the legs at the knee joints, when standing up, the boxer throws the left hook to the head. At the moment of impact, the boxer stands at full height, the forearm of the attacking hand protects the head, the angle at the elbow joint is 45-90 degrees, and the body weight is evenly distributed on both legs, or slightly shifted to the right.

The combination: right uppercut to the head – left hook to the head

This combination is performed from the active defensive position, similar to that described above, but with some special features. (fig. 32). In the first punch (the right uppercut to the head), the muscle groups of the back are involved. The “twisting” in the forearm of the attacking hand is performed simultaneously as the back is sharply deflected, which gives an additional acceleration to the fist rising sharply as high as possible. When the fist reaches the target, it is replaced by the left one performing another punch - the left hook. The pause between the first and second punches is minimal, which ensures a quick swap of fists at the target.

During the second punch (the left hook to the head), the body weight shifts from the left foot to the right, simultaneously rotating around the diagonal axis: left foot – right hip joint – right shoulder. At the moment of impact, the fist is clenched and turned back side forwards, the thumb is facing upwards, the elbow is angled at 45-90°. The boxer is protected by the forearm of the attacking hand, which later, when leaving the distance of the fight, returns to its original position along the same trajectory.

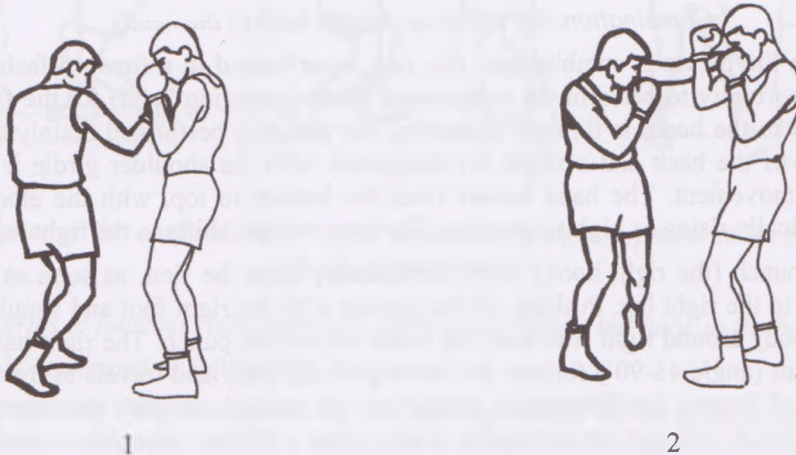


Fig.32. Two-punch combination of varied punches: right uppercut to the head (1), left hook to the head (2)

The combination: left uppercut to the body – right hook to the head

This combination is performed from the attacking position (fig. 33).

1. Bending the legs and simultaneously rotating the body to the left into position, the right shoulder is on the same vertical line with the left knee. Pushing off from the support, with the left foot simultaneously unwinding the body to the right, the boxer throws the left uppercut to the body. The fist with the fingers facing upwards, goes up and forwards, with an elbow angle of between $45-90^\circ$. In the final stage of the punch, the body weight shifts to the right leg.
2. Simultaneously pushing off with the right leg and rotating the body around the diagonal axis, the forearm of the right hand moves in an arc movement from the bottom upwards left moves to the level it needs to be parallel to the ground, before moving towards the target. The punch is performed during the process of standing up (unbending the legs at the knee joints). At the moment of impact, the thumb of the fist is above, and the angle of the elbow joint is between $45-90^\circ$. The boxer is protected by the forearm of the right hand, which is returning in the same trajectory to the initial position.

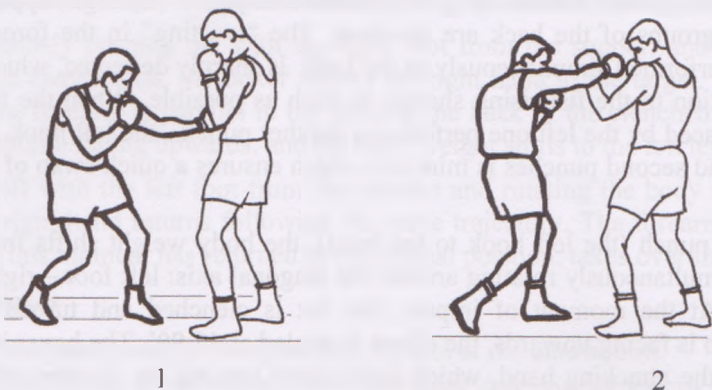


Fig.33. Two punch combination of varied punches: left uppercut to the body (1), right hook to the head (2)

Combination: left uppercut – right hook to the head

In contrast to the previous combination, this one is performed in a forward-facing stance. Here, the opportunity to perform the preparatory phase (swinging hand) for the first punch (left uppercut to the head) is limited. Therefore, the punch is performed mainly due to the straightening of the back and a slight tilt backwards with the shoulder girdle in the final stage of the movement. The hand moves from the bottom to top, with the elbow facing inwards, vertically rising as high as possible. The body weight shifts to the right leg.

The second punch (the right hook) starts immediately after the first, as soon as the body weight shifts to the right leg. Pushing off the ground with the right foot and simultaneously rotating the body around right side axis, the boxer throws the punch. The right hand bent at the elbow joint (angle $45-90^\circ$) follows the turning of the body and travels to the target. At the moment of impact, the forearm is parallel to the ground (or with the elbow slightly elevated), while all links of the kinematic chain (wrist – elbow – shoulder – knee – ankle joints) are fixed. In the final stage, the body weight shifts to the left leg, a step is taken backwards, pushing off the support with this leg and exiting the distance of the fight. The hand returns to the initial position along the same trajectory.

Typical mistakes

- The preparatory stage (shift of the body weight to the leg pushing off), which serves as the starting position for the beginning of the combination, is not performed efficiently enough.

- The effect of shifting the body weight is not used. Hence, during the first punch (left), the boxer 'hangs on' the left foot so that the second punch, (by the right hand), is only performed due to the hand's weight, as there is no possibility to include the legs and the rotation of the body in the punch.
- The first punch (uppercut) is performed due to the straightening and the dropping of the left hand, and not the bending of the legs when 'ducking'.

Series of three varied punches

This series of various punches, as a rule, is performed from the attack position.

A tense situation at mid or short ranges forces the boxer to make quick and decisive actions, and the athlete who has mastered the series has a sufficient advantage.

Skillful athletes are distinguished by their ability to perform a series of various punches in mid and close ranges, and the way they defend against them.

Some two punch combination technique's features may be applied to the three punch series. In a similar manner to the two punch combinations, the hand and foot actions in the three punch series have relatively distinct phases, connected by means of boundary poses. The movements fluently 'flow' from one to the other. For instance, the final phase of the right hand uppercut to the body is the initial phase for the left hook to the head. The final phase of which is the initial phase for the right hook to the head. Described below are the most typical variants of the technique when performing the three punch series with different type punches from the attack position.

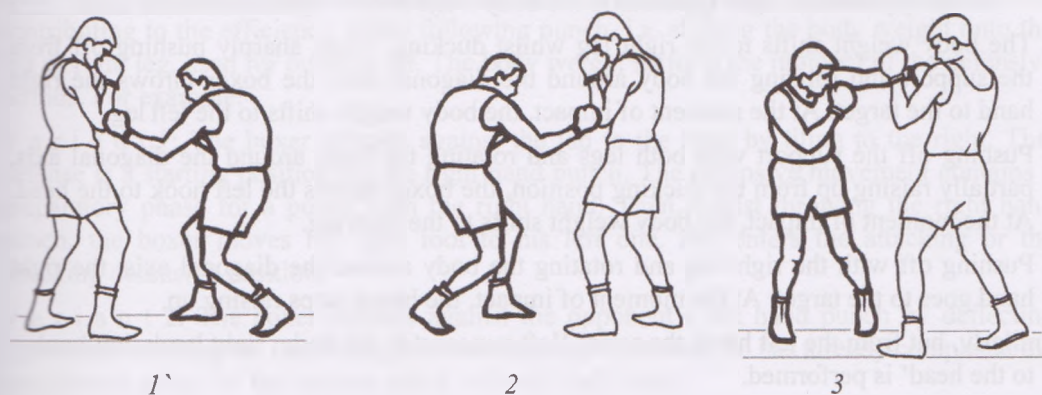


Fig. 34. Series of three varied punches: left uppercut (1), right uppercut to the body (2), left hook to the head (3)

Series of punches: left uppercut – right to the body – left hook to the head

The series is performed as follows (fig. 34):

1. Shifting the body weight to the left leg and pushing sharply off the ground with it, rotating the body simultaneously around the diagonal axis (left foot – right shoulder), the boxer throws the left uppercut. The elbow angle is 45-60°, and the fist is clenched. At the moment of impact, the body weight shifts to the right leg.
2. Pushing off the support with the right foot and rotating the body around the right diagonal axis, the right hand goes to the target. The angle at the elbow joint is 45-60°, the fist is clenched with the fingers facing upwards. At the moment of impact, the body weight shifts to the left leg.

3. Pushing away from the support with both legs, the back tilting backwards, rotating along the diagonal axis, standing up, the boxer throws the left hook to the head. At the moment of impact, the forearm is parallel to the floor, the angle at the elbow joint is around 90°.

The series flows quickly and solidly. The body weight shifts from one leg to another. Similarly, but starting from the right hand, the series 'right uppercut - left to the body - right hook to the head' is performed.

Series of punches: right uppercut – left – right hook to the head

1. The body weight shifts to the right leg, whilst sharply pushing off the support with this leg and rotating the body around the diagonal axis (right foot – left shoulder). The right hand goes to the target (the head). The angle at the elbow joint is 45-60°. At the moment of impact, the body weight shifts to the left leg.
2. Sharply pushing off the support with the left foot and rotating the body on the diagonal axis (left foot – right shoulder), the boxer throws the punch with the left hand to the head. At the moment of impact, the body weight shifts to the right leg.
3. Pushing off with the right foot and rotating the body around the diagonal axis, the boxer throws the third punch – the right hook to the head. At the moment of impact, the elbow joint is angled 90-120°, the fist is clenched and turned backwards.

Similarly, but from the left hand, a series of punches 'left uppercut, right, left hook to the head' is performed.

Series of punches: right uppercut to the body – left hook – right hook to the head

1. The body weight shifts to the right leg whilst ducking. Then, sharply pushing off from the support and rotating the body around the diagonal axis, the boxer throws the right hand to the target. At the moment of impact, the body weight shifts to the left leg.
2. Pushing off the support with both legs and rotating the body around the diagonal axis, partially raising up from the ducking position, the boxer throws the left hook to the head. At the moment of impact, the body weight shifts to the right leg.
3. Pushing off with the right leg and rotating the body around the diagonal axis, the right hand goes to the target. At the moment of impact, the boxer stops raising up.

Similarly, but from the left hand, the series 'left uppercut to the body, right hook, left hook to the head' is performed.

Typical mistakes

- Before the uppercuts, the hands are dropped;
- During the punch, the body leans slightly forward, leaving the hand behind. This movement is labeled 'overtaking the bullet'.
- The punches are due only to the weight of the hand without using the body weight.
- Wrong position of the fist at the moment of impact.

Four punch series of varied punches

Having a number of varied punches series in a boxer's technical arsenal is often a determining factor in achieving victory. A high class boxer, regardless of tactical style, must be able to 'explode' with a series at any time. This is necessary because situation during competitive fight can be unpredictable.

A boxer with a counterattacking style is often involved in an exchange of punches when he does not have enough pre acquired single, double and triple punches. An ability to

automatically use a various multi-punch series (of 4 – 5 punches) is necessary to resist the opponent in such situations.

The formal list of the four-punch series includes 16 variants. We will focus only on some of them.

As a rule, the four punch series is performed from an active position in a merged 'explosive' movement, accumulating power and speed. The accented punch can either be the first or the last, depending on many factors (tactical, technical, physical and mental). In some cases it can even be in the middle of the series. Sometimes each punch in the series can be accented. This latter variant is possible in the case of the boxer having automatic motor skills, using the muscle mass of the legs, torso, and hands in each punch. In this case, it is necessary to remember that the advantage in power will result in the loss of the speed of movement. This can be regarded as a drawback for the first half of the battle, whereas in the second half, against the background of fatigue, stronger blows are more effective.

Systematically improving throwing a series of punches, a boxer will be able to deliver any given series almost automatically in a combat situation, accenting the necessary punch at the opportune moment. Fast, merged, following one from another, series with different styles and techniques, complicate the opponent's defense, demoralize them, and prevent them from taking the initiative.

Series of punches: right uppercut – left – right to the body – left hook to the head

Each of the four punches of the series can be divided into two phases, passing one into the other: the preparatory phase and the punch itself. The preparatory phase includes actions contributing to the efficiency of the following punch, i.e. shifting the body weight onto the left or right leg, used for pushing off. The body weight shifts at the moment of the defensive actions. For example:

V a r i a n t 1: The boxer defends against the jab to the head by tilting to the right. This defense is a starting position for the right hand punch. The defensive movement contains a preparatory phase for a punch with the right hand. Then, whilst throwing the right hand punch, the boxer moves his right foot to his left one, and enters the attacking or the attacking defensive position.

V a r i a n t 2: The boxer defends against the opponent's left hand punch by deflecting backwards, shifting the body weight to the right leg. This way, he has already completed the preparatory phase for the counter punch with the right hand.

Four punch series of varied punches at mid and short ranges are essentially phases rolling one into the other. Alternately pushing off and shifting the body weight from right to left leg, rotating the body around the diagonal axis, the boxer throws uppercuts with the right hand, left hand and right hand to the body. The elbow angle is at 45-90°. Straightening up and shifting the body weight to the right leg, rotating the body, the boxer throws the fourth punch (the left hook to the head). At the moment of impact, the body slightly leans backwards and to the right.

Similarly, a series of four punches is performed: uppercuts left, right, left to the body, right hook to the head.

There is a slightly different technique in the movements of the series: to the body – to the head – to the body – to the head, and vice versa.

Series of punches: right uppercut to the body – left hook – right to the head – left uppercut to the body

1. The boxer shifts their body weight to the right leg ducking, then pushes off the support with this leg throwing the right uppercut to the body, and then shifting their body weight to the left leg.
2. Pushing off the support with the left foot and rotating the body around the diagonal axis, straightening up, the boxer throws the left hook to the head, simultaneously shifting their body weight to the right leg. At the moment of impact of the left hand with the target, the straightening up is completed.
3. Pushing off with the right leg and rotating the body around the diagonal axis, the boxer throws the right hook to the head, shifting their body weight and bending the left foot at the knee joint. At the moment of impact of the right hand with the target, the ducking with the left leg stops.
4. Pushing off the support with the left leg and rotating the body around the left side axis, the boxer throws the left uppercut to the body, shifting the body weight to the right leg.

There should not be intervals between punches: the left fist replaces the right one at the target without a pause, and so on.

Typical mistakes

- Uppercuts to the body are performed due to moving the punching hand aside, without ducking (or bending of the legs);
- Punches are performed due to the hand's weight only, and do not use the weight of the body and legs.

Defenses in boxing

Mastering defenses is the most important part of a boxer's technical and tactical training. The defensive arsenal in boxing is quite wide and requires classification. Kharlampiev (1935) devised the idea of systematizing boxing techniques. His work 'Tactical Forms' served as the basis for the development of the systematization of combat skills in boxing. Developing this, Perelman (1937) proposed a form of systematization of punches and defenses, which allowed Gradopolov (1961) to develop a table of the use of separate methods of protection against the main boxing punches to the head and body. In their works Degtyarev et al. (1979) promoted this direction and developed a classification of the techniques in boxing, which included two equally important sections: the attack techniques and the defense techniques. It should be noted that in the scientific and methodological literature, the defenses are described not as extensively as the techniques of attack. The following example illustrates this: out of 140 dissertations written (until 1995) in the field of theory and methods of boxing, only one was directly devoted to the study of defenses, and another indirectly revealed methods for improving defensive techniques. It is interesting that the interval between these dissertations was 26 years (1956 and 1982). This fact does not in any way indicate a lack of interest in this section of theory among boxing researchers; it rather indicates the conservatism of the defensive techniques. Of all known types, methods, and options of protection in boxing, over the past 30 years, not many have lost their practical significance.

Combined and complex defenses (Box, 1979)

Table 2

Initial defense	Subsequent defense						
	Hands				Body		Legs
	counter punch	cover up	parry	block	tilt	duck	back off
Hands							
counter punch	- complex	- complex	- complex	- complex	combined complex	combined complex	combined complex
Cover up	- complex	combined complex	- complex	- complex	combined complex	combined complex	combined complex
parry	- complex	- complex	- complex	- complex	combined complex	- complex	combined complex
block	- complex	combined complex	- complex	- complex	combined complex	- complex	combined complex
Body							
tilt	combined complex	combined complex	combined complex	combined complex	- complex	combined complex	combined complex
duck	combined complex	combined complex	- complex	- complex	- complex	- complex	- complex
Legs							
back off	combined complex	combined complex	combined complex	combined complex	combined complex	- complex	- complex

Among those unjustifiably forgotten is the 'double elbow defense'². Until recently, this defense was successfully used by the famous American boxer - George Foreman, (Champion of the Olympic Games XIX in 1968, Champion of the World, 1973 in Professional Boxing) who successfully performed in the professional ring at the age of 50 after a long break.

We understand the term 'double elbow defense' as a position, when the forearms of the left and right hands are parallel to the support.

An analysis of boxing literature shows that the 'defense techniques' section is detailed and well covered in the writings of boxing classics: Getye (1930), Kharlampiev (1935), Denisov (1946), Gradopolov (1951), Ogurenkov E. (1959), Ogurenkov V. (1969), Romanenko (1978), Degtyarev et al. (1979), and others.

Defensive techniques such as blocking, backing off, dodging, diving, and others are still relevant and will be as long as boxing continues as it is today. Over time, the variants of performing any one defense and combining them in combinations may change. Analysis of competitive practice shows that the increase in the density of fighting leads to the use of combined and complex defenses (table 2). This should be seen as a positive fact. At the same time, it is necessary to distinguish between the 'clean' defenses, with which the defending boxer manages to catch the initiative and go into a counterattack, and the defenses after which the athlete gets 'tied up' in the punches of the opponent, and the

² Different authors in the scientific literature on boxing understand the "double elbow defense" and "blank defense" as different positions: the forearms of the left and right arms are perpendicular to the support, or the forearms of the left and right hands are parallel to the support

referee is forced to separate them. The second case is typical for boxers who pay insufficient attention to the training/learning of various defensive techniques.

Variants of defenses against single punches (Box, 1979)

Table 3

Variants of defenses	Hands									Body					Legs				
	counterattacks	cover up			parry				block		tilt			duck			Back off		
		wrist	shoulder	forearm	Wrist out	Wrist in	forearm out	forearm in	wrist	forearm	left	right	back	down-left	down-right	down	left	right	back
Straight right	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Jab	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	
Right hook	+	-	-	+	+	-	+	-	+	-	-	+	+	+	-	+	-	+	+
Left hook	+	+	-	+	+	-	+	-	+	-	+	-	+	-	+	+	+	-	+
Right uppercut	-	+	-	+	-	-	-	-	+	-	-	+	+	-	-	-	-	+	+
Left uppercut	-	+	-	+	-	-	-	-	+	-	+	-	+	-	-	-	+	-	+

In the 90s, the method of defense known as ‘binding’ in the short range distance (where the hands are entered into the opponent’s fighting distance) came to lose its significance. Defensive techniques are often substituted by a rough exchange of punches, various clinches, and block defenses by one of the boxers. Such habits can be avoided if defensive techniques are learnt properly (Table 3).

Coaches are often in a hurry to teach boxers a wide range of defensive actions to the detriment of their reliability. Having not sufficiently mastered the simpler ones (cover ups with the shoulders and arms), they move very quickly to the more complex ones using the body.

Defenses with the hands are very reliable and efficient, especially when fighting at a high pace in short, or long range distances.

Such ‘haste’ learning ends, as a rule, when learning ‘little by little’ the young boxer seeks to ‘survive’ in the ring. The boxer does this with a special defense inherent only to him, based on his natural inclinations, rather than on the acquired technical elements of the proper defensive actions. Whether or not they learn to get the fundamentals of right and wrong defensive techniques in the initial stages of training will inevitably influence their destiny as athletes. A gap in defensive technique entails further problems in the teaching of boxing technique. Unreliable defense traumatizes the psyche of the learner, and inhibits their talent.

Variants of counterattacks after defense (Box, 1979)

Defenses		Straight punch		Hook		Uppercut	
		right	left	right	left	right	left
Hands	Counterattacks	+	+	+	+	+	+
	Cover up with						
	wrist	+	+	+	+	+	+
	shoulder	+	+	+	+	+	+
	forearm	+	+	+	+	+	+
	Parry with the						
	Wrist out	+	+	+	+	+	+
	Wrist in	+	+	+	+	+	+
	forearm out	+	+	+	+	+	+
	forearm in	+	+	+	+	+	+
	Blocking with						
	wrist	+	+	+	+	+	+
	forearm	+	+	+	+	+	+
Body	Pull right	+	-	+	-	+	-
	Left	-	+	-	+	-	+
	back	+	+	+	+	+	+
	Duck right	+	-	+	-	+	-
	Lef	-	+	-	+	-	+
	down	+	+	+	+	+	+
Legs	Back off left	-	+	-	+	-	+
	right	+	-	+	-	+	-
	back	+	+	+	+	+	+

This can be avoided by teaching young boxers the reliable, effective defenses of cover ups and moving (perhaps only a small number as long as they are reliable). Only then should teaching defenses with the body begin. Most technical and tactical methods are based on the combination of defense and attack (table 4). To each punch, there is not one but several methods of defense. Improving technical and tactical skills, one should use the defense, after which it is possible to counterattack: not defense for the sake of defense, but as a means of active intervention in counterattacking actions.

In the initial stages of training, it is recommended to defend against the jab covering up with the right palm and counterattacking with the left hand. Against an attack by the right hand (straight right) - by covering up with the left shoulder and right arm, then counterattacking with the right hand. The counter punch with the left hand is not rational, as it starts from an

uncomfortable starting position. Doing this can subsequently develop and fix into place an incorrect motor skill: a punch due to the straightening of the arm at the elbow joint (swiping punch).

The boxer should note that a proper defense creates a solid initial position for a counterattack. For example, a tilt left leads to an uppercut or left hook. Similarly, a tilt to the right creates the initial position for an uppercut or hook to the body or head, and so on.

Learning defenses is an essential part of training for boxers. Defenses constitute the main content of their technical arsenal. If the level of technical skill is determined by a wide range of punches, then the level of combat effectiveness is determined by the arsenal of defenses.

Defenses are used to:

- reliably defend vulnerable parts of the body from punches;
- help a boxer organize their actions and choose the right moment, so that they can quickly move from defense, to counterattack, and attack

The basis of defense, as well as the entirety of boxing technique, is the economy of movement. Not only does it save the boxer's energy in fighting, but it also gives the possibility to relax when defending (pulls, ducks, backing off), before the subsequent muscular 'explosion' when the boxer counterattacks.

The choice of defense depends on the distance:

- Defenses with hands neutralize punching interactions: counter punches, cover ups, parries, and blocks are used.
- Defenses with the body are to avoid interaction with the opponent. These are leaning, tilting, and 'diving'.
- Defenses with legs are to avoid contact with the opponent by backing off and breaking the distance.

In this regard, in all above mentioned techniques, there are common principles of movement: active footwork moving the body and keeping the balance, active work evading the opponent's punches, active work of the hands blocking the opponent's punches and creating readiness for the encounter and counter punches.

The above mentioned three groups of defenses are subdivided into six different methods of performance: cover up, parry, block, tilt, dive and back off. They, like punches, are structurally different, and constitute 36 basic methods of defense. For example, the back off can be performed with the left leg, right leg, or sliding step. Using a defensive action, one can avoid a punch (tilt, dive, back off), or parry it (cover up, parry, block).

In practice, the most used defenses are with the legs. They are the basis of all defensive actions of a boxer. Next come defenses with hands, which are relatively simple, and most importantly, are easily combined with footwork. The most complex, in terms of technique, are defenses with the body.

Practice shows that it is better to begin learning defenses with arms and shoulders, combining them with moves, in response to the actions of the opponent. For example, number 1 attacks with a step forwards and number 2 defends with a cover up in combination with a step back, and so on.

Defenses with arms

According to academic observations, the most common of these defenses are cover ups. These are most suitable for 'layering' them onto defensive movements performed by the

legs and body. This defense, and others with the arms, is aimed at parrying off punches, usually in close proximity to the target.

Cover up with the right palm is used against punches to the head. The inner side of the right hand glove is turned towards the punch. By the time of the collision with the glove of the oncoming punching hand, the palm is pushed slightly towards it. The incoming punch is taken on the palm base and deflected, veering a little to the left. At the moment of impact, the forearm and wrist muscles are tensed and the body weight shifts to the right (back standing) leg. As a result, a weakening of the opponent's punch happens. This defense can be used against any counter punch by the left hand.

An effective defense against a straight punch with the strongest hand is the *left shoulder cover up, safeguarded by the right palm*. The left shoulder, in the initial boxing stance, covers up the boxer's chin. At the moment of taking the defensive position, the body twists from left to right with a simultaneous slight lowering down of the body weight onto the right (back) leg. When doing this, the right wrist touches the left shoulder as a safety function.

Defending from hooks to the head, *cover ups with the forearm and wrist* of the left or right hand are used, depending with which hand the opponent attacks. When doing this, the hand is clenched into a fist, and is slightly moved to the side and up. The arm at the moment of impact is tensed. The cover up is with the back of the forearm.

Uppercuts to the head are stopped by the *palm of the right hand* which is used to meet the uppercut at the end of its trajectory.

The cover ups are valuable because, applying them, the boxer maintains the necessary distance for the counter punch with his free hand. Simultaneously with the defense, the boxer should take the position for the counterattack.

Cover ups are the main type of defense in one's own attacks and an effective means to move into a counterattack.

Elbow cover ups are mainly used to defend against punches to the body. As a rule, these are straight punches from a long range, or uppercuts in the short and mid ranges.

The techniques of defenses against the above mentioned punches are different. A defense against straight arm punches with the right or left hand is a cover up with the left elbow. At the moment of taking the defensive stance (the punch hits the bend of the shoulder and forearm), the defending boxer uses a cover up with the elbow, simultaneously turning the body slightly left, and transferring the body weight to the right leg. It is similar to 'knocking the punch sideways' from the line of the attack.

Defenses with elbows cover up in the mid and short ranges are used against uppercuts to the body by the right, as well as by the left hand. From an attacking, or active defending position, the boxer uses a cover up against the opponent's attack (with the right hand), lowering the left elbow down, bending it at a sharp angle, and directing it to the center of his body. The defense against a left handed punch is similar.

Against uppercuts in the mid and close range fighting, defenses are *by overlaying an arm (forearm) on the punching arm*. From the attacking position, turning the body from right to left, the boxer overlays the forearm of the right hand, bent at the right angle, palm down, on the attacking arm of the opponent. Performing this defense, the boxer ducks slightly (Ogurenkov 1969).

Parries. Unfortunately, parries are rare in up-to-date boxing, although they can be efficiently applied against straight punches. They allow to successfully remove the opponent out of the line of attack and counterattack. It is done by pushing the opponent's forearm, or

elbow with the palm. The opponent's hand is parried aside from the line leading to the target.

Gradopolov (1961) distinguishes two main ways to parry: in, or out. When parrying in, the right defending hand moves from right to left (left-right for the left hand) towards the inside of the opponent's boxing stance. Parrying out, the movement is performed in the opposite direction. Parrying up is combined from these two in and out defenses.

In most cases, parrying is done with the opposite hand to the punching hand of the opponent. Parrying with the opposite hand is necessary, because this enables the defending boxer to free another hand for a defense, or counterattack, protecting himself against a possible second punch from the opponent, and depriving the opponent of a chance to throw the second punch, or even unbalancing him.

When *parrying in*, the body weight can be transferred either to the left, or right leg, depending on the distance (long range or mid range) in order to counterattack. The rotation of the body accompanying the parry in does not enable any encounter punches, but creates a comfortable position to counterattack.

When *parrying out*, the right forearm pushes the forearm of the opponent's punching arm to the right. Simultaneously pushing off with the right foot, the body weight shifts forwards to the left leg, resting on the front of the foot. The movement of the defending arm is combined with the general movement of the body towards the opponent and a rotation to the right, pushing the left hand ahead for the encounter punch. The force of the rotation of the body in the direction of parrying out contributes to the movement of the parrying arm, and at the same time to the hand throwing the encounter punch, giving the overall action a greater efficiency. Parrying out is more difficult than in: a greater precision of the movement is required. The encounter punch, without which this defense has little merit, has to be quick and decisive (Gradopolov 1961). Parrying the opponent's right hand out with the left arm is better when combining it with a defensive movement of the body, adding greater safety.

Defenses with legs

Defending with the legs are various back offs. These movements enable the boxer to escape punches, moving away from the attack, regardless of where the opponent is.

One can move *back, right, left, or forwards*. Using this defense, the boxer is able to break out of the fighting distance (backing off and right against the left hand attack, or backing off and left against the right hand attack), or stay in the fighting distance, possibly moving closer to the opponent (moving forwards right against the right hand punch, or forwards left against the left hand punch). Backing off relies upon the mobility and speed of the legs, and requires an appropriate sense of timing and distance. Backing off is usually used in combination with other defenses.

Backing off can be used against all punches, or any series, and can be performed in 3 ways:

- *stepping back with the right leg*: from the fighting stance, the boxer pushes off with the left foot and takes a step back with his right leg. After this, the left leg steps back the same distance that the right leg has covered. The body weight can be evenly distributed over both legs, or transferred to the right leg;
- *stepping back with the left leg*: this is performed by pushing off with the left foot and stepping back and left with the right leg into the frontal position. The body weight shifts either to the left, or right leg;

- *sliding step*: this movement is similar to stepping back with the right leg, but the pushing off with the left foot is sharper. The boxer simultaneously steps with the right leg and lowers the left leg.

All methods of defense using backing off allow the boxer to take a suitable position for a counter punch, or counterattack with a series.

Defenses by *stepping right* can be performed in three ways:

- *Stepping with the right leg to the side*. The body weight shifts to the left leg. Pushing off with it, the boxer steps right with the right leg. The left leg is pulled up to the right one for a slightly shorter distance to recover the position quicker.
- *Stepping with the left leg*. The body weight shifts to the left leg, or is distributed evenly over both. Pushing off with the left leg, the boxer makes a large step back, and puts it behind the right one. During this movement, the body weight shifts to the right leg.
- *Stepping back with the right leg*. The body weight is on the right leg. Pushing off with it, the boxer simultaneously steps and rotates the body to the left. This movement is performed jumping. The left leg is drawn to the right one to keep balance.

Defenses by *moving left* are identical, but performed to the left side.

Defenses by *moving forwards* are performed by stepping with the left, or right leg. As a rule, the forwards movement is not straight. For the left leg step, it is performed forwards left. For the right leg step, it is forwards right.

For this defense, one should calculate the distance precisely in order to avoid a collision with the opponent.

Defending with body

Defenses by *tilting the body* allow a boxer to remove the head from the line of the opponent's punch. It is an effective defense, freeing the boxer's hands to counterattack. It allows to get closer to the required distance for delivering punches. A skillfully tilting boxer forces the opponent to miss, keeps the initiative, punching at the openings on the opponent's body. In one continuous movement, the boxer quickly turns his body from left to right (or vice versa), tilting it slightly forwards and down.

Defense by *diving* is used against hooks to the head from the right and left hands. Defending against the hooks, in one continuous movement, the boxer turns his body from left to right (or vice versa), slightly ducking, tilts to the right (or left), bends, and simultaneously straightens. This requires quick folding of the body, followed by straightening and keeping the opponent in sight.

Training diving defense starts from the fighting stance. One should dive down so that to remove the head out of the line of the punch. Then one should straighten the body, tilting in the opposite direction to the opponent's punching hand movement. Boxing rules prohibit pushing the head forwards beyond the line of the frontal support (front foot) when diving.

This is to ensure the boxer does not injure either himself, or the opponent. The speed to this movement is given by instantly relaxing the muscles which are keeping the body straight.

Then, just as quickly, by tightening the muscles of the back, the boxer straightens their body. Defending, the boxer must be in a stable position in order to return to the fighting stance, or counterattack.

It is very difficult and impractical to defend from each punch of the series. This requires a lot of energy, which should be spent prudently. The best defense against a series to the head

or body is tilting to the left or right. This interrupts the attack and puts the opponent at risk of a counter hook, or uppercut to the head/body. Often boxers cover up with the forearms in the short range as a type of 'blank defense', but it is not recommended to stay in it for a long time. Today, this defense is quite effective. With good command of it, a well defended boxer can 'stretch' the time before the gong, or to the end of the fight, in the scenario where he has an advantage in points. Nowadays, this 'technique' is used by many boxers. This defense is also successfully used as an active defense, giving the possibility of reducing the distance, and swiftly proceeding into counterattacking actions. When defending this way, the boxer moves the hip joint back, and the arms are bent at the elbows at an acute angle. The forearms mainly protect the body, and the wrists protect the head. The back is in a 'coachman' pose, and the legs are bent at the knees in a stable position.

Teaching punches and defenses

After mastering the movements, boxers usually proceed onto learning the punches in pairs. It is best to do this in two lines, with the learners split into numbers 1 and 2 (attackers and counter-attackers). Boxing in lines enables the coach to see clearly and point out any mistakes, and how to correct them. The formal list of punches and defenses is quite extensive. The trainer should understand the sequence of training, adhering to the principles of gradual increase in the difficulty of tasks, the principle of conformity, etc.

At the initial stages of training, beginners should study defenses in parallel with punches. As a rule, the boxers are given a complex task. For example, number 1 attacks and number 2 defends and counterattacks, then they swap. Punches are studied in the attack and counterattack forms. Attacking and defending actions are performed with a 'jump', or normal step. At the same time, the 1st and 2nd numbers try to keep the distance. When number 1 is attacking, the partner steps back and vice versa. The distance is continuously changing, but both partners are trying to keep it. Below we will reveal the sequence and methodology of training in this 'school' system.

Training punching techniques is described in the sequence that is recommended for use in a real training process.

Single straight punches

(practical tasks)

Task 1: Number 1 attacks with the left straight punch to the head, stepping back after the attack. Number 2 defends with the right palm cover (the palm is fixed at the moment of impact), transferring the body weight to the right leg.

Task 2: Number 1 attacks with the left straight punch to the head and steps back. Number 2 steps back, defending with the right palm cover and counterattacks with the left straight punch to the head whilst stepping forwards. Number 1 steps back, defending with the right palm cover.

Task 3: Number 1 attacks with the left straight punch to the head. Number 2 meets with the same punch, both defending with the right palm cover.

Task 4: Number 1 attacks with the left straight punch to the body, tilting to the right, knees bent, right hand next to the chin. Number 2 defends with the left elbow cover.

Further on we shall not mention the steps back and forth as all attacking and defensive actions must be combined with forwards, backwards, left and right movements, with the body weight shifting from one leg to another.

Task 5: Number 1 attacks with the left straight punch to the body. Number 2 defends with the left elbow cover and counterattacks with the left straight punch to the head. Number 1 defends with the right palm cover.

Task 6: Number 1 attacks with the left straight punch to the head. Number 2 tilts right, and meets with the left straight punch to the body. Number 1 does not defend with the right hand.

Task 7: Number 1 attacks with the right straight punch to the head. Number 2 defends with the left shoulder and right palm cover. The body weight is shifted to the right leg.

Task 8: Number 1 attacks with the right straight punch to the head. Number 2 defends with the left shoulder and right palm cover, counterattacking with the right straight punch to the head. Number 1 defends with the left shoulder and right palm cover.

Encounter form as a response to the right straight to the head is not given to beginner boxers due to the unreliability of the defense in this task.

Task 9: Number 1 attacks with the right hand punch to the body, lunging. Number 2 defends with the left elbow cover.

Task 10: Number 1 attacks with the right hand punch to the body, lunging. Number 2 defends with the left elbow cover and answers with the right hand punch to the body. Number 1 defends with the left elbow cover.

Task 11: Number 1 attacks with the left straight punch to the head. Number 2 answers with the right straight hand punch to the body. Number 1 does not use a defense with the right hand.

Combinations and series of straight punches to the head and body

It is necessary to note before proceeding onto the two punch combinations of straight punches, that the techniques of single punches are different to two punch combinations.

In order to avoid memorizing the incorrect skill, it is advisable to study two straight punch combinations with the 'jumping' step. To do this, it is recommended to master a number of additional preparatory exercises. At first, the rotational movements of the body (without punching) are added to the usual 'jumping' step. The exercise may be chosen to be divided into two conditional phases. During the first phase, when moving forwards, the body rotates around the right side axis (the body weight is on the right leg). During the second phase (on the next jump), the body is rotated around the left side axis (the body weight is still on the right leg). The body rotates right to left, and vice versa. The head and shoulders remain in place during this exercise and the feet are parallel. After mastering this exercise, one should proceed to the two straight punch combinations without a partner in front of a mirror. On the jumping step, during the first phase, the left straight punch is performed. During the second phase – the right straight punch. The body rotates from left to right, and from right to left, as fast as possible, with the hands moving in a straight line to the target. The pause between the punches should be minimal.

Task 12: Number 1 attacks with two straight punch combination to the head. Number 2 defends with the right palm and left shoulder cover, backing off the distance that the opponent has approached.

Task 13: Number 1 attacks with two straight punch combination to the head. Number 2 defends with the right palm and left shoulder cover, and counterattacks with the straight right to the head. Number 1 defends with the left shoulder cover.

Task 14: Number 1 attacks with two straight punches combination: left to the head, right to the body. Number 2 defends with the right palm and left elbow cover, and counterattacks with the right straight punch to the head. Number 1 defends with the left shoulder cover.

Task 15: Number 1 attacks with two straight punches combination: left to the body, right to the head. Number 2 defends with the left elbow and left shoulder cover.

Task 16: Number 1 attacks with the left straight punch to the head. Number 2 counterattacks (encounter counterattack) with the left straight punch to the body and straight right to the head. Number 1 defends with the left elbow and right palm cover.

Task 17: Number 1 attacks with the left straight punch to the head. Number 2 counterattacks (encounter counterattack) with two straight punches combination to the body.

Task 18: Number 1 attacks with two straight punch combination: left to the body, right to the head. Number 2 defends with the left elbow and left shoulder cover, and counterattacks with straight right to the head. Number 1 defends with the left shoulder cover.

Task 19: Number 1 attacks with three straight punch series to the head: left, left, right. Number 2 defends (stepping back) with the right palm and left shoulder cover.

Task 20: Number 1 attacks with three straight punch series: left, left, right to the head. Number 2 defends with the right palm and left shoulder cover, then on the third punch, without stepping back, receives the punch with the defense and counterattacks with the straight right to the head. Number 1 defends with the left shoulder cover.

Task 21: Number 1 attacks with three straight punch series in the combination 'head, body': left to the head, left to the body, right to the head. Number 2 defends with the right palm, left elbow and left shoulder covers.

Task 22: Number 1 attacks the same way, Number 2 defends with the left shoulder and right palm cover, and counterattacks with the straight right to the head.

Task 23: Number 1 attacks with three straight punch series in the combination 'body, head': left to the body, left to the head, right to the body. Number 2 defends with the left elbow, right palm, and the left elbow covers.

Task 24: Number 1 attacks the same way. Number 2 defends with the elbow and arms covers and counterattacks with the straight right to the head. Number 1 defends with the left shoulder cover.

Task 25: Number 1 attacks with four straight punch series to the head, jumping with the same, or opposite leg: left, right, left, right. Number 2 defends with the right palm and the left shoulder covers, moving back.

Task 26: Number 1 attacks the same way. Number 2 defends using arms and the left shoulder covers, and counterattacks with four straight punch series to the head: right, left, right, left. Number 1 defends with arms and left shoulder covers, moving back.

Hooks

Unlike straight punches, hooks are performed in a forward rotational movement. The forward rotational movement involves different muscles than those used in straight punches.

Therefore, before teaching hooks, it is advisable to acquaint the learners with the mechanics of this movement using preparatory exercises: feet are shoulder width apart (just as they are in the frontal stance) and arms are bent at 90-120°, lifted to punching level and are parallel to the floor. With alternate pushing off with the feet from the support, the body rotates around the vertical axis, from left to right, and vice versa. Arms are fixed in the punching

position and rotate together with the body accompanying it. The angle of the rotation of the body is 20-30°, stopping (fixing) in the position of the initial and final phases of the movement. This exercise is performed at the mirror, then with a partner who meets the punch with their palm.

The next exercise is performed from the frontal stance. Hooks are thrown alternately, up to the imaginary sagittal plane, which runs along the nose line. The exercise is performed with or without a partner. After working on the preparatory exercises, one can proceed to working in pairs.

Task 27: Number 1 attacks with the left hook to the head. Number 2 defends with the right forearm cover.

Task 28: Number 1 attacks with the left hook to the head. Number 2 defends with the right forearm cover and counterattacks with the left hook to the head. Number 1 defends with the right forearm cover.

Task 29: Number 1 attacks with the left hook to the head. Number 2 meets it with the left hook to the head. Both are defended with the right forearm cover.

Task 30: Number 1 attacks with the left hook to the body (ducking). Number 2 defends with the right elbow cover.

Task 31: Number 1 attacks with the left hook to the body. Number 2 defends with the right elbow cover and counterattacks with the left hook to the head. Number 1 defends with the right forearm cover.

Task 32: Number 1 attacks with the left hook to the head. Number 2 defends by 'diving' and counterattacks with the left hook to the body. Number 1 defends with the right elbow cover.

Task 33: Number 1 attacks with the right hook to the head. Number 2 defends with the left forearm cover.

Task 34: Number 1 attacks with the right hook to the head. Number 2 defends with the left forearm cover and counterattacks with the right hook to the head. Number 1 defends with the left forearm cover and counterattacks with the right hook to the head. Number 2 defends with the left forearm cover.

Task 35: Number 1 attacks with two punch combination of hooks (left, right) to the head. Number 2 defends with the right and left forearms and shoulders.

Task 36: Number 1 attacks with two punch combination of hooks (left, right) to the head. Number 2 defends with forearm cover and counterattacks with two punch combination of hooks (right, left) to the head. Number 1 defends with the forearms.

Task 37: Number 1 attacks with two punch combination of hooks to the body (left, right). Number 2 defends with elbow covers.

Task 38: Number 1 attacks with two punch combination of hooks (left, right) to the body. Number 2 defends with elbow covers and counterattacks with two punch combination of hooks to the body.

Task 39: Number 1 attacks with three punch series (left, right, left) of hooks to the head. Number 2 defends with the left and right forearms, and with a shoulder cover.

Task 40: Number 1 attacks with three punch series (left, right, left) of hooks to the head. Number 2 defends with the forearms and shoulder covers, and then counterattacks with three punch series (left, right, left) to the head. Number 1 defends with forearms and a shoulder covers.

Task 41: Number 1 attacks with four punch series (left, right, left, right) of hooks to the head. Number 2 defends with the forearms and shoulders covers.

Task 42: Number 1 attacks with four punch series (left, right, left, right) of hooks to the head. Number 2 defends with the forearms and shoulders covers and then counterattacks with four-punch series (right, left, right, left) of hooks to the head. Number 1 defends with the forearms and shoulders covers.

Uppercuts

All uppercuts are learnt from the frontal stance.

Task 43: Number 1 attacks with the right hand uppercut to the body. Number 2 defends with the left elbow cover.

Task 44: Number 1 attacks with the right hand uppercut to the body. Number 2 defends with the left elbow cover and counterattacks with the right hand uppercut to the body. Number 1 defends with the left elbow cover.

Task 45: Number 1 attacks with the left uppercut to the body. Number 2 defends with the right elbow cover.

Task 46: Number 1 attacks with the right hand uppercut to the head. Number 2 defends with the right palm cover.

Task 47: Number 1 attacks with the right hand uppercut to the head. Number 2 defends with the right palm cover and counterattacks with the left uppercut to the head. Number 1 defends with the left palm cover.

Task 48: Number 1 attacks with the left uppercut to the head. Number 2 defends with the left palm cover.

Task 49: Number 1 attacks with the left uppercut to the head. Number 2 defends with the left palm cover and counterattacks with the right uppercut to the head. Number 1 defends with the right palm cover.

Task 50: Number 1 attacks with two uppercut combination (right, left) to the body. Number 2 defends with elbow covers.

Task 51: Number 1 attacks with two uppercut combination (right, left) to the body. Number 2 defends with elbow covers and counterattacks with two punch combination (left, right) to the body. Number 1 defends with elbow covers.

Task 52: Number 1 attacks with two uppercut combination (right, left) to the head. Number 2 defends with palm covers.

Task 53: Number 1 attacks with two uppercut combination (right, left) to the head. Number 2 defends with palm covers and counterattacks with two uppercut combination (right, left) to the head. Number 1 defends with palm covers.

Task 54: Number 1 attacks with three uppercut series (right, left, right) to the body. Number 2 defends with elbows and forearms covers.

Task 55: Number 1 attacks with three uppercut series (right, left, right) to the body. Number 2 defends with elbows and forearms covers and counterattacks with three uppercut series (right, left, right) to the body. Number 1 defends with elbows and forearms covers.

Task 56: Number 1 attacks with three uppercut series (right, left, right) to the head. Number 2 defends with forearms covers.

Task 57: Number 1 attacks with three uppercut series (right, left, right) to the head. Number 2 defends with left and right forearm covers, and counterattacks with three uppercut series (right, left, right) to the head. Number 1 defends with forearms covers.

Task 58: Number 1 attacks with four uppercut series (right, left, right, left) to the body. Number 2 defends with elbows and forearms covers.

Task 59: Number 1 attacks with four uppercut series (right, left, right, left) to the body. Number 2 defends with elbows and forearms covers, and counterattacks with four uppercut series (left, right, left, right) to the body. Number 1 defends with elbows and forearms covers.

Task 60: Number 1 attacks with four uppercut series (right, left, right, left) to the head. Number 2 defends with forearms covers.

Task 61: Number 1 attacks with four uppercut series (right, left, right, left) to the head. Number 2 defends with forearms covers and counterattacks with four uppercut series (left, right, left, right) to the head. Number 1 defends with forearms covers.

Single and two-punch combinations of varied punches

Task 62: Number 1 attacks with the left straight punch to the head. Number 2 defends by tilting right and counterattacks with the right uppercut to the body. Number 1 defends with the left elbow cover.

Task 63: Number 1 attacks with the left straight punch to the head. Number 2 defends by tilting left and counterattacks with the left uppercut to the body. Number 1 defends with the right elbow cover.

Task 64: Number 1 attacks with the left straight punch to the head. Number 2 defends by tilting right, then counterattacks with the right uppercut to the body and the left hook to the head. Number 1 defends with the left elbow and the right forearm cover.

Task 65: Number 1 attacks with the left straight punch to the head. Number 2 defends by tilting right and counterattacks with the right hook to the head. Number 1 defends with the left forearm cover.

Task 66: Number 1 attacks with the left straight punch to the head. Number 2 defends by tilting right and counterattacks with the right hook to the body. Number 1 defends with the left elbow cover.

Task 67: Number 1 attacks with the left straight punch to the head. Number 2 defends by tilting left and counterattacks with the left hook to the head. Number 1 defends with the right forearm cover.

Task 68: Number 1 attacks with the left straight punch to the head. Number 2 defends by tilting left and counterattacks with the left hook to the body. Number 1 defends with the right elbow cover.

Task 69: Number 1 attacks with the right straight punch to the head. Number 2 defends by tilting left, then counterattacks with the left uppercut to the body and the right hook, or the right straight punch to the head. Number 1 defends with the right elbow and left forearm covers.

Task 70: Number 1 attacks with the right straight punch to head. Number 2 defends with the left shoulder cover, then counterattacks with the right straight punch and the left hook to the head. Number 1 defends with the left shoulder and right forearm covers.

Task 71: Number 1 attacks with two straight punch combination to the head. Number 2 defends against the first punch with the right palm cover, meets the second punch with the left straight punch and the right hook to the head. Number 1 defends with the right palm and left forearm covers.

Task 72: Number 1 attacks with two straight punch combination to the head. Number 2 defends against the first punch with the right palm cover, then meets the second punch with the left straight punch to the head and the right uppercut to the body. Number 1 defends with the right palm and left elbow covers.

Series of varied punches

Task 73: Number 1 attacks with the left straight punch to the head. Number 2 defends by tilting right and counterattacks with both right and left uppercuts to the body and the right hook to the head (short straight). Number 1 defends with the elbows and left forearm (shoulder) covers.

Task 74: Number 1 attacks with the right straight punch to the head. Number 2 defends by tilting left and counterattacks with left and right uppercuts to the body and the left hook to the head. Number 1 defends with the elbows and the right forearm covers.

Task 75: Number 1 attacks with the left straight punch (or left hook) to the head. Number 2 defends by tilting right, then counterattacks with right and left hooks to the head and the right uppercut to the body. Number 1 defends with forearms and elbows covers.

Task 76: Number 1 attacks with the right straight punch to the head. Number 2 defends by tilting left, then counterattacks with left and right hooks to the head and the left uppercut to the body. Number 1 defends with forearms and elbow covers.

Task 77: Number 1 attacks with the left straight punch to the head. Number 2 defends by tilting right, then counterattacks with the right uppercut to the body and left and right hooks to the head. Number 1 defends with left elbow and forearms covers.

Task 78: Number 1 attacks with the right straight punch to the head. Number 2 defends by tilting left and counterattacks with the left uppercut to the body and right and left hooks to the head. Number 1 defends with the right elbow and forearms covers.

Task 79: Number 1 attacks with the left straight punch (or left hook) to the head. Number 2 defends by tilting ('diving') right and counterattacks with the right, left, right uppercuts to the body and the left hook to the head. Number 1 defends with elbows and right forearm covers.

Task 80: Number 1 attacks with a right to the head. Number 2 defends by tilting left and counterattacks with left, right, left uppercuts to the body, and the right hook to the head. Number 1 defends with elbows and left forearm covers.

Task 81: Number 1 attacks with two straight punch combination to the head. Number 2 uses a combined defense: the right palm and left forearm cover, tilting right, and counterattacks with the right uppercut to the body, left and right hooks to the head and the left uppercut to the body. Number 1 defends with elbows and forearms covers.

Task 82: Number 1 attacks with the left straight punch to the head. Number 2 defends by tilting left and counterattacks with the left hook to the head, right and left uppercuts to the body and the right hook to the head. Number 1 defends with forearms and elbows covers.

Task 83: Number 1 attacks with the left straight punch to the head. Number 2 defends by tilting right and counterattacks with the right uppercut to the body, left and right hooks to the head and the left uppercut to the body. Number 1 defends with elbows and forearms covers.

Task 84: Number 1 attacks with the left hook to the head. Number 2 defends by 'diving' and counterattacks with the right hook to the head, left and right uppercuts to the body and the left hook to the head. Number 1 defends with elbows and forearms covers.

Task 85: Number 1 attacks with the left hook to the head. Number 2 defends with the right forearm cover and counterattacks with left, right, left hooks to the head and the right uppercut to the body. Number 1 defends with forearms and the left elbow covers.

Task 86: Number 1 attacks with the right hook to the head. Number 2 defends with the left forearm cover and counterattacks with right, left, right hooks to the head and the left uppercut to the body. Number 1 defends with forearms and the right elbow covers.

Repeated punches with one hand

Task 87: Number 1 attacks with repeated left straight punches to the head. Number 2 defends with the right palm cover and counterattacks with the left straight punch to the head. Number 1 defends with the right palm cover.

Task 88: Number 1 attacks with repeated left straight punches to the body. Number 2 defends with the left elbow cover and counterattacks with straight left to the head. Number 1 defends with the right palm cover.

Task 89: Number 1 attacks with repeated straight right punches to the head. Number 2 defends with the left shoulder cover and counterattacks with right straight punch to the head. Number 1 defends with the left shoulder cover.

Task 90: Number 1 attacks with the left straight punch to the head. Number 2 defends by diving right and counterattacks with repeated right uppercuts to the body. Number 1 defends with the left elbow cover.

Task 91: Number 1 attacks with the right straight punch to the head. Number 2 defends by diving left and counterattacks with repeated left uppercuts to the body. Number 1 defends with the right elbow cover.

Task 92: From the frontal stance, in an attacking position, at mid or short range, number 1 attacks with repeated right uppercuts to the head. Number 2 defends by putting their forearm over number 1 punching arm and counterattacks with the right hook to the head. Number 1 defends with the left forearm cover, or by 'diving'.

Task 93: From the frontal stance, in an attacking position, at mid or short range, number 1 attacks with repeated left uppercuts to the head. Number 2 defends by putting their forearm over number 1 punching arm and counterattacks with the left hook to the head. Number 1 defends with the right forearm cover, or by 'diving'.

Task 94: From the frontal stance, in an attacking position, at mid or short range, number 1 attacks with repeated right hooks to the head. Number 2 defends with the left forearm cover and counterattacks with the right hook to the head. Number 1 defends with the left forearm cover, or by 'diving'.

Task 95: From the frontal stance, in an attacking position, at mid or short range, number 1 attacks with repeated left hooks to the head. Number 2 defends with the right forearm cover and counterattacks with the left hook to the head. Number 1 defends with the right forearm cover, or by 'diving'.

Task 96: From the frontal stance, in an attacking position, at mid or short-range, number 1 attacks with repeated right uppercuts to the body and head. Number 2 defends with the left elbow and forearm covers, and counterattacks with the right hook to the head. Number 1 defends with the left forearm cover, or by 'diving'.

Task 97: From the frontal stance, in an attacking position, at mid or short range, number 1 attacks with repeated left uppercuts to the head and body. Number 2 defends with the right elbow and forearm covers, and counterattacks with the left hook to the head. Number 1 defends with the right forearm cover, or by 'diving'.

Task 98: From the frontal stance, in an attacking position, at mid or short range, number 1 attacks with repeated left hooks to the body and head. Number 2 defends with the right elbow and forearm covers, and counterattacks with the left hook to the head. Number 1 defends with the right forearm cover.

Task 99: From the frontal stance, in an attacking position, at mid or short range, number 1 attacks with repeated right hooks to the body and head. Number 2 defends with the left elbow and forearm covers, and counterattacks with the right hook to the head. Number 1 defends with a forearm cover, or by 'diving'.

Teaching short range boxing

Short range boxing is the most active form of combat consisting of a complex range of tactics and techniques (Ogurenkov 1969).

Before learning short range boxing, a boxer should master a sufficient amount of tactical and technical skills.

Young boxers should not be taught short range boxing until they are a minimum of 1 - 1.5 years into their training. Short range boxing skills make up a system consisting of punches with arms bent at the elbow, appropriate defenses and ways of getting into the short range, as well as getting out of it. Efficient and rational movements in the short range create the possibility of fulfilling a planned task over a very short period of time, which is appreciated by referees.

There are various approaches to teaching short range boxing. Proponents of 'hasty learning' start teaching short range boxing after a pupil has finished mastering the techniques of single straight punches and two punch combinations, single hooks and uppercuts, and defenses with the arms and body.

Some coaches (they are a minority) consider short range boxing to be the main form of fighting for both beginners and skilled boxers.

After mastering single straight punches and two-punch combinations, they start to study uppercuts to the body and head, now with included defenses of tilting and 'diving' in the mid and short ranges. They then teach hooks to the head and body in short range which are performed mainly by rotating the torso around the vertical axis. An argument in favor of such an approach is the judgment that in long range boxing the athletes get used to reacting to the actions of their opponents mainly by analyzing visual stimulus, whereas in short range boxing, it is through muscular-motor sensations. If a young boxer develops these muscular-motor sensations during the early stages of their career, then accordingly, it will be easier to compete in this most active form of fighting in future. On the contrary, an athlete who improved their techniques in the long range for two to three years and developed the necessary specialized skills, feels uncomfortable in the short range. If the coach is not persistent, the athletes try to spend as little time as possible in short range, avoiding it, which ultimately leads to a limitation of their technical and tactical arsenal.

The most detailed account of technique and progress of teaching short range boxing is described by Ogurenkov, an outstanding Soviet boxer. His work, which is the fundamental short range textbook, is based on the author's personal sporting experience, years of observation and experimental research, and contains large volumes of varied material on

short range combat. Below we provide a program for teaching short range fighting by Spivakov (1969).

A program for teaching short range boxing (with some reductions)

Technique components:

1. Stance position.
2. Active defense position.
3. Defense position.
4. Right and left uppercuts to the body – eight variants. At the same time, defenses are learnt.
5. Defenses against right and left uppercuts to the body:
 - the left (right) elbow cover;
 - putting the right (left) forearm on the forearm of the punching arm;
 - putting the left palm on the punching arm's biceps;
 - putting the left (right) forearm on the forearm of the punching arm.
6. Right and left uppercuts to the head – eight variants. At the same time, defenses are learnt.
7. Defenses against right and left uppercuts to the head:
 - tilting the body back;
 - the right palm cover;
 - the left palm cover;
 - putting the left (right) palm on the punching arm's biceps.
8. Right and left hooks to the head – eight variants. At the same time, defenses are learnt.
9. Defenses against right and left hooks to the head:
 - 'diving';
 - complex defense;
 - ducking;
 - tilting back.
10. Short right straight hand punches to the head – six variants. At the same time, defenses are learnt.
11. Defenses against short left and right straight punches to the head:
 - complex defense;
 - ducking;
 - tilting back.
12. Two punch combinations to the body, to the head, to the head and body, and to the body and head. At the same time defenses are learnt.
 - Left, right uppercuts to the body;
 - Right, left uppercuts to the body;

- Left, right hooks to the head;
 - Right, left hooks to the head;
 - Left uppercut to the body, short straight to the head;
 - Short right straight to the head, left uppercut to the body;
 - Right uppercut to the body, left hook to the head;
 - Left hook to the head, right uppercut to the body;
 - Left uppercut to the head, short straight to the head;
 - Short right straight to the head, left uppercut to the head;
 - Right uppercut to the head, left hook to the head;
 - Left hook to the head, right uppercut to the body.
13. Hands take the inner positions (4 variants).
14. Active defenses against right and left uppercuts to the body (2 variants).
15. Active defenses against right and left hooks to the head (5 variants).
16. Entering a short range counterattacking, when the opponent attacks with the left straight punch, or left hook to the head (10 variants).
17. Entering short range during own attack (3 variants).

SPECIAL PHYSICAL PREPARATION OF BOXERS

The boxer's motor abilities

Over the last decade, discussions in sports theory have been about different methods of training and on how to understand human motor abilities.

Beside the traditional concepts of physical qualities (strength, speed, endurance etc.) the concept of 'motor abilities' of an athlete is held in scientific literature. This concept embraces psychomotor qualities that determine aiming for a certain target, qualitative characteristics, and efficiency of activities of the human muscles (Verkhoshansky, 1988). In fact, it refers to the organic unity of physiological and mental components in motor activities, and corresponds better to modern ideas of human motor capabilities (Pharfel, 1977).

Long-term training is an extremely complex process involving the activities of the body and all its systems. All human motor activities performed with the muscles regulated by the central and peripheral mechanisms of the nervous system. The functionality of the muscles and nervous system are provided with energy by the same physiological systems. The human body has unique properties: functional versatility and adaptivity. Because of them, as a result of focused and regular physical training, the body selectively increases its working capabilities. A form of specialization is developed by a certain motor activity and mainly determines its success. This selective nature of functional specialization is mainly determined by the work performed, which is characterized by two factors: the volume and intensity of the training. In this regard, we can talk about the morphofunctional specialization of the body which is determined by the conditions of training and competitive activity (Verkhoshansky, 1988). Morphofunctional specialization is formed for a specific type of muscle activity and determines the degree of development of specialized sensations (the feeling of distance, punch), physical workability, etc. Morphofunctional specialization is characterized by certain anatomical and physical changes, which are expressed in the development of the body's functional capabilities in the required direction. It is also expressed in the coordination of all functionally active systems, which determine a high level of activity for this type of muscular activity. Adaptive changes of the body are asynchronous.

The desired morphofunctional specialization is achieved through specialized training, when the conditions of the sporting activity contribute to the formation of a specialized functional structure that provides this activity.

The process of specializing training in boxing involves the use of specialized exercises as well as general developing exercises. The wide use of general physical exercises is justified by the severe impact of the special exercises on the psyche of athletes. The boxing training cannot be limited to exercises in pairs, work with equipment, sparring, and so on. Various training exercises, weight lifting, sports and outdoor games, etc., which are of a specialized nature, are naturally interwoven into the training process. To specialize general developmental exercises, they should be brought closer to the competitive ones, not so much in form, but through the nature of neuromuscular efforts and the system of work.

In the process of sports' training, various momentary and perspective tasks are solved that ensure the achievement of the ultimate goal - to bring the athlete to the peak of their sporting form. These tasks are solved with a variety of training means and methods that are relevant for each particular training stage.

Here, one can refer to the experience of training the youth team by the USSR. As a basis for the improvement of functional fitness, as well as its comprehensive assessment, a classification of exercises was put in place, according to their working capacities and zones of their intensity (maximum, submaximal, large, and moderate capacities - according to Pharfel, 1977). According to the authors Koptsev and Vasiliev (1984), physical activity refers to:

- the zone of maximum capacity (the time, up to 20 s) - running 60, 100 and 200 m
- the submaximal zone - physical activity (up to 5 min) - 400, 800, 1500 m run
- the zone of high capacity - physical load (up to 30 min) - running 3000, 5000 m
- the zone of moderate capacity - stayer run (60 min or more).

To evaluate the strength of the muscles in the arms (the most informative indicator), the results of throwing a shot put weighing 4 kg were used. To assess the strength of the leg muscles, the results of two types of jumps were used: a long jump, as an indicator of pushing off force, and a 5-fold long jump, as an indicator of strength endurance of the leg muscles. When evaluating the strength of the arms, speed-strength flexion and extension of the arms in a plank were used for a duration of 20 s. The same exercise, but performed over 1 minute, was used to assess strength endurance.

These types of tests were used because the strength of the leg muscles and the triceps of the arms largely determine the effectiveness of boxing punches.

Thus, the proposed tests made it possible to assess the development of the most important motor abilities for boxing practice. This approach to assessing physical abilities, according to the authors, can be applied when working with an adult team of masters as well.

Nikiforov (1987) offers a different special classification for specialized exercises in boxing, based on the degree of similarity with competitive conditions. The author identifies 4 groups of special exercises: special preparatory, exercises in the boxing gym, exercises to improve technical and tactical skills with a partner, and competitive exercises. He claims that specialized exercises, especially with a partner, have a significant impact on effectiveness in a competitive context, and can serve as a means of specializing the training process.

The ratio of general and special training means and methods varies depending on many factors: age, qualifications, body weight of athletes, degree of fitness, stage of preparation in either a one year or six month training cycle, etc.

During the initial stages of training, the volume of general preparation outweighs that of special training. As the boxer's ability improves, the volume of special preparation increases, while the general exercises become additional.

This ratio is especially varied for an elite athlete during the pre-competition period.

At the beginning of the 1970s, the volume of general physical exercises was three to four times more than special ones. At the end of the 70s they accounted for 58 to 70% of the training time (Nikiforov 1987). At the same time, in Cuban schooling, the volume of special pre-competition preparation was one and a half to two times more than the volume of general exercises (Nikiforov, Viktorov 1978; Romanenko, 1985).

One of the factors affecting the ratio of volumes of the special and general preparation is the weight of the athletes. According to Gorstkov (1983), there is a tendency between heavyweight athletes to decrease the volume of general training exercises during the preparation for main boxing events of the year. Among heavyweights, a decrease in the

volume of special training was noted as well. These athletes work less than athletes of other weight categories on heavy boxing equipment, with pads, with a partner, in freestyle sparring, and sparring. Heavyweights spend more time doing exercises with lighter equipment.

An analysis of the main parameters of training loads in the USSR national team in 1986 - 1990 showed that the specialization of the training process to 1990 increased by 5%. The specific volume of specialized training increased from 50.1% to 55.1%. At the same time, the volume of specialized preparative exercises decreased from 23.3% to 21.1%. However, the time of work with partners on technical/tactical mastery increased from 6.7% to 7.9 %, with boxing practice from 5.1% to 6.9 % (Kopzev, Tsirgiladze, 1991).

The ratio and focus of general and specialized training depends on the above factors and can vary significantly. The result of performance in specific competitions depends on how correctly the coach plans this ratio. Often, highly qualified coaches begin the pre-competition period by decreasing the volume of specialized training, replacing it with general physical exercises, while maintaining the desired (competitive) mode of training.

It is easier and more important to bring an athlete to the start 'fresh', in physical and mental terms, while avoiding a state of fatigue. For this purpose, the general training exercises are more suitable than special training, which more acutely affect the psyche of an athlete. At the same time, it is obvious that there are no distinct differences between general and special preparation. There are many exercises of an intermediate nature, performed in conditions where it is difficult to distinguish what kind of training they are attributed to. Often, the same exercise can be effectively used at different stages and periods of training, depending on the load and intensity.

Experiments conducted on a large group of youth boxers (191 people) revealed the factors that characterize the boxer's specialized preparedness (Degtyarev & others, 1984). The studies have shown differences in the structure of specialized physical fitness among boxers of different weight groups. So, for athletes of the super lightweight group (46-52 kg), the following indicators are significant: explosive force of a single punch (straight left), speed of serial punches, speed/strength endurance (total strength of punches in the first 30 seconds of a one minute of maximum work). For the lightweight category (52-60 kg), significant indicators include: explosive force of a series of punches, power endurance (total strength of punches during three rounds of specialized work on a dynamometer simulator), strength characteristics of a single punch. For boxers of the middle weight categories (60-70 kg), the significant indicators are: the explosive strength of a series of punches, the strength of single punches, working capability in high-speed/strength mode (test of 1 min of specialized work to a maximum capacity). For the group of heavyweights (70 kg and more), significant indicators are: endurance during specialized work with high power, the strength of single punches.

The results can conditionally be divided into 2 groups:

- the first group - indicators of the strength of single punches
- the second group - indicators of the specialized performance of boxers, in particular, strength/speed manifestations in punches.

These studies overlap with studies conducted previously with a group of adult light and medium weight category boxers. As a result of these studies, informative indicators were identified in the boxers' specialized preparedness that correlate with the indicators of competitive activity (Table 5). They can be taken as informative criteria ($r = 0.6-0.9$, $P < 0.1$)

Correlation coefficients of the indicators of specialized preparedness of boxers

INDICATOR	DE	Koff	Kpnt	Knot	Kr	AE	AF	Kmis	FE	AI ₁
B - 1				0,42						0,5
B - 10				0,53	-0,44					
B - 50			-0,6		-0,63		0,51			0,53
F ¹ ₁₀				-0,7						0,89
F ² ₁₀										-0,61
F ₁₀				0,7						
K ₁₀	0,81		0,91		0,85		0,86		0,71	0,7
K	0,52		0,63							
N	0,72								0,84	
SP		0,94								
AI ₁	-0,7	0,87	-0,7	0,6	-0,81	-0,63	0,9			

Note: Horizontal is the criteria for the evaluation of competitive fights: DE - defensive effectiveness, Koff - number of fend off punches; Kpnt - points per fight (round), Knot - number of not delivered punches; Kr - number of reached punches. AE - attack effectiveness, AF - fight activity, Kmis - number of missed punches, FE - fight effectiveness, AI₁ - punch accuracy indicator.

Vertical are the coefficients characterizing specialized preparedness: B-1 - speed manifestations in a single punch (straight right), B-10 - speed manifestations in a series of 10 punches, B-50 - speed manifestations in a series of 50 punches,

F¹₁₀ - a combined coefficient of the specialized test in 'short' (10 s) intervals of work in the 1st round, F²₁₀ - the same 10 coefficient of specialized work in the 2nd round, F₁₀ - the same coefficient of specialized work in the 1st and 2nd rounds, K₁₀ - number of punches in the specialized test in short (10 s) intervals of work in the 1st and 2nd rounds, K - total number of punches in the specialized test in the 1st and 2nd rounds, N - power of work performed, SP - a coefficient of the specialized test (total per two rounds), AI₁ - indicator of punch accuracy.

So, a combined coefficient of the number and strength of punches in 10 s intervals of the specialized test (F₁₀) on a boxing punch bag (2 rounds of 3 minutes each) correlates with the following indicators of a competitive fight: effectiveness of defense - DE (r=0.81), number of points collected in the fight - Kpnt (r=0.91), number of punches that reached the target - Kr (r=0.85), fight effectiveness (r=0.71).

Another coefficient - straight right hand punch accuracy (AI₁) - correlates with almost all selected coefficients of fighting performance: - DE (r=-0.7), number of punches fended off - Koff (r=0.87), number of points collected in the fight - Kpnt (r=-0.7), number of punches that reached the target - Kr (r=0.81), activity of the boxer during the fight - AF (r=0.9).

Significant motor abilities of boxers are those that determine the strength (in single, or series punches), the development of specialized perceptions (differentiation of punches) and specialized functional fitness.

Speed-strength and functional training

Boxing is a sport characterized by the complex deployment of human motor abilities, where most actions have pronounced speed-strength qualities against the background of specialized endurance.

Methods to develop speed abilities

The term 'speed ability' refers to a combination of functional properties required to perform an action in the shortest time possible (Platonov, Bulatova, 1995).

There is a distinction between elemental and complex forms of the manifestation of speed abilities. Simple forms of speed are manifested in the latent time of simple and complex motor reactions - the speed of an individual movement with little external resistance and in a frequency of movements.

Complex forms refer to an ability to gain maximum speed over a distance, an ability to speed up from a starting point or to perform with high-speed actions required in competitive fighting (Platonov 2004).

It should be noted that the elementary and complex forms of speed abilities are specific, and as a rule are not dependent on each other. In the conditions of a boxing fight, complex manifestations of speed abilities are observed (such as the speed of single and series punches, movements, and the speed of defense). There is no transfer of training between these forms of speed abilities.

The training directed towards the improvement of one form of speed abilities will not significantly influence the motor skills of another form (Dekhtyarov 1979).

A different approach is required to develop speed abilities (both elementary and complex) and it is advisable to use a wide choice of means and methods.

An example of a simple movement that requires maximum manifestation of speed is a single punch. Muscle groups of the legs and body actively participate, their coordination is relatively simple, and does not significantly affect the speed of the main movement. In more complex motor acts, changing the position of the body in space, or the direction of its movement, or switching from one action to another, the coordination of muscles is complicated. A good example would be the actions of boxers, which are characterized by changes in the direction of movement, sudden side movements, multidirectional movements (cuts, dives), switching from defense to attack (Supov, 1983). Reducing time of complex motor actions is associated with an improvement in the mobility of nervous processes (perfecting the flow of excitations and inhibitions in various parts of the nervous system) and with the development and strengthening of rational intermuscular coordination of the motor skill (Verkhoshansky 1988, Platonov 2004).

The degree of development of speed abilities depends on features such properties of muscle tissue as the ratio of different muscle fibers, their elasticity, extensibility, level of intramuscular and intermuscular coordination.

The manifestation of speed abilities of athletes also closely relates to the level of strength development and improvement of technique, the capabilities of biochemical mechanisms to quickly mobilize and resynthesize anaerobic energy supplies, as well as the level of development of willpower (Platonov 2004).

Often in sports practice one needs to demonstrate speed abilities in movements overcoming significant resistance. Specialized strength training is required to improve such movements performed with muscle effort with 15% of the maximum (to increase their speed) (Verkhoshansky 1988).

It is known that there is certain dependence between the strength and speed of movements under external resistance. The maximum power (sometimes called 'explosive') is the result of an optimal combination of strength and speed. Power is demonstrated in many sporting exercises: in the initial or final phases of a punch, in the 'explosions' of a multi-punch series, in sudden (unexpected) movements, etc. The higher the power an athlete develops, the greater the speed they demonstrate using sporting equipment, or their own body, since the final speed is determined by the strength and speed of the impact (Kots 1986). Power can be increased by improving either strength, or speed of muscle contractions, or both. Usually, the greatest increase in power is achieved by increasing muscle strength.

It should be noted that changes in the body caused by strength or speed loads are very close, and the difference between them is mainly quantitative (Yakovlev 1974). During any work, the content of myoglobin in the muscles increases significantly, which indicates the adaptation of muscles to oxygen deficiency.

For high-speed multi-joint movements, the skill and habit of muscle relaxation is essential.

This is especially important for high-speed movements, due to the need for adenosine triphosphoric acid resynthesis in the intervals between muscle tensions (repeated attacks in boxing).

Use of elastic muscle properties is important for the efficiency and economy of high-speed movements.

The elastic properties of muscles include an ability to accumulate elastic energy in the preparatory phases and then realize it to increase the effectiveness of motor efforts in the working phases. An example: a jump backwards and the subsequent return to the fighting distance with a punch is more effective than performing the same punch after tilting backwards. When an athlete's speed of movement increases, the contribution of non-metabolic energy to the overall energy consumption increases too. Along with an increase in the power of effort, which is important in itself, the effectiveness of the usage of metabolic energy improves. (Verkhoshansky 1988).

To work in high-speed mode, one should be ready psychologically. It requires a mobilization of the psychomotor system: to work to the maximum intensity in the conditions of tough fighting and to realize the technical and tactical task of a match.

Thus, high-speed work causes total morphofunctional rearrangements of the whole body at the level of the central nervous and functional physiological systems.

The speed of acyclic movements is determined mainly by the muscular efforts rationally organized in time and space. In principle, the larger the force applied to the body, the longer the distance, the higher the speed. The speed is directly proportional to the strength and time of the strength's action, inversely proportional to the mass of the body.

Getting an increase in speed capabilities is possible in 2 ways: 1) by increasing the maximum speed, or 2) by increasing the maximum force.

From experience, we know that it is extremely difficult to increase the maximum speed significantly, but the task of increasing strength capabilities is more promising (Matveev 1999). An increase in the strength can be achieved in the training process. This is due to improving the ability of the motor cortex used to generate a powerful flow of afferent

transfers to the muscle system, expanding the functional capabilities of the working mechanisms of the body, and organizing their rational interactions. The power of energy supply mechanisms for the movement also increases. Appropriate biodynamic structures of sporting actions are formed (Verkhoshansky 1988).

Energy support of high-speed work has its own specifics. It happens mainly via creatine phosphate and glycolytic pathways.

Each sport is characterized by its own specialized functional structure that provides muscular activity of one kind or another.

The activity of boxers in a competitive fight is characterized by multiple demonstrations of maximum explosive strength to perform intensive short-term work (in medium and close combat distances), which alternates with short intervals of not so intense long distance work, while maintaining the spatial accuracy of movements and their working efficiency.

The boxers' fight is characterized by sudden and frequent changes in the coordination and pace of movements, which leads to significant changes in metabolic processes in the body and in the activity of the cardiovascular, nervous, and respiratory systems. With emotions running high before and during the battle, being under significant physical loads, with physiological, biochemical, and psychological functions being violated, the speed and technique (coordination) of movement is negatively affected. One should differentiate methods to develop different speed abilities (reaction time, single movement, and frequency of movements) and methods to perfect complex speed abilities (Platonov, Bulatova 1995).

Proceeding from this, for the development of speed abilities in boxing, one uses an analytical method of improving separate forms of speed, and a holistic method aimed at the comprehensive improvement of the speed abilities of a boxer when he performs complex technical actions in direct contact (Degtyarev et al. 1980).

Verkhoshansky (1988) identifies two methods to develop speed: exercises with weights and the integrated improvement of speed abilities.

To develop the speed of acyclic sporting movements, one can use weights exercises, static exercises, exercises of muscle work in shock mode, and jumping exercises. All of them are aimed at improving an ability of explosive effort in movements, which are corresponding in structure to competitive exercises, and are focused on the development of certain sensations, depending on the specifics.

A number of experimental works prove an effectiveness of using weights to perfect various high speed movements (including single and series punches), an ability to begin a series with an 'explosion', etc. (Lavrov 1982).

Use of weights increases proprioceptive afferentation, accompanying movements (Verkhoshansky 1988). Thus, the formation of an appropriate central motor pattern is activated, which helps to establish a rational order, i.e. consistency and speed of the inclusion of muscles in the work and their coordination in the movement. This program involves fast motor units in the contractile act of muscles, determining the development of the most effective intramuscular coordination.

It is possible to use weights either in competitive types of exercises, or in additional ones, which should be selected according to the principle of dynamic compliance.

The specifics of the competitive activity determine the weight, or weights used, as well as the complexity of the coordination of the movement, and the physical and functional fitness of the athlete, or group. To develop the maximum speed of the unloaded movement, the weight of the load should not exceed 20% of the maximum.

In practice, the following methods in exercises with weights were tested (Verkhoshanskii 1988):

- to improve speed and frequency of unloaded movements - weights up to 15-20% of the maximum, the movements should be extremely fast. If the speed is being improved, the pace is moderate, with muscle relaxation between movements, in a series of 2-3 approaches of 8-10 movements, and with rest of 2-4 minutes. If the frequency is being improved, the pace is high, in a series of 2-3 approaches of 8-10 movements, and with rest of 4-6 minutes. There are 2-3 series in a training session, with rest respectively of 4-6 and 8-10 minutes.
- to improve the speed of the motor reaction, the form of movements and muscular coordination must correspond exactly to the competitive exercise. Weight should be 30-40% of the maximum. Attention is focused not on the magnitude, but on the abrupt start of the effort on a signal specific of the competitive activity (visual, tactile). The training effect of the method is aimed at increasing efficiency of the organization of motor action and the rapid mobilization (with appropriate coordination) of the involved muscles. It is recommended to do a series of 4-6 repetitions with long pauses. In a training session there should be 2-3 series with rest of 4-6 minutes. Exercise can also be performed in the mode of explosive isometric muscle tension with the same motor task.

It is recommended that boxers develop speed using the method of additional mobilization of motor, visual, auditory, and tactile analyzers. In this method, relatively small weights of 2-10 kg (dumbbells, stones, cannonballs, medicinal balls) are used to mobilize the motor analyzer according to the following scheme:

- imitation of punches without weights (3-5 times);
- imitation of punches with weights (3-5 times);
- imitation of punches without weights (3-5 times).

Solovei (1982) suggests using dumbbells weighing 1.5-2 kg (when imitating hooks) and up to 4 kg (when imitating straight punches), or stuffed balls weighing 9-10 kg. The order of exercises with weights (dumbbells) is as follows:

- imitations of punches (5-6 times with each hand): 1) straight; 2) hooks; 3) uppercuts;
- imitations of defenses (5-6 times to each side): 1) tilts; 2) dives; 3) tilts backwards.

The scheme of the exercise is as follows: 1) without loads; 2) with loads; 3) without loads. Exercises with medicinal balls are performed in the same sequence.

To use these weights in order to develop the speed of single punches has a positive effect on the speed of boxers' series of punches.

To develop the speed capabilities of the leg muscles, loads with an initial weight of 20-40 kg can be used (the number of repetitions is 5-10-10). To develop the speed of body movements, the initial load of weights is 10-16 kg. Using the method of additional mobilization of the motor analyzer (according to the above), one should systematically recommend increasing the loads after 5-7 sessions.

An effective way of comprehensive improvement of speed abilities is through competitive exercises. In the conditions of a competition, with an appropriate preliminary preparation and motivation, it is possible to achieve such speed indicators in the individual components of competitive activity, which, as a rule, are difficult to show during training sessions. (Platonov 2004).

Training to improve speed qualities of athletes can be divided into two conditionally interconnected stages: the stage of differentiated improvement of the individual components of speed abilities (reaction time, speed of a single movement, frequency of movements), and the stage of integral improvement, at which the different abilities are combined into a single motor action (Platonov, Bulatova 1995).

For the development of speed in all its forms, Verkhoshansky (1988) suggests using two variants of the complex method: 1) after the warm up, perform a competitive exercise with a focus on the maximum speed (frequency) of movements, 2) after a warm up with preliminary muscle work, use a methodological technique such as source of the immediate information, or game forms for improving specific motor reactions.

The two variants of the complex method have found their application in boxing practice. Training a stuffed ball weighing 5-10 kg stimulates an increase in the speed of subsequent punches (Solovei 1982). Use of strength exercises corresponding to boxing punches and distances in terms of their motor structure effectively improves the speed and frequency of the boxer's movements, when followed by their execution with maximum speed without loads (Lavrov 1982).

In boxing, a method of collecting comprehensive immediate information is widely used. For example, a training device (chrono dynamometer), developed by Savchin (1991, 2003), allows one to record quantitative and qualitative information of punching actions (single and series) of boxers. Performing on a punch bag, the athlete receives immediate information on the strength of a single punch, or any punch in the series, as well as the total indicator (average) of the work performed (in conditional units of measurements). Also, time (frequency) of punches in combinations and series is recorded. The practical application of the immediate information method in the training process of elite boxers has shown improved results for members of the national team of Ukraine. The improvement of the complex indicator in a two-punch combination of straight punches (the strength of the punches and the time between them) was individual and ranged from 3-7%. It was noted that the 'improved' indicator was not stable and lost its properties when re-measured on the 3rd day.

Studies conducted in other sports (Pharfel 1977) have shown the effectiveness of the immediate information method in sports practice.

Games, with their inherent speed loads and increased emotional background, with elements of responding to a situation, or to a signal, contribute to both: an increase in the speed of movements and an improvement in the time of motor reaction. A positive influence found on the speed of specialized reactions of performing various actions started through the response to sudden signals in outdoor games, relay races, exercises that include elements of quick response, ball games, etc.

Strength and methods to develop it

The analysis of specialized data from literature and the experience of trainers shows that strength training, and the development of speed-strength qualities in highly qualified boxers, have their own characteristics, requiring the use of appropriate and specific means and methods.

In the available scientific and methodological literature, the accumulated experience in the development of strength abilities is reflected quite fully. Our task is to describe the up to date views on the solutions, based on practical experience.

A practical solution to the problem: the increase of effectiveness of specialized methods of

strength training can be described by the principal scheme: **MODE – MEANS – METHODS**.

A **Mode** involves recording muscular performance in sports. It is a fact that in practice, the mechanical work of muscles can be in four main forms: overcoming (myometric), giving way (plyometric), holding (isometric), and combined.

The research of the strength in boxers' punching movements has found different forms of muscle tensions in varied punches (punches in long, mid, or close range; punches in attacking, counterattacking, encounter forms; punches with different tactical tasks: searching, knocking out, responding to a situation, etc.).

Ballistic and non-ballistic types of punch movements are distinguished in boxers of different tactical roles (Filimonov et al. 1989): in 'knocking out', boxers mostly perform punches of non-ballistic nature, while those who mainly win on points, and the boxers working at a fast pace in the mid and close range, do ballistic punches. Depending on the technique of execution, boxing punches have both ballistic and non-ballistic muscle contractions.

A high level of explosive strength is necessary for delivering a knockout, but a fast force is required to perform an effective series of punches. To overcome a physical resistance in close range (power struggles, blocking defenses, pushing away, etc.), a high level of absolute strength is necessary (Filimonov 1989).

Means of sports' training is a set of various physical exercises, influencing directly, or indirectly, to the athletes' mastery. Their impact is targeted towards the development of the different sides of training (physical, technical, and tactical). They are to achieve a goal and to solve tasks at each stage of training.

Physical exercises, as a means for sports' training, may be classified conditionally into the following groups: general preparation, additional, specialized preparation and competitive exercises (Platonov 2004). Such subdivisions are rather conventional and distinctions between the groups are vague. The same exercise may be used successfully in any group, depending on its target, scope, intensity, quantity, and the stage of preparation, in varying amounts.

The strength development of a boxer can follow these two directions (Dekhtyarov 1979):

- The extensive use of general preparation strength exercises, with or without gym equipment, exercises loaded with weights, resistance exercises with a partner, etc.;
- Specialized preparation means selected in such a way that the type, mode of neuromuscular efforts, and structure are similar to the specialized competitive exercises of a boxer.

The development of strength in specialized preparatory, or specialized exercises, finds its theoretical foundation in the principle of 'dynamic correspondence'³.

Planning the content and target of strength training, a coach should take into account the characteristic features of the effects of the training means (Verkhoshansky 1988):

1. The effect of any training means decreases when the level of fitness of the athlete increases, especially if this increase is achieved using the same means.
2. Used means should provide an optimal strength training effect, relative to the current functional condition of the sportsman.

³ The exercises used to train the individual physical qualities must correspond to the dynamics of the sport or exceed it in complexity.

Changes of previous work change the training effect of any means.

The training effect with a combination of means is determined not so much by the amount of stimuli, as by their combination, sequence, and the intervals between them.

Specialized strength's training means as a whole should include a set of specific stimuli that ensure the development of the strength structure required for the given sport, taking into account the level of mastery of the particular athlete.

The physical load is only successful when the means that comprise it are sufficiently effective, i.e. capable to cause certain adaptive reactions in the body.

This is especially true for the elite athletes, as those means and methods that were used in previous training, no longer bring the expected effect. Therefore, the search for highly effective means is one of the main tasks of the trainer.

Methods of strength development. Among the diversity of strength development methods, one should select those corresponding to the main competitive movements in the technical, biomechanical, and physiological characteristics of the sport.

The implementation of the principle of systematic application of means, in accordance with the task of obtaining the necessary cumulative training effect (Verkhoshansky 1977), is very promising for improving the methodology for the development of specialized strength training.

Of particular interest to sports practice is an assessment of the effectiveness of using different methods developing strength qualities, possible variants of their interactions, the mode of usage of different methods, etc. To develop strength qualities using any method, weight loads can change, speed of movements, angles of movements, number of repetitions, rest pauses between attempts or series, the tasks of maximum tension of muscles at the beginning or at the end of the movement, etc. It is impossible to increase strength without applying maximum muscle tensions. Therefore, the main task for any method is to create conditions for maximum muscle tension. The basis for the development of power abilities is the use of muscle tension stimulants. The main ones are:

- willpower, mainly applied in isometric tensions;
- value of external resistance;
- kinetic energy of one's own body, or moving equipment (shock stimulation);
- electric current (electro stimulation);

The main methods for the development of strength abilities are:

- repeated efforts;
- maximum short (dynamic) efforts;
- progressing loads;
- block method;
- linked impacts;
- wendler method;
- isometric tensions;
- electro-stimulation.

The method of repeated efforts. The essence of this method is in the repeated exercises with increasing weight loads. The most effective weight load is 70-80% of the maximum, performing the exercise to the limit ('failure'). In this case, during the final repetitions the

effector impulsion from the central nervous system is enhanced, which contributes to adaptive-trophic rearrangements in the muscles. The physiological mechanism of increasing strength due to muscle growth is based on the intense breakdown of muscle proteins taking part in physical exercises. In this case, the weights used should be large enough, but not the maximum. The duration of the exercise series should be 20-40 seconds which allows to use the necessary anaerobic mechanism of energy supply.

This method involves performing a series of strength exercises. Each series goes 'up to the failure', 3-4 series total, 6-8 repetitions per series, and rest intervals between the series of 3-4 minutes.

The repetitions method is not very beneficial energy-wise. When exercising 'up to the failure', a large volume of work is being performed. As a result, the final attempts take place when the fatigue sets in and a decrease of the central nervous system's excitability complicates the formation of subtle conditioned reflex links, which, in fact, should provide a further increase in strength.

A variation of the repetitions method is the method of dynamic efforts, which is quite common in boxing. Exercising at top speed with 20-30% of maximum weight load, one achieves significant muscle tensions, not due to the weights, but due to the high speed of movements.

A method of maximum short time efforts is considered the most effective at increasing absolute muscle strength. It involves working with limit, or near limit weights.

The effectiveness of this method is determined by the frequency and strength of the effector impulsion, resulting in maximum muscle tension, and the inclusion of a large number of motor units and their synchronization, which provides a significant increase in strength abilities. Moreover, the development of strength in the method of maximum efforts follows the myofibril way, which, as is known, does not lead to a significant increase in muscle mass. The method of maximum efforts, in terms of energy, is preferable to the method of repetitions, in which athletes increase muscle mass.

In practice, the method of maximum efforts is used exercising on specialized gym equipment, lifting up to the limit weight loads (in various ways), with 1 - 2 movements in each attempt. In total, there are 3 to 4 attempts during one training session. Rest intervals between attempts should be 3 to 5 minutes.

The method of maximum efforts, together with the method of repetitions is effective enough for the development of absolute strength. In boxing training, it is advisable to apply both methods during the preparation period to support muscle tone, etc.

The development of explosive strength is more relevant for boxing. Exercises with weights, isometric exercises with quick tensions, jumps, and exercises involving the muscle shock method, are used to develop the explosive strength and reactivity of the neuromuscular apparatus.

The method of progressive loads involves a gradual increase in loads during a single training session, as well as in subsequent ones.

It is advisable that in the first attempt, one should start with a 50% load of what the sportsman can lift, 10 times. In the second attempt, the exercises are performed with a load of 75%, 6-8 repetitions. During the third attempt, 85-90%, repeated 3-6 times. In total, one does 3 attempts during one training session, with rest intervals of 2-4 minutes. Exercises in each attempt should be performed with the top speed, until there are evident signs of fatigue.

This method is effective for the improvement of strength qualities and provides a gradual

workout with maximum muscle tension. During the first attempt it is achieved through speed and during the last, due to the weight load. In practice, this method is used mainly in weight lifting and in gym because it is easier to change and measure loads quickly and exactly.

Shock method. At present, the shock method invented by Verkhoshansky, is well used to develop explosive strength. Studies (Jeroyan 1971; Filimonov 2006; Khusyainov 1983) confirmed the effectiveness of the work of the muscles in shock mode, when training an elite, as well as youth boxers, during the preparation stage, and during the annual cycle. The idea of the shock method is to use the kinetic energy of the body for the stimulation of neuromuscular tensions, or sports equipment swinging from a definite and strictly fixed height. Braking the fall of the body in a relatively short path causes a sharp (shock) stretching of the muscles, stimulating the intensity of the central impulsation of the motor neurons, creating elastic potential of tension in the muscles, which contributes to their fast subsequent contraction as they quickly switch from resisting, to overcoming. The first studies of such a method led to the conclusion that it had a strong training effect on the central nervous system and neuromuscular apparatus (Verkhoshansky, 1977, 1985):

1. The kinetic energy of the swinging equipment provides intensive stimulation of muscle activity. This does not slow down the speed of muscle contraction (as it is when using weight loads), but on the contrary, creates conditions for its increase.
2. The mobilization of muscular activity in shock mode, to an extent, is of a forced nature. When working with weights, the degree of mobilization of the motor potential of the muscles depends mainly on the will force. In shock mode, it is caused mainly by external factors. Motor apparatus and the central nervous system must react to the extreme conditions in the phases of resistance of the blow with strong muscle contraction, which cannot be reached simply by arbitrary effort.
3. Shock mode has an extremely evident training outcome, stronger than any other natural way of stimulating muscular activity. Therefore, it is unacceptable to exceed its optimal dosage and duration of use in training.
4. Shock mode swiftly leads to significant changes in the explosive strength ability. However, the duration of muscle contraction is rather short in this case. This is why the shock method should be used in combination with other methods, i.e. within a framework of the system of specialized physical preparation.

An example of using the shock method to develop explosive leg strength in boxers is: jumping down from a platform, followed by jumping up with a punching movement. Jumps down are performed with the legs slightly apart, in the anteroposterior direction when landing. When jumping up, the attention should be paid to pushing off with the back standing leg, and the imitation of a punch should be performed with the strongest hand whilst jumping. The height of jumping down should be 0.70-0.75 m, in a 2 to 4 series of 10 exercises per training session. The amortization track of the leg pushing off should be minimal, but enough to create a shock tension in the muscles. The value of the shock load is determined by the weight (own body weight) and the height of its fall. Higher height is better than heavier weight.

The shock mode is used to develop explosive strength of various muscle groups in various combinations. A well-known exercise - push-ups - can be done combined with clapping hands in front of the chest.

The shock method may also be used directly to perfect the explosive strength of the arm muscles, pushing away a weight load moving towards the sportsman like a pendulum.

Pushing the weight away should be performed standing in the fighting stance, whilst trying to keep the coordinative structure of the punch. At present, gym equipment has been designed to develop the explosive strength of the boxers (Savchin et al. 1989).

The *method of linked impacts* can be used to develop specialized strength qualities in boxers (Degtyarev et al. 1979). The effectiveness of this method is due to the fact that the development of strength abilities occurs directly during the performance of the specialized boxing punching actions, which in their kinematic characteristics and dynamic structure, correspond to the competitive exercises.

In training, when using specialized exercises such as 'shadow boxing' and other, various kinds of loads are used. Specialized preparatory exercises are widely used, throwing various kinds of stuffed balls, cannonballs, stones, performed from the fighting stance, etc.

One of the most important conditions of training is the rational selection of optimal weights for each boxer, depending on the weight category and level of fitness. If the load is above the critical value for a particular boxer, then the dynamic structure of the efforts will be disorganized, which will inevitably affect the quality of the acquired skill. Another indispensable condition for the successful use of weight training exercises to improve specialized skills is the correct execution of the technique (Degtyarev et al. 1979).

Variant method implies performing specialized exercises with varying weight loads (boxing gloves of different weights, additional loads on hands and legs, heavy and light boxing equipment, sacks of different weights, pneumatic punch bags, punch bags filled with water or other substances, etc.) The variant method involves alternating serial execution of exercises with weights and without them. Contrast resistances (heavyweight - lightweight) improve the ability to develop strength and speed. As a result, it ultimately leads to improvement in competitive movements.

So far, *the method of electro-stimulation* is not widespread. This method is based on the electric stimulation of a target muscle, provoking involuntary maximum tension. It may be successfully used in medical treatment.

Boxing is characterized via a combination of motor qualities. There is no integral strength indicator, as well as no method of its development, which would fully provide for the requirements of this kind of sport.

The development of maximum strength

In modern sports' practice, there are two independent ways to develop maximum strength:

- a) Perfecting mechanisms of neuron regulation (perfecting the impulsation of intramuscular and intermuscular coordination);
- b) An increase of muscle size.

The first option is the development of strength at the expense of neuroregulatory mechanisms (perfecting impulsation, intramuscular and intermuscular coordination) and the increase of capacity, power, and mobility of alactic mechanism of energy supply for muscle contraction. As the result of this approach, the increase of maximum strength is achieved without increasing muscle mass (Platonov, Bulatova 1995).

The second option is organizing the training process so that intensive proteolysis in the working muscles goes on. Both ways of maximum strength development are used, depending on the specifics of the sport, individual abilities of the sportsman, and other factors. In addition, a combination approach may be used for the development of maximum strength.

To develop maximum strength without muscle mass increase, the loads should be within the limits of 50-60% to 90-100% of the maximum. When doing an eccentric work - from 70-80% to 120-130%.

The most preferable exercises for increasing muscle mass are with weights, which can be 5-10 times. In this scenario, the training should be longer (1.5 to 2 hours) with three to five attempts with each load, or exercise. It is advisable to perform exercises 'up to the limit', with short rest intervals between attempts (30 seconds to 2 minutes). Each subsequent attempt should be performed under-recovered. (Filimonov 2006).

The second method of developing maximum strength is via the enhancement of excitation in the nervous system, providing improved intramuscular and intermuscular coordination.

Intramuscular coordination is determined by the frequency and strength of the effector excitation coming from the central nervous system, and the inclusion of a different number of motor units, as well as the synchronization of their excitation (Kots, 1986).

Table 6

Loads and a number of repeated strength exercises in boxing training

Load	Ratio to maximum (%)	A number of possible repetitions in one attempt	Exercise features	Conditional assessment of the exercise	Strength to be developed
Limit	100	1	Slowly without acceleration	Maximum	Absolute force
Near limit	99-90	2-3	The same	Sub maximum	Absolute force
Heavy	89-90	4-6	'Explosive effort'	Large	Explosive force
Moderate	79-70	7-11	Fast, accelerating in the end of the movement	Moderate	Accelerating strength
Average	69-55	12-18	The same	Average	Accelerating and fast strength
Light	54-40	19-27	Fast, accelerating in the beginning of the movement	Low	Starting strength and endurance
Insignificant	39-25	28-38	Maximum speed	Insignificant	Speed endurance

To improve intramuscular coordination, the loads should be within the limits of the

maximum: 75-100%. To apply the combined method one can use various loads: 80-95%, or 50-70% of the maximum. In the first case, the number of repetitions should be 1 to 2 per attempt, with 5 to 7 attempts in the training session. In the second case, the exercises should be performed at the maximum speed, with acceleration in the end of movement. The number of repetitions in one attempt is 5 to 7, with 2 to 5 attempts per training session. This method in boxing trains not only strength, but also the power of movements, which might not always be at its maximum with maximum loads.

To develop maximum strength, movements with various loads, in different work modes and of multidirectional coordination, are used in specialized exercises. The optimal value of load is determined by coordination complexity and the speed of a practiced movement (table 6). For single acyclic exercises requiring powerful explosive efforts, an optimal weight is 60-70% of the maximum (Verkhoshansky 1977).

The development of fast strength in muscles

The phenomenon of fast strength in sports is extremely diverse. Its nature is highly specific. Its rate of transfer from one type of movement to another is poor and pace of development is comparatively low (Verkhoshansky 1977). The strength shown in fast movements has many qualitative aspects and it can be difficult to draw a line between them.

Scientific and methodical studies on this problem show that higher speed loads in training with less time of continuous work at low speed, creates more effective fast speed strength development. Moreover, the main means of developing rapid strength are the exercises with light weight loads, about 20% of the maximum. In this case, the speed of movements increases with or without the load, and its overall growth may reach 146% of the initial level (Verkhoshansky 1977). The movements should be performed with maximum effort, aiming to 'speed up' as soon as possible. For the purpose of direct influence on the muscles' activation mechanism, the exercises with light weights should be combined with exercises raising heavier weights (up to 45% of the maximum), accented with an acceleration in the beginning of the movement. Shock exercises and exercises contributing to the rapid development of isometric tensions within 75-85% of the maximum are also recommended. An optimal ratio of exercises using different loads (heavy and light) should be 1:5 (the variant method).

To develop a fast strength in shock movements of acyclic nature, the load should be chosen taking into account its influence on the type of exercise and its performance.

To improve strength in specialized exercises, boxing school exercises with relatively small external loads are used: 200 to 500 g for the hands, and no more than 1.5 kg for the legs. The following technique is recommended: one minute of shadow boxing without a load; two minutes with a load; one minute without a load. The coordination structure of these exercises should be similar to competitive ones.

The alternation of light and heavy loads has a positive effect confirmed by experimental studies in throwers and hockey players (Savin 1990). Moreover, the positive effect is observed in fast strength when a small difference in weight of 200 - 250 g is used, and with a difference of 500g, it is absent, or unreliable.

When practicing fast strength development, one should seek weight loads which would not slow down the movements.

For localized loads of high speed movements, the optimum weight is the one that does not change the structure of movements.

Of particular importance is the use of weights to improve coordination features for speed

exercises. These exercises have an inherent coordination of the neuromuscular structure, which is formed under conditions of a high speed regime when performing them. However, this is not possible at all stages of the annual cycle. With a decrease in the speed of the movement, the number of probable muscle coordination links increases, which can ensure the reproduction of its spatiotemporal structures, but does not help develop speed skills. Under such conditions, the use of optimal weight loads can, to a certain extent, compensate for the lack of speed and ability to form rational neuromuscular coordination (Verkhoshansky 1988).

The loads may be used in both competitive and additional exercises, which should be selected in accordance with the principle of 'dynamic correspondence'.

As for the optimal weight of the load, there is a noticeable agreement in the opinions of researchers in scientific and methodological studies. To develop the maximum speed of an unloaded movement, the additional load is recommended to be under 15-20% of the maximum strength and to perfect the frequency up to 20% (Verkhoshansky 1977).

A number of experiments in boxing testify to the effectiveness of using loads to improve various speed forms, as well as strength of single and series punches, and the ability of using an 'explosion' to start a series (Solovey 1982, Lavrov 1982).

A pause between the repetitions of exercises is determined by the level of specialized endurance towards the repeated maximum stresses, as well as the intensity of strength manifestations. The optimal pause time is 30 seconds to a minute (Verkhoshansky 1977). In this time interval, a high quality of strength characteristics can be maintained.

Of great importance in the development of fast strength are the optimal weight load, the pace of movements, and the duration of work.

Ways to improve the methodology of developing fast strength should be sought using a certain combination of means, taking into account the positive consequences of the impact of previous work on the next, using exercises where muscle strength acts against the load's inertia, but not against the weight itself (Verkhoshansky 1977).

The development of explosive strength and muscle reactivity

Explosive strength shows itself both in dynamic and isometric modes in sport. Explosive strength is the ability of muscles to develop significant tensions in a minimum time, and is characterized by the ratio of maximum effort, to the time it is reached.

The curve of explosive strength has three components and is quantitatively determined by properties of the neuromuscular apparatus such as: maximum muscle strength, an ability to quickly exert powerful effort as muscle tension begins (starting strength), and the ability to build up working strength during the acceleration of transferred weight (accelerating strength). To develop explosive strength one has to perfect all these properties of the neuromuscular apparatus, but their participation depends on the external conditions of work and the resistance to overcome.

Intramuscular coordination is also an essential factor of explosive force in a multi-joint movement. In this case, the sequence of activation of certain muscle groups and the interrelation of antagonist muscles are especially important. It should also be noted that the explosive force is associated with a high rate of mobilization of chemical energy and its transformation into mechanical energy (Kots 1986).

The reactive ability of the neuromuscular apparatus is a special form of muscular ability that shows explosive effort. It manifests itself in movements with a rapid switch from resisting

to overcoming work of the muscles, i.e. after significant mechanical stretching of the muscles, their immediate contraction occurs, accompanied by maximum dynamic effort.

Experiments (Verkhoshansky 1977, Khusiyanov 1984) established the existence of the reactive ballistic mode of muscular work in shock movements of boxers. In boxing, the reactive ability most often occurs in various unexpected movements at the moment of pushing off with the legs. It has been established that the sharper the stretching of the muscles in the phase of amortization (leaving the attack distance), the faster the muscles switch from giving in work to overcoming work, and the higher the power and speed of their contraction.

When improving explosive strength, the dynamic mode of muscle work with an emphasis on overcoming is preferable. The pace of exercise is up to the limit, or close to it. Special attention should be paid to an instantaneous ('explosive') start to the movement.

The load depends on the fitness of the sportsman, the stage of training, and the means used. Thus, loads used in general preparatory exercises may reach 70-90% of the maximum, or 30- 50% in specialized preparatory exercises.

Many years of search for an effective way to develop explosive strength and muscle reactivity has led to the development of the so-called 'shock method'. When performing shock exercises, the following should be considered (Verkhoshansky 1988):

1. The value of a shock load is determined by the weight of the load and the height of its free fall. As a precaution, when the explosive strength and reactivity of the muscles in the legs and body are being developed, one can do the exercise without any additional loads, using only body weight to shock stimulation.
2. The amortization path should be minimal but sufficient to create shock stress in muscles.
3. Shock stress exercises should be no more than 5-8 in a series.

For boxers it is recommended to perform 8-13 jumps down from a platform in one series (Filimonov 2006), and 30-60 jumps down in one practice. The 'shock method' is described in more detail in the section *Methods of strength development*.

Here is a suggested exercise: pushing the bar (or metal stick) weighing 5-10 kg from the chest, from the initial position, in a shock type movement. This exercise should be performed in a fast series, 10-15 times during 25-30 seconds. One exercise may include up to five series. To develop explosive strength of leg muscles, sacks of sand and bars with an initial weight of 20-40 kg may be used. The number of repetitions is 5-10. To develop the strength of body movements, the initial load should be 10-16 kg. In 5-7 training sessions, the load weight should be increased. The exercise should start with explosive movements, or the number of attempts should be increased.

Specially conducted experiments on the implementation of the shock method in boxing practice (Filimonov et al. 1979 etc.) prove the effectiveness of its use in training, aimed at the development of explosive strength and the reactivity of the neuromuscular apparatus. The process of developing explosive strength must be built taking into account the level of fitness of athletes, the stages of annual and long-term training cycles, and should provide a certain combination, as well as the sequence and continuity of training methods and means.

In the development of explosive power, means should be found to improve the ability to quickly build up significant efforts from zero, as well as to switch from resisting work to overcoming work in conditions of maximum dynamic effort.

Endurance and methods of its development

Qualitatively, the basis of specialized endurance comes from the energy capabilities of the human body, along with other factors.

A certain type of energy is inherent in each physical exercise with which the work is realized.

Therefore, in training practice, the term 'energy specific sport, or type of physical activity' has become widespread. This specificity determines the training load, which contributes to the improvement of energy factors, i.e. factors selectively affecting the development of specialized functional fitness of athletes.

Recent studies conducted at molecular levels provided information on the physiological mechanisms of endurance localized in the depths of muscle cells. Following on from these studies, training leads to specific primary changes in skeletal muscles at the cellular level, which are then supplemented by secondary adaptive changes in the blood, cardiovascular and other systems. The ability of the body to maintain a high level of performance is the result of the development of the ability of muscle cells and their mitochondria to extract a higher percentage of oxygen. Their inner membranes are the last instance in the cascade of oxidative metabolism, which determines the effectiveness of the body's ability to use oxygen oxide in conditions of intense muscle activity. A high level of endurance in sports can only be achieved if the ability to use oxygen is well developed and balanced at all levels of the oxygen cascade, and none limit the efficiency of the entire system.

Unfortunately, the described mechanism of endurance development did not find sufficient experimental confirmation in speed-strength sports. At the same time, an attempt was made in boxing to train with it, taking into account the qualifications of athletes, their age, etc.

Based on physiology, 3 ways in which previous work affects the results of subsequent training are distinguished (Repnikov 1985): 1) positive (reinforces the results); 2) negative (reduces the results); 3) neutral (does not affect the results).

Given the interaction of current and delayed effects of different directions in training, it is also necessary to remember that between the two main biochemical exchanges - aerobic and anaerobic, there is a positive relationship (the higher the aerobic abilities of the body, the more work it can perform under anaerobic conditions). On the other hand, there is a struggle for priority in a regulating metabolism. When the body is sufficiently supplied with oxygen, the advantage in this competition is on the side of the aerobic process. Breathing inhibits anaerobic metabolism. This phenomenon is called the direct Pasteur reaction. Insufficient supply of oxygen to tissues leads to the opposite phenomenon. Increased glycolysis causes a decrease in aerobic (respiratory) reactions. This process is called the reverse Pasteur reaction. Therefore, to achieve a positive interaction of training sessions is possible when they are built according to the following scheme:

1. first, alactic anaerobic (speed-strength) exercises are performed, followed by anaerobic glycolysis exercises (speed endurance training);
2. first, alactic anaerobic exercises are performed, followed by aerobic ones (overall endurance training);
3. first, anaerobic glycolysis exercises are performed in a small volume, and then aerobic ones.

When improving the alactic anaerobic mechanism, physical load should be as follows: the duration of work intervals is 10-15 s, maximum intensity (explosive work), 5-6 repetitions, rest intervals, walking calmly, or shadow boxing between repetitions - 2 minutes.

Training of the glycolytic anaerobic component of energy production also uses *interval* work with decreasing rest intervals according to the scheme: intensity - close to maximum; duration of work intervals - 2 min; 3 repetitions; interval between first and second repetitions - 2 min; between the second and third - 1 min. Shadow boxing is used during the rest between repetitions. Exercises are performed in series after 3 minutes (3-6 series). Means of improving alactic anaerobic and glycolytic anaerobic mechanisms are by working on heavy boxing equipment, as well as on 'pads'.

The reduction of rest intervals is a principle training tool for the development of glycolytic resources of a boxer.

For the effective development and realization of aerobic capabilities in any type of muscular activity, training should correspond to it in terms of work mode and muscles involved. For the improvement of aerobic endurance, the load should not exceed 70-80% of the maximum, pulse should not exceed 180 bpm (beats per minute), the time of the activity should be 1.5 min., with 8-10 repetitions, and a rest interval of 2 min. During rest intervals the pulse rate should not be lower than 150 bpm.

In their studies, (Dehtyaryov, Cheremisinov and Kisilyov 1980) divided all boxing exercises into three groups, depending on the energy supply and the degree of activation of energy conversion mechanisms.

The *first group* included primarily aerobic exercises. They enhance the aerobic process, but the degree of activation is not significant. These exercises include general physical training, improving boxing techniques, tactical training, and recovery exercises.

The *second group* includes aerobic-anaerobic exercises, subdivided into two groups: subcritical and supercritical zones of work. Subcritical zone exercises cause near-limit strengthening of aerobic processes and a marked increase in glycolysis. They can be considered an effective means of improving the aerobic mechanism of energy supply. Exercises of the supercritical zone effectively affect aerobic processes, and especially anaerobic glycolysis.

The *third group* includes exercises of the alactic anaerobic orientation, which improve mainly the alactic mechanism of energy conversion. They include training exercises of maximum, or near maximum intensity, and cause fatigue in 10-15 seconds of work. Specialized boxing aerobic oriented exercises mainly include the following:

- work in pairs, at a variable pace, to improve technical and tactical skills, lasting 10- 12 rounds;
- work with heavy boxing equipment (bags, wall bags), at an average pace, lasting 10-12 rounds;
- work with light boxing equipment (pneumatic punching bags and boxing balls filled with water, as well as other substances) at an average pace lasting 3-6 rounds;
- work on 'pads' to improve technical and tactical skills.

Subcritical zone exercises include controlled and qualifying sparring, conditionally freestyle fighting, at maximum pace (type of specialized work in pairs, when rounds of a given task of activities alternates with rounds of freestyle work) - 6 rounds, work on 'pads' to improve technical and tactical skills at maximum pace - 3-4 rounds.

The authors of the study revealed training exercises that cause anaerobic shifts that are close in essence to competitive ones. Such exercises turned out to be work on the boxing wall and the boxing bag fixed by a partner in an upright position. In this case, the following mode of training should be maintained:

- **pace** – maximum;
- **duration of work** – 1 minute;
- **interval between repetitions** – 1 minute or 30 seconds;
- **number of repetitions in series** – 3;
- **number of series** – 3 to 5;
- **interval between series** – 10 to 15 min.

The criterion for specialized endurance is the length of time a boxer can maintain a critical power level of the performance (Platonov, Bulatova 1995). The capabilities of the energy supply system and its effective use in the performance of a motor activity, which is the main aim of training and competitive work, are crucial for achieving high endurance indicators.

In connection with the foregoing, in the development of specialized endurance, these points should be taken into account (Platonov 1987):

- a variety of means and methods should be used when improving technical and tactical actions, as well as when developing specialized endurance;
- the close interconnection of the processes in improving technical and tactical actions, as well as when developing specialized endurance;
- in the conditions of training activity, modeling the whole spectrum of states and reactions of functional systems characteristic of the competitive activity;
- the variability of environmental conditions, both in the development of specialized endurance, and in the process of technical and tactical improvement.

Training combinations of specialized exercises

In boxing practice, a wide arsenal of means is used to develop general and specialized endurance, taking into account the aims and objectives of the particular stage in the training process. The shortened rounds of specialized work on boxing equipment (heavy punch bag, etc.) may be used to develop strength endurance. Such exercises improve the glycolytic mechanism of the energy supply, develop a stereotype of high intensity speed-strength work for boxers, and teach them to 'give all' for a limited time.

Combination 1

Punching the bag with maximum strength and frequency in series. Performance mode:

- 1 min - maximum intensity work;
- 1 min - active rest (walking);
- 1 min maximum intensity work;
- 30 s - active rest (walking);
- 1 min - maximum intensity work;
- 7 min - mixed rest: 2 min - passive rest, 3 min - imitations of body defenses, side steps, shuttle movements, 2 min - passive rest.
- 4 series to perform.

Combination 2

Punching the bag with maximum strength and frequency in series:

- 20 s - maximum intensity work;

- 2 min - mixed rest: 30 s - walking, relaxation exercises, 1 min - imitations of body defenses, movements, 30 s - passive rest;
- 20 s - maximum intensity work;
- 2 min - rest (like previous);
- 20 s - maximum intensity work;
- 1.5 min - mixed rest: 30 s - walking, relaxation exercises, 30 s - imitations of body defenses and movements, 30 s - passive rest;
- 20 s - maximum intensity work;
- 1.5 min - rest (like previous);
- 20 s - maximum intensity work.

4 series to perform. Rest between series – 4 min:

- 1 min - walking;
- 2 min - imitation of body defenses and movements;
- 1 min - walking.

Combination 3

Practice is on the punching bag with 2 boxers. One athlete holds the bag in an upright position and the other one throws a series of punches with maximum strength and frequency. Each 10 seconds the partners change places. The round lasts 2 minutes and includes 6 work periods, with 6 rest periods. This exercise is performed as follows:

- 10 s - maximum intensity work;
- 10 s - holding the bag;

3 rounds to perform. Active rest between rounds – 2 min:

- 1 min - relaxation exercises, walking;
- 1 min - imitation of body defenses and movements.

Combination 4

Punching the bag with maximum strength and frequency:

- 8 s - maximum intensity work;
- 1 min - active rest: relaxation exercises, walking;
- 8 s - maximum intensity work;
- 30 s - active rest: relaxation exercises, walking;
- 8 s - maximum intensity work;
- 15 s - active rest: relaxation exercises, walking;
- 8 s - maximum intensity work;
- 15 s - active rest: walking;
- 8 s - maximum intensity work.

4 attempts to perform. Active rest between attempts - 3 min: 1 min - walking, 1 min - relaxation exercises and imitation of body defenses, 1 min - walking.

Combination 5

Repetitive and interval training are performed on a punching bag in modes: 'normal' - 20 s and 'explosive' - 10 s. In the 'explosive' mode, punches are thrown with maximum strength and speed. In the 'normal' mode, punches are performed naturally (as usual). The complex consists of two 3 min rounds with 2 min of active rest between them: walking, relaxation exercises.

In the repetitions and interval methods, running is widely used in the training of boxers. It is known, that in the interval method of training, rest pauses are given, and the main training effect of the exercises is achieved due to their duration. In the repetitions method, before each next exercise, the rest period should not be large, but sufficient in restore performance.

Combination 6

- 150m run at maximum speed;
- 3 min - active rest: 1 min - walking, 2 min - imitation of punches and defenses;
- 150m run at maximum speed;
- 2 min - active rest: 1 min - walking, 1 min - imitation of punches and defenses;
- 150m run at maximum speed;
- 1 min - active rest: walking;
- 150m run at maximum speed;
- 30 s - active rest: walking;
- 150m run at maximum speed; 3 series to perform. Rest - 10 min:
- 5 min - relaxation exercises, walking, sitting down;
- 3 min - imitation of punches and defenses;
- 2 min - walking, relaxation exercises.

Combination 7

- 40m run at maximum speed;
 - 2 min - active rest: relaxation exercises, walking;
 - 40m run at maximum speed;
 - 1.5 min - active rest: relaxation exercises;
 - 40m run at maximum speed;
 - 1 min - active rest;
 - 40m run at maximum speed;
 - 30 s - active rest;
 - 40m run at maximum speed.
- 3 series to perform. Rest between series - 5 min:
- 2 min - active rest: relaxation exercises, walking;
 - 2 min - imitation of body defenses;
 - 1 min - active rest: walking.

Combination 8

Consists of 5 series of short distance races (Filimonov at al. 1989). The first series:

- 10m run at maximum speed;
- 3-5 s - active rest;
- 10m run at maximum speed;
- 3-5 s - active rest;
- 10m run at maximum speed;
- 3-5 s - active rest;
- 10m run at maximum speed;
- 3-5 s - active rest;
- 10m run at maximum speed.

Rest 3 min: 1 min - relaxation exercises, 1 min - imitation of body defenses, 1 min - exercises to restore breathing.

The second series consists of 15 m short distance races, and is performed in the same sequence, with 3 min of rest.

The third series consists of 20 m short distance races, and is performed in the same sequence, with 3 min of rest.

The fourth series consists of 15 m short distance races, and is performed in the same sequence, with 3 min of rest.

The fifth series consists of 10 m short distance races, and is performed in the same sequence.

Combination 9

This combination is used to improve speed-strength abilities. When running at an average pace, a boxer runs a total of seven and a half laps around the stadium, performing within 100 m stretches: 10 accelerations at each 30 m, 10 accelerations at 20 m stretches, and 10 accelerations at 10 m stretches. Thus, the athlete runs 3000 m and performs 30 accelerations, running the distance, on average, within 18-20 minutes.

The second version of this combination: during a race, a boxer does five accelerations of 30 m, five accelerations of 20 m, and five accelerations of 10 m.

Combination 10

This combination is recommended for well-trained sportsmen. It can also be used for testing an athlete's work capacity.

- 100 m run at maximum speed;
- 1.5 - 2 min - active rest: relaxation exercises, imitation of body defenses and punches;
- 100 m run at maximum speed;
- 1.5 - 2 min - rest: the same;
- 100 m run at maximum speed;
- 1.5 - 2 min - rest: the same;
- 100 m run at maximum speed;
- 1.5 - 2 min - rest: the same;
- 100 m run at maximum speed;
- 1.5 - 2 min - rest: the same;

• 100 m run at maximum speed;

• 5 min - active rest: 2 min - relaxation exercises, walking, 2 min - imitation of body defenses and punches, 1 min - breathing exercises.

In the second series of this combination, there are three races of 800 m. The time of the first race should be between 2 min 30 s - 2 min 40 s, the second race - 2 min 40 s - 2 min 50 s, and of the third - 2 min 50 s - 3 min.

Thus, athletes run 2900 m at high-speed. In the first series, the time of high-speed (100 meters) segments is on average 12 - 14 s. In the second series (800 meter segments) - 2.5 - 3 min.

Training combinations of exercises with weights are aimed to improve the speed-strength qualities of boxers.

Combination 11

The barbell's weight is 50% of the maximum. Push the barbell from the chest up with maximum speed. There are three movements in each of the three attempts (3 x 3);

• The barbell's weight is 60% of the maximum. Push the barbell from the chest up with maximum speed. There are 2 movements in each of the three attempts (3 x 2);

• The barbell's weight is 70% of the maximum. Push the barbell from the chest up with maximum speed. The number of attempts and movements in one attempt is individual.

Combination 12

• The barbell's weight is 80% of the maximum. Push the barbell from the chest up. There are two attempts with one movement each (2 x 1);

• The barbell's weight is 90% of the maximum. One attempt - one movement (1 x 1);

• The barbell's weight is 100% of the maximum. One attempt - one movement (1 x 1);

The number of series is individual.

To train speed and strength, exercises should be performed with top, or near to top speed. The less the weight, the higher the speed of the movement. Exercises with light weights (up to 40% of maximum) should be performed at the highest speed. An exception is only made when the task of the training also includes the development of strength endurance. In this case, strength exercises are performed against fatigue - 'to the failure'.

Combination 13

• The barbell's weight is 40% of the maximum. A boxer with the barbell on the shoulders performs jumps on his toes, jumping out of a half squat, 20 times;

• 3 min - active rest: relaxation and breathing exercises, imitation of body defenses;

• The barbell's weight is 30% of the maximum. The same movement - 20 times;

• 2 min- active rest: relaxation exercises, imitation of body defenses;

• The barbell's weight is 50% of the maximum. The same movement - 20 times. 3 series to perform with active rest between the series - 5 min:

• 2 min - walking, relaxation exercises;

• 2 min - imitation of body defenses and punches;

• 1 min - walking, breathing exercises.

Combination 14

- The barbell's weight is 40-50% of the maximum. The starting position is standing on a slope, legs shoulder width apart. Rising on the toes, 5-8 springy extensions in the ankle joints are performed;
- The barbell's weight is 40% of the maximum. The starting position is with the barbell on the shoulders. The boxer alternates jumps on the left leg to right leg, or both legs in place or with moving forwards - 10-15 times in each;
- A kettlebell's weight is 16 kg. The starting position is feet apart, with hands holding the kettlebell in front and on the side. This is followed by circular movements of the body with the rotation of the kettlebell over the head;
- The barbell's weight is 40% of the maximum. The starting position is with the barbell on the shoulders. The boxer jumps over the chalk line - 10-15 reps;
- The barbell's weight is 50% of the maximum. The starting position is legs apart, with the barbell on the shoulders. The boxer alternately turns of the body left and right. Feet should stay firmly pressed to the floor.

3 series to perform. Active rest between exercises of 2-3 min, between series - 5 min:

- 2 min - walking, relaxation exercises;
- 2 min - imitation of body defenses and punches;
- 1 min - walking, breathing exercises.

Combination 15

- The kettlebell is 16kg. The starting position is feet apart, standing on two gymnastic benches (pedestals), kettlebell in hands. The boxer bends their legs to a half squat position, which is followed by jumping up 10-15 times;
- The barbell's weight is 60% of the maximum. The starting position is tilting forwards, holding onto the bar of the barbell, legs apart. Without bending the arms or legs, the boxer raises the barbell to the level of the chest, and lowers it back into the starting position. The movement is done 10-12 times;
- The kettlebell is 16kg. The starting position is feet shoulder width apart, in a half squat, with the kettlebell in lowered hands. The boxer moves the kettlebell like a pendulum, back and forth - 20 reps;
- The barbell's weight is 60% of the maximum. The starting position is feet apart, with the barbell on the shoulders. The boxer slowly moves into the half squat position and quickly stands up - 5-7 reps;
- The starting position is feet shoulder width apart, hands up with a weight from the barbell. The boxer then alternately tilts in different directions – 15 in each exercise.

3 series to perform. Active rest between the exercises – 2-3 min, between series – 5 min (the same scheme as in combination 14).

Combination 16

- The barbell's weight is 40% of the maximum. The starting position is feet apart, with the barbell on the shoulders. The boxer tilts their body to different sides, 10-15 times to each side;

- 15 kg kettlebell. The starting position is feet shoulder width apart, with the hands holding the kettlebell behind. The boxer then squats and rises with the kettlebell 20 times. When down, the kettlebell should touch the floor.
- The barbell's weight is 20% of the maximum. The starting position is feet apart, with the barbell on the chest. The boxer pushes the barbell forwards in a 'shock' explosive movement 20 times;
- The barbell's weight is 20% of the maximum. The starting position is a lunge forwards with the barbell on the shoulders. The boxer then jumps to change the position of the legs. The exercise is done on the spot, or with jumping forwards - 20 times;
- The barbell's weight is 40% of the maximum. The starting position is feet shoulder width apart, with the barbell on the shoulders. The boxer then jumps on two legs 15-20 times.

3 series to perform. Active rest between the exercises – 2-3 min, between series – 5 min (like in combination 14).

In the training combinations 17-20 (Koptsev at al. 1990) the weight of the load is determined individually, based on the level of fitness, the stage of training, the athlete's weight, etc.

The load should be determined considering the following: weight of the equipment, number of repetitions in a series, number of series. For example, when exercising with 20 kg weights with the athlete performing 10 movements, correspondingly he should perform 2 series of this exercise. Weights should be selected individually as recommended above.

Combination 17.

- The starting position is sitting. The boxer lifts the barbell from behind the head with a wide grip;
- The starting position is sitting on a bench with the back supported at an angle of 45°. With medium grip, the boxer does the barbell lift.
- The starting position is standing. The boxer lifts up a kettlebell with straight arms;
- The starting position is standing. The boxer lifts the kettlebell (or disk from the barbell) sideways and upwards with straightened arms;
- The starting position is kneeling. The boxer throws the medicine ball upwards and backwards;
- The starting position is lying on the back, with the medicine ball behind the head. The boxer throws the medicine ball forwards by simultaneously bending the legs and body;
- The starting position is standing. The boxer lifts the barbell to the level of the chest and pushes forwards to straighten the arms. They then return the barbell to the chest and lower it down with straightened arms;
- The starting position is kneeling. The boxer throws the medicine ball from behind the head to the wall.

Combination 18.

- The starting position is lying. The boxer does the barbell lift with a wide grip;
- The starting position is lying. The boxer presses the barbell with a normal grip, pushing from the chest;
- The starting position is standing. The boxer lifts the barbell (on the biceps) with a wide grip to the level of the forehead;

- The starting position is standing. The boxer lifts the dumbbells on the biceps (at speed);
- The starting position is standing. The boxer pushes the barbell forwards from the chest;
- The starting position is sitting on a bench. The boxer lifts dumbbells on the biceps, from the side, up to the shoulders;
- Push-ups leaning on bars;
- Push-ups from the floor, clapping hands in front of the chest.

Combination 19

- Push-ups leaning on parallel bars. The exercise is performed pushing up with both hands. If necessary, the distance can be smaller;
- Push-ups from the floor, tossing the body over a small elevation;
- The starting position is standing with a slight tilt forward. The boxer holds a medicine ball in front of the chest, elbows to the sides, and throws the ball into the floor (unbending the elbow joints);
- Jumping sideways through a small elevation with weight on the shoulders;
- Lifting legs, when hanging on a horizontal bar;
- Lifting the body to a horizontal position, when legs are fixed at the 'Swedish wall';
- Turning the body sideways, when sitting on a bench, with the body deflecting backwards at an angle of 45 degrees;
- Steps forward with dumbbells in hands. For every step, the boxer turns and tilts the body to the leg, then straightens with an imitation of boxing punches;
- The starting position is legs shoulder width apart with a disc at the side, by the right hip. The boxer's hands carry the disk upwards, forwards, and move to the left side.

Combination 20

- Pull-up on the crossbar with a wide grip behind the head;
- Press the barbell, pushing with the hands, whilst sitting on a bench with support of the back at an angle of 45 degrees;
- The starting position is standing with a tilt forwards, pulling the barbell to the groin;
- The starting position is hands with dumbbells in front of the chest, elbows bent. The boxer steps forwards, turning the body with an imitation of punches at every step;
- The starting position is hands with dumbbells in front of the chest with an imitation of boxing punches;
- The starting position is with the barbell's disc in two hands by the right thigh. The boxer transfers the disc from the right to the left, and from the left to the right, with acceleration at the beginning of the movement;
- The starting position is with the legs fixed on an inclined board, hands behind the head. The boxer lifts their body to their feet with a forward tilt and turn.

Combinations of exercises for specialized physical fitness

Combinations of exercises for specialized physical fitness are recommended to develop strength endurance of muscles participating in specialized movements of boxers. They are recommended during both the basic, as well as the pre-competition stages of preparation.

'Merry go rounds' combination

This combination includes 6 stations. Exercises are performed in the static-dynamic mode (muscles are tense, without a relaxation phase at the time of exercise). Exercises are performed until a sensation of 'burning' in the muscles is reached, with 2 repetitions as extra. If this sensation isn't reached, one must change either the load, or increase the frequency of movements. The weight of the load is 30 – 45% of the maximum. Time to perform 1 exercise is 30 - 40 s.

Two boxers work on one station, alternately changing on the same equipment. The time of work on 1 station is 4 – 5.20 min (4 times for each sportsman). One sportsman works on the station 30 – 40 s, the other one rests. The active rest, when going from one station to another, is 1.5 – 2 min.

The active rest between the series is 5 – 8 min.

1 – 3 series can be performed in a training session depending on the stage of preparation and the boxers' qualifications.

Station 1. *Lying barbell bench press.*

Execution time – 30 - 40 s. Four approaches in one series. Move to station 2. Rest during the transition 1.5 - 2 min

Station 2. *Squats with the barbell on shoulders.*

Execution time – 30 - 40 s. Four approaches in one series.

Station 3. *Turns of the body with the barbell pancake (disk) in hands, imitating uppercuts.*

Execution time – 30 - 40 s. The weight of the disc is 5, 10, or 20 kg. Four approaches in one series. In the first approach, the body turns from left to right. In the second - from right to left. Altogether the boxer makes 2 movements in one direction and 2 movements in the other.

Station 4. *Throwing the bar of the barbell from the chest with two hands.*

Or, pushing a vertically standing barbell bar with one hand forwards (with the strongest hand, with the weakest hand) 30 – 40 s. Four approaches in one series.

Station 5. *Jumping through the gymnastics bench:*

on two legs, on one leg, in different ways – 30 – 40 s. Four approaches in one series.

Station 6. *Pull the weight on the 'block crossover' with straight arms from top to bottom, to the knees.*

The exercise is performed in one direction and in one approach (from left to right or from right to left). In another approach the direction changes.

Working with stones

Warm up 15 min.

The sportsmen work with 2 stones: large and small (weight of the stones is chosen individually).

Exercises:

Round 1.

1. Squats with stones in outstretched arms:
 - a. Large - 30 s; small - 30 s. Total time equals 1 min.
2. Imitation of hooks: arms bent at the elbows are parallel to the support; the stone is in one hand. With the large rock: to the left (30 s); to the right (30 s); the same with the small stone to the left (30 s); to the right (30 s). Total time equals 2 min.

Round 2

3. Pull the stone from knee level, up and down: the large one - on the left side (30 s); on the right side (30 s); the same with the small one. Total time equals 2 min.
4. Throw the stone from the chest down: the large one with two hands (1 min); the small one (1 min). The total time equals 2 min.

Round 3

5. Throw the large stone down with the strongest hand (1 min), the small one (1 min). Throw the large stone with the weakest hand (1 min), the small one (1 min). The same throws, but for 30 s with the strongest hand, then for 30 s with the weakest hand - 1 min. The total time equals 5 min.

Round 4

6. Throw the large stone forwards with the strongest hand (1 min), the small one (1 min). Throw the large stone with the weakest hand (1 min), the small one (1 min). The same throws, but for 30 s with the strongest hand, then for 30 s with the weakest hand - 1 min. The total time equals 5 min.

Round 5

7. Throw the large stone forwards from the chest with 2 hands (1 min), the small stone (1 min).
8. Throw the large stone from behind the head (1 min), the small stone (1 min).
9. Throw the large stone from the bottom upwards (1 min), the small stone (1 min). The total time equals 6 min.

Interval training

Perfecting specialized endurance

N	Exercise	Time of work	Time rest	of Pulse
1	Running on the spot	1 min	30 s	26
2	Jumps on the toes	30 s	15 s	25
3	Jumps on the toes	30 s	15 s	26
4	Rope jumping	1 min	15 s	27
5	Rope jumping	1 min	15 s	25
6	Rope jumping	1 min	15 s	27
7	Training on the punch bag	30 s	15 s	28
8	Training on the punch bag	30 s	15s	30
9	Training on the punch bag	30 s	15 s	31
10	Squats	45 s	30 s	30
11	Squats	45 s	30 s	28
12	Throw stuffed ball	1 min	30 s	28
13	Throw stuffed ball	1 min	30 s	27
14	Training on the punch bag	1 min	1 min	31
15	Training on the punch bag	1 min	1 min	32
16	Training on the punch bag	1 min	1 min	32
17	Movements around the ring	3 min	1 min	27
18	Training on the punch bag	1 min	1 min	31
19	Training on the punch bag	1 min	1 min	33
20	Training on the punch bag	1 min	1 min	32
21	Movements around the ring	3 min	1 min	28
22	Step test	1 min	30 s	30
23	Step test	1 min	30 s	31

24	Step test	1 min	30 s	32
25	Speed training on the punch bag	45 s	15 s	32
26	Speed training on the punch bag	45 s	15 s	32
27	Speed training on the punch bag	45 c	15 s	32
28	Half squats	30 s	30 s	28
29	Half squats	30 s	30 s	28
30	Punching the bag	20 s	15 s	31
31	Punching the bag	20 s	15 s	28
32	Punching the bag	20 s	15 s	30
33	Running on the spot rising hips high	30 s	15 s	27
24	Running in a circle	5 min	30 s	26

Total time equals 35 min 17s.

CHAPTER 5

PLANNING AND ORGANISING A YEARLY COMPETITION TRAINING CYCLE

Planning a training cycle for boxers is a complex process.

Boxing is one of the few sports having a comprehensive manifestation of motor qualities in competitive situations.

When training for competitions, a coach should not only work on tactical and technical skills development, but should train special endurance, a complex combination of strength and speed skills, special perceptions like awareness of the opponent, distance and so on. Another important objective of the preparation is one of the athlete's mental attitude to a specific fight and to the whole tournament. All of these training features are interconnected. It is difficult to distinguish the main and secondary objectives, because underestimation of any of them can lead to a negative result.

It is important to ensure the right combination of these skills for competitions. Each of the individual aspects mentioned above is a part of the integral whole, and the omission of one aspect can have a negative impact on the boxer's overall performance.

An attempt was made (Dikhtyarenko 1979) to identify controllable factors of boxer's readiness on the pre-competition stage of the competition training period. As a result of the experiments, the author came to a conclusion that the indicators of physical qualities (74%) and technical and tactical readiness (65%) were of the leading importance. Indicators of the functional state and psychomotor skills were 25% and 24% respectively. For objective reasons, the author could not study all aspects of training boxers, but only controllable factors, and their contributions. But this does not mean that the coach has not to deal with the other issues of the training process. A contribution of different factors at different stages is different. At the initial stage, when there is long time till competition, more attention is paid to development of physical qualities. Later, closer to the competition, - to issues of technique, tactics, etc.

The professionalism of the trainer is in correctly finding how much of the physical qualities training is required at each particular stage of preparation.

The influence of a factor, or sum of factors is individual for each subject, i.e. "... the same physical activity can cause different athletes, or the same athlete in a different functional state, to have different reactions". Therefore, when choosing a preparation strategy for the specific competitions, the coach needs to take into account the importance of the upcoming start, the current initial functional state of the athlete, or group, the cumulative effect of the previous training. He has also to plan the future stages training strategies, which should be the physiologically sound. The effectiveness of the management of the training process is determined by the reliability of the target program, the ultimate goal of which is to achieve the highest result in precisely defined time.

Several authors (Dzheroyan, Khudadov 1971; Dekhtyarov 1979, 1985; Koptzev et al 1990) pinpointed planning and management as vital in boxer's training. The system of training and bringing an athlete to the main competitions is central in all sports. The correctness of choice of the direction in the sport's development is probed in practice by it, in the particular period of time.

The modernization of competition rules has a direct influence on the technical and tactical, as well as specialized physical qualities of a competing boxer. These changes force national federations to reconsider their standing relative to the sport and in particular, to the systems of training for major competitions. These reconsiderations do not require programs revision, but rather understanding of the accumulated rich scientific and methodological material, based on specific conditions.

The periodization of training in boxing

The practice of sports of the highest achievements developed over the years scientifically based general principles of preparation of the athletes using macro-, meso- and micro cycle training. Never the less, the peculiarities of various sports and the specifics of calendars of competitions require detailed planning in order to achieve the necessary level of training in relation to specific conditions of the activity (Degtyarev 1985).

The improvement of mastery and fitness of boxers depends on the quality of teaching and training process, on the perfection of the planning. One of the main problems in the sport theory and practice is periodicity, or the structure of training the athletes in the context of a year's competition cycle. The importance of this problem is confirmed by the intense, with a considerable dispersion of opinions, discussion in the scientific, methodological and popular literature in the late 90s. The existing system of periodization of the training processes with its large time intervals cannot be transferred to the training of the elite boxers due to the specifics of their competitions.

The concept of "test starts", which there is in other sports also, in boxing, is relatively contradictory. The threat of a knockout makes the boxer carefully prepare for each competition. A boxer who enters the ring must be ready for everything, regardless of his physical condition and sports form. On one hand, loss to a weaker opponent even of a training fight (sparring) has a significant psychological impact on both: the winning and the losing athlete. On the other hand, it provides "food" for thought to coaches and teammates. And these "rules of the game" are known to all. Therefore, "test starts" should confirm the strength of the strong and the weakness of the weak. If this does not happen, then this is followed by a rethinking of rating values.

An analysis of the competition calendars (AIBA, EABA and Ukraine) shows that the timing of the main international tournaments is relatively stable. European Championships and Olympic Games calendars are usually relatively stable. Participation in the boxing competitions of the national team of Ukraine shows that each individual event is included in a chain of starts in preparation for the "main" competitions. And the countdown of these begins in February by participating in international tournaments (Bulgaria, Germany, Italy, and the Czech Republic), the national championships, etc. This list ends in October - November. Naturally, such tight schedule is not designed for the participation of the same team. Participants vary depending on the goals, objectives and stage of preparation.

The scientific and methodological data indicate that the boxers - members of national team - have $7-10 \pm 2-3$ starts during the calendar year, - excluding matches, rating and miscellaneous fights in the "league" competitions (Degtyarev, Ostyanov 1980).

For a successful performance in the main competitions, the boxer needs to gain necessary competitive experience. Without it is difficult to expect the maximum possible result.

This competitive experience is necessary, first of all, to improve the specialized perceptions of a boxer and equally important, to train mental self-regulation and special physical qualities.

The number of starts in preparation for the main competition should be 12-14 (Koptsev 1990).

Preparation of boxers for participating in competitions is special: an athlete must prepare intensively, with full dedication for each one. This attitude to training is because of a desire of the boxer not only to show a good result, but also to “save” himself avoiding a defeat before the end of the fight “due to obvious advantage” of the opponent, or by knockout. A calendar year in boxing includes several training cycles that are similar in training tasks, volume, dynamics and structure, training tools used and other features. Usually the number of cycles is determined by the number of competitions (tournaments) in the year (Degtyarev, Ostyanov 1980).

Nowadays, there are two main opinions on planning and managing boxer training in the annual cycle: multi-cycle periodization (Degtyarev 1985, 1979), or large-cycle periodization (Nikiforov 1987).

In this book, we are not faced with the task of discussing this issue. Both points of view have positive and negative sides, which should be considered from the perspective of real, practical conditions. For example, a periodization of the season 1998 for the Ukrainian national team can be considered (with some amendments) as a large-scale. The calendar year began with the national qualifiers for the Ukrainian strongest boxers (18-22.02) followed by the European Championship (17-24.05), the World Cup (as a member of the European Team, 13-20.06), participation in the European Cup (23-28.09) and the National Championship of Ukraine (17- 24.10).

The pre-Olympic year of 1999 periodization can be considered (also with some amendments) as a multi-cycle. That calendar year for the Ukraine national team began with a series of international class ‘A’ tournaments: Bulgaria (13-22/02), Germany (3-8/03), Italy (8-14.03), Finland (7-12.04), Spain (19-24.04), Ukrainian Games (15-22.05) and an international tournament in England (21-27.06). The national team completed the first half of the year participating in the World Championships (17.08 – 1.09). In addition, there were such starts as the Ukraine Absolute Championship, the participation of the Ukrainian boxers in two matches with boxers from Cuba, various ‘league’, rating and other competitions. In the second half of 1999, the national team participated in series of licensing tournaments: the Black Sea Cup (5-11.10), international tournaments: Tampere (18-25.10), Bucharest (31- 7.11), Istanbul (15-22.11), and Athens (6-13.12). At these tournaments, the boxers won licenses for the European Championships and Olympic Games of 2000. It is difficult to overestimate the significance of these competitions for each boxer. Almost whole 1999 was full of very important competitions. To prepare for them - for various reasons - required maximum physical and mental return from the boxers. The difficulty also is in planning and management of the training process of the entire team taking into account the concept and strategy of its preparation, as well as taking into account the requirements of individual members, - in centralized camps training and at “home”.

In the scientific and methodological literature, there are three main forms of building training in time: the annual cycle, a large stage cycle and microcycles (Verkhoshansky 1985).

In boxing practice, the four-year cycle (macro) does not yet have its scientific and methodological justification and is, to a great extent, of the theoretical interest.

The large stage is a relatively independent part of the annual cycle, the main and enlarged form of building a training process, organizing microcycles and combining them according to the unity of tasks to work on. Microcycles in this system become a working form of the

training; - from the basic unit of it. Their function is to rationally use the part of the volume of the training attributed to them, in accordance with the targets and general strategy of the large stage.

A one-year cycle of training boxers begins with a vacation that lasts for at least one month (Jeroyan, Khudadov 1971). Then the preparatory period follows taking two months at least. It consists of general and special preparatory stages. After the end of this period, the boxer reaches the "primary" sports fitness and participates in the first competition after the vacation. So the competitions period begins, which lasts about 9 months. During this, participation in the competitions alternates with active rest and preparation for the next competition. The time intervals between the competitions include "micro-stages": transitional (an active recreation) and preparatory. The duration of the active leisure phase depends on the difficulty and intensity of the previous competition and the duration of the preparatory stage and its parts and on the level and difficulty of the upcoming one. Optimally, pre-competition preparation for a major tournament should be about two months. The competitive period in boxing is nine months. Its structure is determined by the number and rank of the competition. The duration of cycles inside the periods is determined by timing of getting and maintaining the high level of fitness.

Practically, athletes can increase the level of specialized physical qualities (strength, speed, endurance, etc.) only due to the total motor activity at the stages of preparation for the next starts. The disadvantages of multi-cycle periodization in boxing are described in sufficient detail in the specialized literature and there is no need to dwell on this. Perhaps reducing the number of cycles and increasing their duration would help optimize the training process. Researches (Nikiforov 1987) prove, "that most successful Soviet boxers were in those periods, when it was possible to reduce the amount of cycles". At that time, the most important competitions "fitted" into a period of 3-6 months. Preparations for them were carried out in a form reminiscent of half-year or one-year cycles. The author indicated that such a construction of training was typical for the 60s, when the competition calendar was not so saturated. Nowadays, using cycles of this duration is very difficult and, in most cases, impossible. The author proposes to apply 2-3 training cycles throughout the year from 2 to 5 months long, or from 3 to 6 months, with fairly pronounced preparatory and competitive periods. A transitional period of about a month is required only after the competition, or after the most important tournament.

A detailed analysis of the periodization in boxing shows that there are no fundamental contradictions in the training systems. All authors identify a period of time (2-3 months), when there are no crucial competitions and call it the preparatory. After the preparatory period, series of more or less responsible competitions follow. This period is usually 5-6 to 9 months and is called competitive.

During the competitive period, the status of competition is of great importance. Some believe that for the each one the boxer should prepare intensively and hard. Others think that, in accordance with the functions and significance of the competitions, they should be distinguished into the main and preparatory.

Similar reasoning is the right of an individual approach of each coach and athlete. On one hand, it's good when a leading athlete passes series of qualifiers without especial mental and physical stress and gets to the "main" ones. But, if a promising athlete has problems in qualifying competitions, then in order to get to the "main ones", naturally he must prepare himself intensely for each of them. Although, we agree with the opinion (Nikiforov 1978) that "preparation for additional competitions should not be too forceful and violate the training system, as a whole aimed at reaching the peak of a sports fitness by the time of the

main ones." Preparation of boxers for specific competitions has "shortened" transitional, preparatory and competitive micro stages, each with specific objectives and training means that are appropriate for this specific competition, this individual athlete and the current stage of preparation in the structure of the annual cycle. All this is called the pre-competitive training of the boxer. During the calendar year, the sportsmen should have an average of 7-10 such stages.

The process of training in boxing is complex and ambiguous. It would depend on the tasks of training at one stage or another, the size and interconnections of the training loads, the calendar of competitions. The ability to use patterns of building a workout taking into account these factors largely determines the effectiveness and ways to improve the training process.

Thus, the structure of the training in a large training cycle is determined by the calendar of competitions and the patterns of development of sports fitness and the duration of its phases.

The influence of the training loads on the sportsmen

Management of the influence of the training loads on an individual is the only way to improve efficiency in elite sportsmen (Verkhoshansky 1988).

In order to ensure optimal training loads at each given stage, it is necessary to evaluate efficiency of the training loads. When assessing, one should use the quantitative and qualitative characteristics of training such as content, volume, intensity and organization.

Quantitative and qualitative responses of an organism to environmental changes depend, first of all, on the initial state of the organism and specific qualities of the environmental changes. The initial state of the athlete is conditioned, on one hand, by his genetic potential, and on the other, by the realization of this potential, - depending on the previous life (including, in particular, the previous training).

This initial state should be assessed not only at the beginning of any stage of preparation, but also before and during each training session, in order to assess the level and direction of changes occurring during this training, and for the purpose of further planning and correction of the training process.

One of the tasks is to choose a form for building the training session. A common form for building a workout is a complex one that solves simultaneously and in parallel a number of training aims and objectives using loads required by predominant directions of the training. The complex form, depending on the tasks and stage of preparation, has its positive and negative sides. For example, heavy complex loads involving the simultaneous improvement of sports technique and special physical fitness can lead to general fatigue. In the conditions of increased volumes and intensive loads, it is difficult to differentiate the effect on specialized sensations. But, if the heavy workloads would have some predominant influence, this can be avoided. It is necessary to look for rational application of loads of a definite training plan, as at separate lesson, so during the whole training stage (Verkhoshansky 1977).

In practice of training elite athletes, a special method of concentration of the loads has been developed at certain stages of training. The principal novelty of this technique is to create a massive training effect on the athlete's body using a high volume of loads effecting in similar way, during a time-limited (up to 2 months) stage. Based on the concept of preparation of the national Ukrainian team for the Olympic Games, a program was developed. At the general physical preparation stage of the preparatory period, a part of this program was the improvement and development of speed-strength qualities involved in boxers punching movements.

When using concentrated loads, there should be a relatively low intensity, since their frequent use leads to an intensification of the training process. Method of the concentrated loads also has disadvantages. It leads to a temporary, but steady decrease in speed-strength indicators, which negatively affects the athlete's special performance and complicates improving technical skills and speed. It was estimated (Filimonov 1989) that concentrated power loads had a negative effect on the athlete's speed. That is why the concentrated power loads should be used mainly during earlier stages of preparation for competitions. The idea is that it should have a long term training effect (LTTE). A group of scientists led by Verkhoshansky came to this conclusion.

The main provisions of the long term training effects (Verkhoshansky 1985) should include the following:

- To achieve LTTE, the main condition is a concentration of large volumes of training loads focused during a time-limited stage influencing the athlete's body in the same way;
- The formation of LTTE includes two phases: the first one is where the right conditions are created and the second one is where the effects are achieved;
- The stronger (in the optimal limits) is the decrease in speed and strength indicators at the stage of the concentrated loads, the higher is the subsequent rise of these indicators during the implementation phase;
- The means used in training should not be intensive;
- A moderate volume general physical work contributes to the implementation of LTTE from the concentrated power training;
- The duration of LTTE is defined by the volume and the duration of the concentrated power training. In principle, the period of steady manifestation of LTTE is equal approximately to the period of the concentrated strength training. In real conditions of training highly qualified athletes, this trend was observed, when duration of the concentrated strength training stage was 4 weeks, or more (up to 12);
- During the period of the LTTE realization, athletes easily tolerate intense loads, but react negatively to large volumes of work. Intensive strength work can be used short-term, as a means of toning the neuromuscular system in preparation for competitions, as well as to maintain the achieved level of speed-strength qualities.

Preparatory period

General preparatory stage

The preparatory period in boxing consists of two relatively independent parts: general preparatory training and special preparatory training. Each has its aims and objectives, which are achieved using different means.

The teaching and training aimed at developing functional (basic) skills using a wide variety of means (running exercises, games, weight lifting, boxing exercises, etc.), as a rule, is not amenable to objective analysis and forecasting. With this approach it is difficult to estimate the potential of the chosen training load and to ensure achievement of the effects required at the particular stage of training. In addition, the recommendations available in the literature do not answer many questions. For example, on the priority of development/improvement of the physical qualities: strength, speed, endurance. In case, when the main direction of development of one, or another quality is chosen, the question rests on the organization of

the training: its distribution in time and how the training loads working in different preferred directions influence one another. The choice of priority of developing "necessary" physical qualities at the general preparatory stage of the preparatory period is of a great importance for further planning of this stage loads.

During the training of the Ukraine team for the Olympic Games, the Coaching Council chose as a priority the development and improvement of the speed-strength (explosive) abilities of the muscles participating in boxers' punching movements.

The task of the stage was to increase the level of general physical training of a special orientation in high-speed power mode by a concentrated method aimed at developing muscle groups of the legs, trunk and arms involved in the blows.

Means of preparation - jumping, jogging exercises with and without loads, running and games, work on gym equipment in various modes. Methods: shock and combined.

The practical implementation of this approach consisted in the development of a specialized set of exercises for the muscles involved in punching movements. For this purpose, 12 exercises were created for the development of muscles of the lower extremities, trunk and arms, and the methodology for their application. The basic training model was as follows:

- preparatory part: duration 20-25 minutes (Heart rate 150-160 beats per min);
- main part: explosive work for the muscles of the legs, arms, and body (the sequence of exercises was changed according to the created scheme): duration 30-40 minutes. (Heart rate 140-150 beats per min). Or work in gym in high-speed power mode: duration 27-30 minutes (Heart rate 160-180 beats per min);
- the final part: sports games, exercises for relaxation, etc. Duration 20 minutes (Heart rate 160-170 beats per min.).

In addition, in the morning and evening workouts, game and running exercises and a boxing school were used. They were aimed at switching the type of activity and, as a rule, were not voluminous.

This direction of work was continued at home, when athletes left training camp. Each boxer was given an individual schedule of loads and sets of exercises for the "home stage".

The specialized test results, conducted on 27 parameters at the end of the stage, revealed a deterioration in the indicators of strength and special endurance (in creatine phosphate and glycolytic ways).

To create the conditions for the emergence of a long-term delayed training effect, it is also necessary to take into account the organization of the subsequent training process. As a rule, after voluminous loads of power or speed-power nature, athletes do not provide for a recovery period sufficient in time. Thus, they significantly reduce the effect of LTTE.

Without restoration of the energy potential, the effectiveness of such training is rather low, and athletes approach the competitive stage with low indicators of the level of special working capacity. During the implementation of the training effect, the body negatively reacts to long-term voluminous work. Particular care should be taken with power loads. Intense and short-term power loads can be used in small volumes.

At other stages of preparation, the chosen direction of work was supported with a change in the organization of the training loads depending on the stage, tasks and objectives. The choice of this direction can be explained by the fact that at the first stage of the preparatory period it is almost impossible to develop the functional base of such qualities as speed and endurance

The first quality – speed – is predetermined genetically and is specific to the individual. Depending on the aims and objectives of training, speed should be maintained at a suitable level.

The development of endurance is associated not only with the improvement of breathing “methods”, but with the functional specialization of skeletal muscles – increasing their strength and oxidative properties.

Special preparatory stage

The structure of the special preparatory stage largely depends on the quantity and quality of work done during the first stage. The concept of “primary level of sports fitness” (the athlete should acquire it by the end of the special preparatory stage) is rather vague and does not have quantitative and qualitative description. The model characteristics that should describe this condition are usually local, characteristic of a specific contingent of athletes, the aims and objectives of the study, the availability and accuracy of instrumental techniques characterizing this condition, etc. In general, the problem of “the level of the sports fitness”, despite of its importance, has not been resolved in the theory and methodology of boxing. The results of numerous studies, when an improvement or deterioration of an indicator, or a block of indicators was recorded cannot yet determine the level of the sports fitness on the startday.

Sports results in boxing depend on a set of indicators, which are often difficult to take into account.

It is logical that the task of the special preparatory stage would be “to increase the level of fitness, to develop special qualities and skills specific to boxers, to acquire the high sports fitness level and to bring athletes to specific competitive activity” (Degtyarev et al. 1979).

The main means of preparation are general developmental exercises of a special orientation, special physical exercises, and special exercises in boxing technique and tactics. The main condition is the proximity, in their physiological, biochemical and biomechanical characteristics (within reasonable limits), to competitive exercises.

I.P. Degtyarev et al. (1979) indicates that physical training at a special preparatory stage is 25-30% of the total time, technical training - 35-45%, tactical training to develop combat skills in conditional battles and boxing with different types and styles partners - 35-40% of the total time.

In addition, at this stage of preparation, comparatively many exercises are done in boxing gym in competitive mode. Conditional and free fights increase the intensity of training.

The special preparatory stage is 3-4 weeks, depending on the timing and significance of the upcoming competitions and, in some cases, can be used as a stage of preparation for them.

Competition period

Features of the structure and content of the pre-competitive stages and their duration depend on the importance of the upcoming competitions and the intensity of the previous ones.

On the basis of assumptions about the main phases of the development of sports fitness, two stages are distinguished in the preparation for specific competitions. The main task on the first stage is the improvement of the boxer’s special physical training, the development of their technical and tactical mastery, and the creation of a good basis for developing the sports fitness.

At the second stage – just before the competition during the special preparatory stage – the

physical training continues, but the main attention is paid to the development of specialized qualities, improvement of technical and tactical skills, and the development of the state of sports fitness. The opinions of many authors about this stage coincide: the second stage is the most important, largely determining the results of the boxers at competitions. The main tasks at this stage are to increase the special readiness of boxers, to practice tactical actions for a fight with a likely opponent and to ensure an optimal neuropsychic state to win.

Some authors distinguish the third stage of the special preparatory, dedicated to maintaining and stabilizing the level of the sports fitness, restoring and preserving physical and nervous energy, or as a stage of special preparation and improvement of individual technical and tactical skills, lasting 14-21 days (Lavrov 1982). The tasks of this stage are to stabilize the elements of boxing technique and tactics, develop speed and pace, psychological preparation, individualization of the sports mastery.

Pre-competition stage

(The direction and structure of training)

Different authors have different opinions on structure of the training prior to competitions. They identify various features in the organization of training loads to achieve the high level of sports fitness. High level of fitness is understood as a complex variable characteristic of the athlete's state reflecting abilities in his chosen sport (Dekhtyarov 1985). According to Volkov (1974), high level of sports fitness can be achieved in two ways: by increasing the functional reserves of the body, or by increasing the efficiency of using these physiological reserves, i.e. using energy for physical loads more efficiently from the point of view of biochemistry.

We (Degtyarev, Ostyanov 1980) made an attempt to diagnose conditions at three stages of preparation: during the preparatory period, in a state of preparedness for the competition (competition period), and within 14 days after the competition. We studied the reactions of the athletes to various doses of physical and mental stress on 67 parameters, divided into 5 conditional blocks: mental (8 coefficients), technical (7 coefficients), general physical (6 coefficients), special physical (from a specialized test - 38 coefficients) and competitive (8 coefficients). Over 13,000 correlations were analyzed. The study was conducted on 138 elite boxers (masters of sport, candidates to masters of sport).

Results were multiple multidirectional links identified both within and between individual blocks. Extensive experimental material made it possible to single out the general and particular characteristics of these links in the correlation matrix.

The general characteristics should include:

1. An increase of the amount of significant correlations during the preparatory period in relation to the state of readiness for competitions (high level of sports fitness) and the post-competitive stage (14 days). Because the number of correlations is higher, they are tighter in the correlations matrix.
2. The state of readiness for competitions (high level of sports fitness) is characterized by a greater number of correlations between blocks of coefficients.

The particular characteristics should include:

- The state of readiness for competitions (high level of sports fitness) is characterized by an increase in the number of correlations between mental functions block - technique block coefficients, as well as general physical coefficients block. It also is characterized by a decrease in the number of correlations between mental functions block and special physical qualities block.

- In the block of special physical qualities coefficients, the state of readiness for competitions (high level of sports fitness) is characterized by less tight links within the block. On the post-competitions stage, the number of links within this block increases.
- High level of sports fitness is characterized by the localization: the amount of links (significant correlations) is less within the blocks and they are less tight. At the same time, amount of links and their tightness increases between the blocks.
- Another tendency was noted on the stage of temporary loss of high level of fitness (14 days after competition): the links inside the blocks are tighter, and simultaneously violations of inter system connections and a decrease in their number.
- Comparing the correlations of athletes' fitness coefficients in the preparatory and competitive periods, we revealed a tendency to an increase in the number of links during the preparatory period.

A few studies carried out in a similar direction, to some extent confirm the tendency we have identified. So (Savchin 2003), among boxers-finalists noted a smaller number of correlations between the mental and physical functions of the body than in boxers who lost earlier. In the studies (Verkhoshansky 1985) is noted that at the stage of higher sportsmanship there is a tendency to reduce the tightness between separate abilities, and that the phenomenon of "skills transfer" does not appear as clearly as before. Conclusions of a research (Zatsiorsky 1970) is that a degree of transfer of physical qualities with an increase in fitness decreases and that the mechanism of interconnections is highly specific.

It is especially important at the last stage of preparation (microcycle) to enable these specific individual abilities, not to "strangle" them with large volumes of loads. The professionalism of the trainer should ensure this/.

General preparatory period. During the first week (microcycle) we work on the development of general physical qualities of a special orientation and improvement in boxing technique and tactics. The first week is characterized by a stability of the quantitative characteristics of the workout: large volumes, medium intensity. Training sessions are complex. Means of general physical training are used: games, athletics, barbell, medicine ball, "work on the road", as well as those of the special physical training: boxing school, conditional fights, improving the speed of movements, perfecting specialized sensations.

The aims of the second week include achieving a high level of general physical fitness and improving speed-power and general endurance. This is achieved via maximum intensity exercises: running, "work on the road", exercises on gym equipment, boxing school.

The third week is characterized by relatively stable high loads in the first half of the week, increasing intensity in the second half of the week to the maximum, simultaneously insignificantly increasing the volume. This is achieved via sports games, "work on the road", improvement of the individual technique, school of boxing, gym exercises, and conditional and free sparrings.

Special preparatory period. The first week (microcycle) of training is devoted to the development of special speed and endurance and the perfecting of special perception and sensory motor development. The volume of training in the first part of this microcycle is high, with exercises of average intensity. This is followed by a wave-like decrease in volume; the intensity stays stable, average. Then the volume and intensity rise high like the next "wave" with a decrease to the next level by the end of the microcycle. Means used during the first microcycle are games, "work on the road", boxing gym, boxing school,

conditional and free sparring.

During the second week athletes should achieve a high level of special and mental endurance, high level of functional regulations and maintenance of the high level of special physical fitness. Training means used in the second microcycle are exercises with a partner (improvement of technical and tactical skills), exercises on boxing equipment in high-speed mode, conventional, or free-style fights and sparrings, boxing school, "work on the road", outdoor activities.

The third preparatory microcycle is to create necessary conditions to accumulate the effects achieved during previous stages via changing quantitative and qualitative characteristics of the training to increase the special speed and endurance and improve specialized perceptions, tactics and technique. The volume of loads in this third microcycle is average, slightly increasing on the second day. The intensity is high, later decreasing to average. Means used: special exercises in pairs and in boxing gym, individual work with the coach, boxing school, active recreation.

High level of sports fitness is characterized by a decrease of the amount of links inside the studied blocks of parameters (intra system correlations) and simultaneous increase between the blocks (inter system correlations).

The large-scale cyclical structure in training

(Approximate training plan)

When realizing the pre-competition training plan, it is necessary to record systematically partial loads of each individual, the volume and intensity of the training means used.

The following plan (direction of work it gives and the duration of the preparatory period) is more consistent with the large cycle periodization, when periods of preparation are long and boxers get ready for an important competition. By this time, boxers already had the necessary competitive experience. A systematic preparation consisting of three stages was following it on. We present the objectives and content of weekly cycles at the three stages of nine-week pre-competition training.

The training program of the national team of Ukraine for major annual competitions

The program consists of three stages. The first stage lasting 21 days was carried out on Crimean Black Sea coast. It was preceded by qualifiers and an active recreation.

The second stage, beginning after 7-days' active recreation, was divided into two sub-stages. One was carried out in the low Carpathian Mountains (around 1200 m), and the second one was carried out at a low altitude (400 m), followed by a return to the middle altitude of Carpathians. The duration of each stage was one micro cycle (seven days).

The third stage of the training was carried out after 7-days' active recreation on the Koncha-Zaspa Olympic sports base, Kiev. The duration of this stage was 21 days.

The 1st stage – general training

Main objectives and means to achieve:

1. The improvement of special physical qualities by means of general physical training and "work on the road".
2. Achieving a high level of body's functional capabilities in aerobic conditions. Means are: running and games, special exercises with a partner and in boxing gym.

3. The improvement of special physical qualities in exercises with weights and specialized training.

The 1st week of the first stage (Fig. 35)

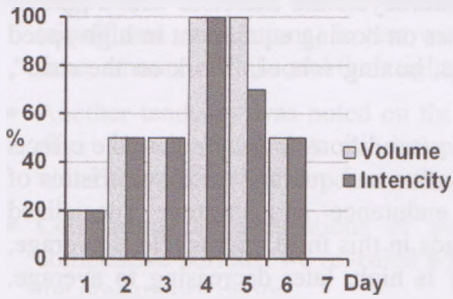


Fig. 35. A chart of the training loads and intensity during the first week of the first period of the preparatory training

Monday. Arrival of sportsmen and coaches. Meeting of participants and trainers to familiarize with the aims and objectives of the training camp. Daily regimen.

Evening. Russian steam bath, massage.

Tuesday. An average volume and intensity training:

Early morning (before breakfast). A walk. General physical exercises. Boxing school: combinations of techniques in attacking and counterattacking actions of boxers. Duration 40- 50 min.

Late afternoon - early evening (before dinner). Running on rough terrain at an average pace (heart rate of 140-160 beats per minute). Duration 40 min.

Wednesday. An average volume and intensity training.

Early morning (before breakfast). A walk. General physical exercises: "work on the road", repeated jumps on one leg. Duration 40 min.

Early afternoon (before lunch). Football – two periods for 20 min (heart rate of 170-180).

Late afternoon - early evening (before dinner). Development of special physical qualities. Exercises with weights: barbell, kettle bell. Duration: 60 min.

Thursday. High volume and intensity training.

Early morning (before breakfast). A walk. General exercises. Boxing school: punches combinations in attacking actions. Duration 40-60 min.

Early afternoon (before lunch). Control of the parameters characterizing general and special physical conditions: measurements and recording. Duration 90 min.

Late afternoon - early evening (before dinner). Free style swim, games (heart rate of 150-160). Duration 50 min.

Friday. High volume and higher than average intensity training.

Early morning (before breakfast). A walk. General exercises. Movements in pairs, resistance exercises with a partner. Speed development using special exercises. Duration 60 min.

Early afternoon (before lunch). Running 10 km at a uniform pace

Saturday. An average volume and intensity training.

Early morning (before breakfast). A walk. General exercises. Boxing school: punches combinations in attack actions, "work on the road". Duration: 60 min.

Monday afternoon (before lunch). A development of special physical qualities (complex of exercises). Duration 90 min.

Tuesday. *Early morning (before breakfast).* A morning walk. General exercises. Recreation activities. Russian steam bath. Massage.

The 2nd week of the first stage (fig. 36)

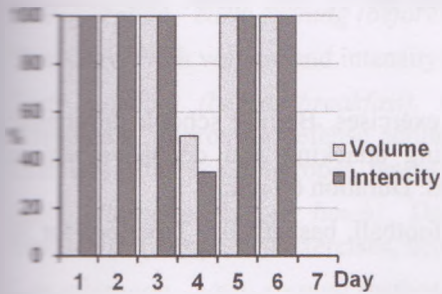


Fig. 36. A chart of the volumes and intensity during the second week of the first stage

Monday. High volume and intensity training.

Early morning (before breakfast). A walk. General exercises. Boxing school: punches combinations in attacking and counterattacking actions, perfecting the speed of movements in special exercises, individual work with the coach on pads. Duration 60-70 min.

Early afternoon (before lunch). Competitive games (football, basketball) – 2 periods for 30 min (heart rate of 180-190).

Late afternoon - early evening (before dinner). Free style swimming for 30 min.

Tuesday. High volume and intensity training.

Early morning (before breakfast). A walk. General exercises. Boxing school: improving defenses, perfecting the defense actions in one line, or in pairs. Duration 40 min.

Early afternoon (before lunch). Competitive games (football, basketball) – 2 periods for 30 min (heart rate of 150-160).

Late afternoon - early evening (before dinner). Developing general physical qualities: working with weights (complex of exercises). Free style swimming – 30 min.

Wednesday. High volume and intensity training.

Early morning (before breakfast). General exercises. "Work on the road" with stones, skipping ropes, tennis balls. Boxing school: resistance in pairs, boxing movements, individual work with a coach on pads. Duration 60 min.

Early afternoon (before lunch). Games (basketball, rugby) – 2 periods for 30 min. (heart rate 150-160).

Late afternoon - early evening (before dinner). Free style swimming – 30 min.

Thursday. An average volume and above low intensity training.

Early morning (before breakfast). A walk. General exercises. Boxing school: combination of defense and attack techniques – counterattack in response. Duration 60 min.

Early afternoon (before lunch). Development of general physical qualities, exercises with weights (complex of exercises, heart rate 140-150). Duration 90 min.

Late afternoon - early evening (before dinner). Free style swimming – 30 min.

Friday. High volume and intensity training.

Early morning (before breakfast). A walk. General exercises, "work on the road". Resistance exercises in pairs. Individual work with a coach on pads. Duration 60 min.

Early afternoon (before lunch). Developing speed strength qualities in special exercises. Imitation exercises with various weights. Gym exercises with accelerations (complex exercises). Mobility and sports games – two periods for 15 min (heart rate 150-160). Duration 90 min.

Saturday. High volume and intensity training.

Early morning (before breakfast). A walk. General exercises. Boxing school: developing speed of movements in special exercises, improving attacking and defensive actions required in a fight with boxers of various combat styles. Duration 60 min.

Early afternoon (before lunch). Competitive games (football, basketball – 2 periods for 30 min (heart rate 150-160).

Late afternoon - early evening (before dinner). Developing special physical qualities. Weights exercises (complex of exercises, heart rate 140-160). Duration 60 min.

Sunday. A morning walk. Recovery activities. Russian steam bath. Massage.

The 3rd week of the first stage (fig. 37)

Monday. An average volume and intensity training.

Early morning (before breakfast). A walk. General exercises. Boxing school: improving false movements' technical and tactical actions, improving speed. Individual work with a coach on pads. Duration 60 min.

Early afternoon (before lunch). Developing special physical qualities. Weights exercises (complex of exercises - heart rate 170-180). Duration 90 min.

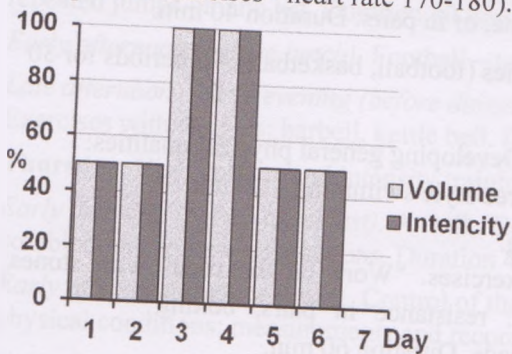


Fig. 37. A chart of the volumes and intensity of training during the 3rd week of the 1st period

Late afternoon - early evening (before dinner). Free style swimming – 30 min.

Tuesday. An average volume and intensity training.

Early morning (before breakfast). A walk. General exercises. Developing speed in pairs using special exercises. Games with tennis balls and skipping ropes. Duration 40 min.

Early afternoon (before lunch). Developing speed and strength qualities using special exercises. Imitation exercises with various weights on arms and legs (training speed and step length) using the shock method. Gym exercises: 4 attempts of 3 min and 7 attempts of 1.5 min. Duration 90 min.

Wednesday. High volume and intensity training.

Early morning (before breakfast). A walk. General exercises. Boxing school: improving attack and counterattack techniques, individual work with coach on pads. Duration 60 min.

Early afternoon (before lunch). Competitive games (football, basketball) – 2 periods for 30 min (heart rate 150-160). Gymnastics exercises for relaxation. Duration 90 min.

Late afternoon - early evening (before dinner). Free style swimming – 30 min.

Thursday. High volume and intensity training.

Early morning (before breakfast). A walk. General exercises. Improving speed of movements. Improving defense actions in special exercises. Resistance exercises in pairs. Exercises using skipping ropes, tennis balls and such. Duration 40 min.

Early afternoon (before lunch). Developing speed-strength qualities of the punching movements (complex of exercises, heart rate 160-170). Duration 90 min.

Late afternoon - early evening (before dinner). Free style swimming – 30 min.

Friday. An average volume and intensity training.

Early morning (before breakfast). A walk. General exercises. Individual work with coach on pads. Duration 30-40 min.

Early afternoon (before lunch). Cross-country running on rough terrain 5-7 km. Duration 90 min.

Late afternoon - early evening (before dinner). Free style swimming – 30 min.

Saturday. An average volume and intensity training.

Early morning (before breakfast). A walk. General exercises. Boxing school: improving punches technique (jabs, hooks, uppercuts and combinations) in attacking, counterattacking and encounter forms. Duration 40 min.

Early afternoon (before lunch). Developing special physical qualities. Exercises with weights (complex of exercises, heart rate 140-150). Duration 90 min.

Sunday.

Early morning (before breakfast). A walk.

Early afternoon (before lunch). Recovery activities. Russian steam bath. Massage.

The second stage: special physical training and improvement of technical and tactical mastery

The second stage begins after a seven day rest period. It is structured as follows: daily walks, sports games, the improvement of individual tactical and technical mastery with a coach - 30-40 min, two or three times (average closer to high intensity). The main objectives on this stage:

1. Achieving maximum level of functional abilities via general and special training.
2. Improving individual technical and tactical mastery.

The main means of the training:

1. General exercises (running, sports games, etc.) performed in the midlands (1200 m).
2. Special physical training (special exercises with weights), gym exercises performed in various modes in conditions of midlands (heart rate 180-190).
3. Improvement of individual technical and tactical mastery with a partner at low altitude (400 m). The aim is to maximize the speed of individual punches. Boxing gym exercises should be performed with 180-200 heart rate.

The 1st week of the second stage (fig. 38)

Monday. An average volume and intensity training. Arrival of athletes and coaches.

Early afternoon (before lunch). A walk in the mountains, ascent – 30 - 40 min.

Late afternoon - early evening (before dinner). Russian steam bath, massage – 60 min. General meeting. Introduction to aims and objectives.

Tuesday. An average volume and intensity training.

Early morning (before breakfast). A walk. General exercises, "work on the road". Duration 40 min.

Early afternoon (before lunch). Comprehensive examination of boxers' condition by an integrated scientific group. Tests are performed at heart rate 180-190.

Late afternoon - early evening (before dinner). Uniform running 30-40 minutes at an average pace (heart rate 160-170). Duration 30 - 40 min.

Wednesday. High volume and intensity training.

Early morning (before breakfast). A walk. General exercises. Boxing school: developing speed in special exercises with and without weights. Duration 60 min.

Early afternoon (before lunch). Boxing gym exercises: 7 attempts of 1.5 min, 3 attempts of 4 min (heart rate 170-180). Weights exercises: barbells, kettle bells, medicine balls (complex of exercises). Duration 90 min.

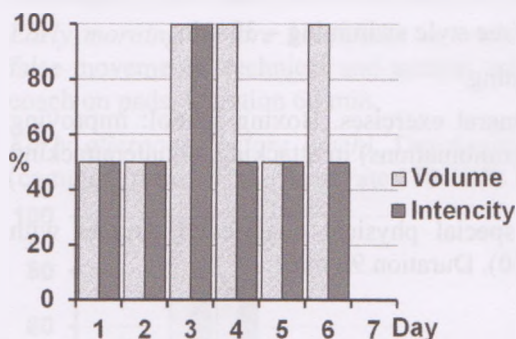


Fig. 38. A chart of the volume and intensity of training during the 1st week of the 2nd period

Late afternoon - early evening (before dinner). Fast walk to Hoverla Mountain (2062 m). Duration 1 hour.

Thursday. High volume and average intensity training.

Early morning (before breakfast). A walk. General exercises. Boxing school. Duration 40 min.

Early afternoon (before lunch). Gym exercises: seven attempts of 2 min, three - 4 min. Individual work with a coach on pads 20-30 min (heart rate 180-190). Duration 90 min.

Late afternoon - early evening (before dinner). Developing special physical qualities. Special exercises with weights: all types of punches with weights 200-500 g – 1.5 min each for left and right hands and the same in sitting position. Exercises with medicine balls in the explosive mode, with ropes and expanders, resistance exercises in pairs. Russian steam bath, massage, recovery. Duration 60 min.

Friday. An average volume and intensity training.

Early morning (before breakfast). A walk. General exercises. Boxing school: combinations of punches in the attacking actions. Duration 40 min.

Early afternoon (before lunch). Cross-country running on rough terrain – 40 min.

Mountain ascent 2062 m (heart rate 140-160) – 140 min.

Saturday. High volume and average intensity training.

Early morning (before breakfast). A walk. General exercises, "work on the road".

Jumping on one and both legs. Wrestling with a partner. Duration 60 min.

Early afternoon (before lunch). Developing specific physical qualities. Exercises with
rope, expanders and medicine balls performing specific tasks (no less than 5 stations).

Exercises with weights (complexes, heart rate 170-180). Duration 90 min.

Late afternoon - early evening (before dinner). Games (football, basketball) – two
periods of 20 min (heart rate 170-180).

Sunday. Move to Ivano-Frankivsk. Russian steam bath, recovery.

The 2nd week of the second stage (fig. 39)

Monday. An average volume and intensity training.

Early morning (before breakfast). A walk (light jogging). General exercises. Boxing school:
punch combinations in counterattacking actions. Duration 60 min.

Early afternoon (before lunch). Improving individual technical and tactical mastery
working with a partner: six rounds for 3 min (heart rate 160-170). Gym exercises – 3
attempts for 3 min (heart rate 180). Duration 90 min.

Late afternoon - early evening (before dinner). Free style swimming – 30 min.

Tuesday. High volume and intensity training.

Early morning (before breakfast). A walk. General exercises. Individual work with a coach
on pads. Duration 40 min.

Early afternoon (before lunch). Improving technical and tactical mastery in a
conditional fight – 4 rounds for 3 min. Working on the favorite combinations – 4 rounds for
3 min. Gym exercises– 3 attempts for 3 min (heart rate 170-180). Duration 90 min.

Late afternoon - early evening (before dinner). Games (basketball, football) – 2 periods of
20 min each.

Wednesday. High volume and intensity training.

Early morning (before breakfast). A walk. General exercises, "work on the road". Duration
50-60 min.

Early afternoon (before lunch). Improving technical and tactical mastery in a
conditional fighting – 4 rounds for 3 min (heart rate 180-190). Working on the favorite
combinations with a partner – 4 rounds for 4 min (heart rate 170-180). Gym exercises –
3 attempts of 3 min each, or on pads with a coach. Duration 90 min.

Late afternoon - early evening (before dinner). Free style swimming – 20-30 min.

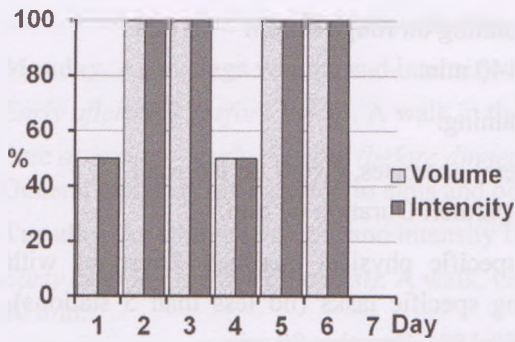


Fig. 39. A chart of the volume and intensity of training during the 2nd week of the 2nd period

Thursday. An average volume and intensity training.

Early morning (before breakfast). A walk. General exercises. Special exercises to develop legs' speed (speed strength work), long jumps, deep jumps, shuttle movements changing rhythm, etc. Duration 30-40 min.

Early afternoon (before lunch). Developing special physical qualities. Weights exercises (Complex of exercises, heart rate 150-170). Duration 90 min.

Late afternoon - early evening (before dinner). Russian steam bath, recovery, massage.

Friday. High volume and intensity training.

Early morning (before breakfast). A walk. General exercises. Boxing school: perfecting tactics of performing attacks and counterattacks. Duration 40 min.

Early afternoon (before lunch). Gym exercises on. Developing special endurance using special exercises (complex of exercises). Individual work with a coach (heart rate 170-180). Duration 90 min.

Late afternoon - early evening (before dinner). Developing special strength in circular training - no less than 6 stations (heart rate 170-180). Duration 60 min.

Saturday. High volume and intensity training.

Early morning (before breakfast). A walk. General exercises, "work on the road" (throwing stones, resistance in pairs, etc.). Specific exercises develop speed of boxing movements. Duration 60 min.

Early afternoon (before lunch). Games (basketball, football) – two periods of 20 min (heart rate 150-160). Weights (complex of exercises, heart rate 140-150). Duration 90 min.

Late afternoon - early evening (before dinner). Free style swimming – 30 min.

Sunday. Move to mountains ("Zarosliak" training camp). Russian steam bath. Recovery.

The 3rd week of the 2nd stage (fig. 40)

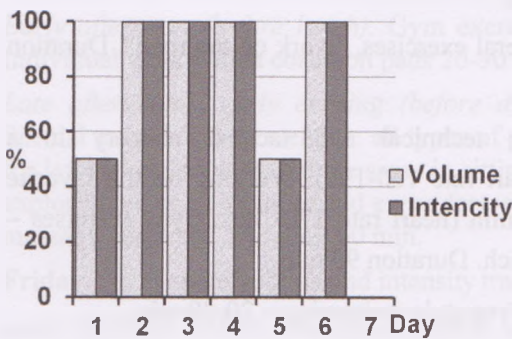


Fig. 40. A chart of the volume and intensity of training during the 3rd week of the second period

Monday. An average volume and intensity training.

Early morning (before breakfast). A walk. General and special exercises. Boxing school: improving attacking and defensive actions required in a fight with boxers of various combat styles. Duration 60 min.

Early afternoon (before lunch). Cross-country running on rough terrain with varying intensity and altering speed to suit conditions, no less than 30-40 min. Total running time – 40 min (heart rate 150-160).

Late afternoon - early evening (before dinner). Games (volleyball, badminton, tennis: heart rate 140-150). Duration 40 min.

Tuesday. High volume and intensity training.

Early morning (before breakfast). A walk. General and special exercises. Individual work with a coach on pads. Duration 60 min.

Early afternoon (before lunch). Gym exercises: 3 attempts of 2 min with accelerations, two 5- 7 second intervals of acceleration per each minute (heart rate 180-190). Improving technical and tactical mastery working with a partner - 8 rounds. Of these 8, four rounds of 3 min on the instruction of coach, followed by four rounds of 3 min working on individual instructions (heart rate 180-190). Duration 90 min.

Late afternoon - early evening (before dinner). Events (entertainment, lectures, etc.) Duration 60 min.

Wednesday. High volume and intensity training.

Early morning (before breakfast). A walk. General and special exercises. Improving speed using specific exercises. Duration 40 min.

Early afternoon (before lunch). Developing special physical qualities using the shock method in special exercises. Training punches with and without weights. Developing strength of the muscles unbending legs using jumps: in length, in depth, followed by jumping out of the depth. Duration 90min.

Late afternoon - early evening (before dinner). Games (basketball, football) – 2 periods of 20 min.

Thursday. High volume and intensity training.

Early morning (before breakfast). A walk. General and special exercises. Boxing school: improving techniques and tactics in the attacking and counterattacking. Duration 60 min.

Early afternoon (before lunch). Competitive games (football, basketball) – 2 periods of 30 min (heart rate 150-160).

Late afternoon - early evening (before dinner). Developing special physical qualities using exercises complexes. Duration 60 min.

Friday. An average volume and intensity training.

Early morning (before breakfast). A walk. General and special exercises. Boxing school: perfecting tactics in attacking and counterattacking actions. Punching movement performed with stones. Duration 60 min.

Early afternoon (before lunch). Comprehensive examination of participants by an integrated scientific group:

- specialized testing in high-speed power mode;
- verification of compliance with the standards for special physical and general physical fitness.

Late afternoon - early evening (before dinner). Games (football) – 2 periods of 30 min (heart rate 150-160).

Saturday. High volume and intensity training.

Early morning (before breakfast). A walk. General and special exercises, "work on the road". Duration 40 min.

Early afternoon (before lunch). Developing of special physical qualities using shock method. Sets of speed-strength exercises. Duration 60 min.

Late afternoon - early evening (before dinner). Walking at a steady pace. Ascent to Hoverla Mountain (2062 m). Duration 90 min.

Sunday

Russian steam bath. Recovery. Departure of the participants.

The third stage: perfecting individual techniques and tactics

The main focus at this stage is an in-depth specialized training, improving the individual technical and tactical skills working with a partner and in boxing gym.

The third stage is preceded by a 7-day active vacation at home. Participants are suggested to do daily walks, include individual special exercises such as in school of boxing movements changing rhythm, punches in the attack and counterattack actions. Games should be played 2- 3 times. Swimming. Recovering massage, restorative shower, Russian steam bath.

Work with a partner, or individual work with a coach during a "home pause" is not recommended.

The main tasks of the third stage:

1. Achieving the maximum level of functional capabilities of the body in the anaerobic and aerobic modes of work.
2. Improving individual technical and tactical mastery of the boxers. Bringing athletes to a state of ready to fight and high mental stability (high level of sports fitness).

The 1st week of the third stage (fig. 41)

Monday. An average volume and intensity training.

Early morning (before breakfast). The athletes arrive.

Early afternoon (before lunch). Games (basketball) – 2 periods of 30 min.

Late afternoon - early evening (before dinner). Russian steam bath, recovery.

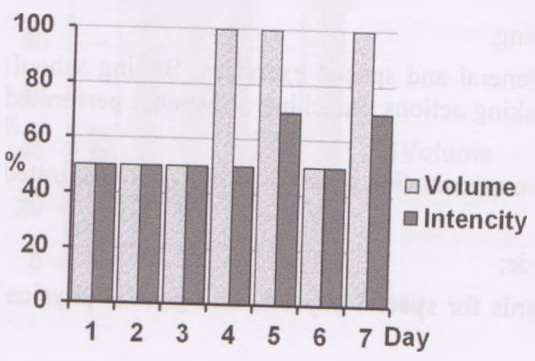


Fig. 41. A chart of the volume and intensity of training during the 1st week of the third period

Tuesday. An average volume and intensity training.

Early morning (before breakfast). A walk. General and special exercises. Boxing school: improving technique and speed. Punch combinations in tactical actions of getting into, or out of the punching distance. Duration 60 min.

Early afternoon (before lunch). Examination of the athletes by a complex scientific group. Afterwards, gym exercises: 3 attempts of 3 min (free style). Duration 90 min.

Late afternoon - early evening (before dinner). Improving individual technical and tactical mastery working with a coach on pads. Duration 40 min.

Wednesday. High volume and average intensity training.

Early morning (before breakfast). A walk. General and special exercises, "work on the road". Duration 40 min.

Early afternoon (before lunch). Improving technical and tactical mastery working with a partner: 8 rounds of 3.5 min. Gym exercises: 3 attempts of 2 min. Final exercises: stretches, etc. (heart rate 170-180). Duration 90 min.

Late afternoon - early evening (before dinner). Games (basketball) – 2 periods of 30 min. (heart rate 140-150).

Thursday. High volume and higher than average intensity training.

Early morning (before breakfast). A walk. General and specific exercises. Running with accelerations: 10 accelerations of 15 meters each. The school of boxing. Duration 60 min.

Early afternoon (before lunch). Conditioned sparring with different - light and heavy - partners— 3 rounds of 3.5 min. Gym exercises – 4 attempts: two of 1 min and two of 2 min: the 1st attempt – 2 min; the 2nd – 1 min; the 3rd – 2 min; the 4th – 1 min (heart rate 170-180). Duration 90 min.

Late afternoon - early evening (before dinner). Russian steam bath, massage, recovery.

Friday. An average volume and intensity training.

Early morning (before breakfast). A walk. General and special exercises, "work on the road". Duration 40 min.

Early afternoon (before lunch). Improving special physical fitness using complexes of exercises, the circular method. Games (football) – 2 periods of 30 min (heart rate 150-160). Duration 90 min.

Late afternoon - early evening (before dinner). Improving individual technical and tactical mastery with a coach on pads. Duration 40 min.

Saturday. High volume and higher than average intensity training.

Early morning (before breakfast). A walk. General and special exercises. Boxing school: punch combinations in attacking and counterattacking actions. Duration 60 min.

Early afternoon (before lunch). Improving individual technical and tactical mastery with a coach – 10 rounds of 3 min. Gym exercises – 3 attempts of 1.5 min.

Late afternoon - early evening (before dinner). Theory lesson. Analysis of technical and tactical mastery of the future opponents, their individual features and personality.

Sunday. A boat trip along the river Dnieper.

The 2-nd week of the third stage (fig. 42)

Monday. High volume and an average intensity training.

Early morning (before breakfast). A walk. "Work on the road". Duration 60 min.

Early afternoon (before lunch). Improving technical and tactical mastery with different weight partners: 8 rounds of 3 min. Gym exercises – 3 attempts of 2 min (heart rate 130-190). Duration 90 min.

Late afternoon - early evening (before dinner). Improving special physical fitness using complexes of exercises, heart rate 150-160. Duration 40 min.

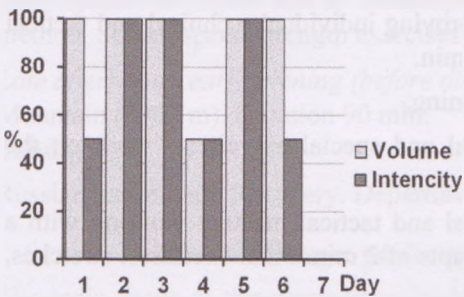


Fig. 42. A chart of the volume and intensity of training during the 2nd week of the third period

Tuesday. High volume and intensity training.

Early morning (before breakfast). General and special exercises. Working with a coach on pads. Duration 60 min.

Early afternoon (before lunch). Sparring. Gym exercises – 3 attempts of 2 min (heart rate 190-220). Individual work with a coach. Duration 90 min.

Late afternoon - early evening (before dinner). Improving special physical fitness. Weight exercises (complexes). Duration 60 min.

Wednesday. High volume and intensity training.

Early morning (before breakfast). A walk. General and special exercises. Individual work with a coach on pads. Duration 60 min.

Early afternoon (before lunch). Theory: analysis of fights. Watching videos. Duration: 40 min.

Late afternoon - early evening (before dinner). Sparring. Gym exercises – 3 attempts of 2 min. Improving special physical fitness. Duration 90 min.

Thursday. An average volume and intensity training.

Early morning (before breakfast). A walk. General and special exercises. School of boxing: improving tactics of the attacking and counterattacking actions. Duration 60 min.

Early afternoon (before lunch). Improving individual technical and tactical mastery working with a coach on pads. Games (basketball) – 2 periods of 20 min. Duration 90 min.

Late afternoon - early evening (before dinner). Russian steam bath. Massage, recovery.

Friday. High volume and intensity training.

Early morning (before breakfast). A walk. General and special exercises. Individual work with a coach on pads. Duration 40 min.

Early afternoon (before lunch). Improving technical and tactical mastery with a partner – 6 rounds of 3 min. Gym exercises – 4 approaches of 2 min. Improving special physical fitness (complexes of exercises, heart rate 180-190). Duration 90 min.

Late afternoon - early evening (before dinner). Games (basketball) 2 periods of 30 min. Developing general physical fitness. Duration 60 min.

Saturday. High volume and an average intensity training.

Early morning (before breakfast). A walk. General and special exercises, "work on the road" (heart rate 150-160). Duration 40 min.

Early afternoon (before lunch). Improving individual technical and tactical mastery with a coach on pads. Developing special physical fitness using complexes of exercises, heart rate 170-180. Duration 60 min.

Late afternoon - early evening (before dinner). Improving technical and tactical mastery with a partner. Free and conditioned sparrings – 5 rounds of 3 min with partners of different weight categories and styles (swapping partners in each round). Gym exercises – 3 attempts of 2 min (heart rate 180-190). Duration 90 min.

Sunday. Recovery. Russian steam bath, massage. Events.

The 3rd week of the third stage (fig. 43)

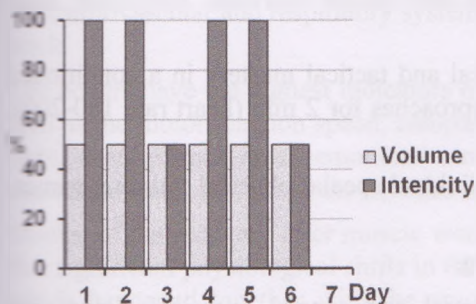


Fig. 43. A chart of the volume and intensity of training during the 3rd week of the third period

Monday. An average volume and high intensity training.

Early morning (before breakfast). A walk. General and special exercises, "work on the road". Duration 40 min.

Early afternoon (before lunch). Improving technical and tactical mastery working with a partner in conditional sparring – 4 rounds of 3 min. Sparring following individual instructions

4 rounds of 3 min. Gym – 2 attempts of 2 min (heart rate 180-200). Duration 90 min.

Late afternoon - early evening (before dinner). Theory: An analysis of the technical and tactical features and the styles of the future opponents. Duration 40 min.

Tuesday. An average bulk and high intensity training.

Early morning (before breakfast). A walk. General and special exercises. Boxing school: technique and tactics of the short straight punches and hooks. Duration 40 min.

Early afternoon (before lunch). Comprehensive examination of boxers using special tests. After it, individual exercises on the punch bag – 2 attempts of 2 min. Special physical training (heart rate 170-180). Duration 90 min.

Late afternoon - early evening (before dinner). Developing individual technical and tactical mastery with a coach on pads (heart rate 160-170). Duration 40 min. Russian steam bath, massage, recovery.

Wednesday. An average volume and intensity training.

Early morning (before breakfast). A walk. General and special exercises, "work on the road". Duration 40 min.

Early afternoon (before lunch). Improving individual technical and tactical mastery and conditional sparring with a partner – 6 rounds of 3 min. Gym exercises: 2 attempts of 2 min (heart rate 180-200). Improving individual technical and tactical mastery with the coach on pads. Duration 60 min.

Thursday. An average volume and high intensity training.

Early morning (before breakfast). A walk. General and special exercises, "work on the road". Duration 40 min.

Early afternoon (before lunch). Games (basketball) – 2 periods of 20 min (heart rate 160). Gym exercises on individual instructions. Duration 90 min.

Late afternoon - early evening (before dinner). Individual work with a coach on pads. 20-30 min. Russian steam bath, recovery.

Friday. An average volume and high-intensity training.

Early morning (before breakfast). A walk. General and special exercises. Individual work with a coach. Duration 40 min.

Early afternoon (before lunch). Improving technical and tactical mastery in a conditional sparring – 4 rounds of 3 min. Gym exercises: 3 approaches for 2 min (heart rate 180-200). Duration 50-60 min.

Late afternoon - early evening (before dinner). Individual special physical training, games. Duration 40 min.

Saturday. An average volume and intensity training.

Early morning (before breakfast). A walk. General and special exercises. Improving technical and tactical mastery with a coach. Duration 40 min.

Early afternoon (before lunch). Improving technical and tactical mastery with a partner and/or a coach on individual instructions, gym exercises (heart rate 180-200). Duration 90 min.

Features of the multi-cycle training system

(Approximate training plan)

As was mentioned above, such large (in terms of time and volume of physical activity) stages of training do not always take place in a reality for objective reasons (lack of sufficient funding, a tight calendar of competitions, etc.) If it is the case, a system of multi-cycle periodization of training boxers should be followed.

One of the features of multi-cycle periodization is to take into account the recovery of boxers after competitions.

Based on the data on the dynamics of the recovery of physical and mental indicators, objective planning of the training process is possible in order to "bring" athletes to the next starts

The rehabilitation of athletes after high physical loads

Researches of many authors have proved that at present there is no necessary clarity on the duration of recovery processes after training and/or competitions. Local, regional, and global effects on functional abilities and energy reserves are not clear. New forms of training planning have not been sufficiently demonstrated. There are no clear ideas about the readiness of different systems for energy exchange, or of various muscle structures for coping with repeated training. This poses a problem when planning a training plan to follow

heavy training or competition. In these cases, it is important to form an accurate estimation of how

training and competition correspond with the state of the athlete's body. The efficiency of the training process and, consequently, the development of results depend on this.

Training and competition impact on the cardiovascular, muscle and mental systems of the athlete.

Under competitive conditions, the heart systole rate increases to $190,8 \pm 8,0$ contractions per minute from the second minute of the first round and successively increasing reaches the maximum around 202.0 ± 7.0 by the end of the third round. Systolic blood pressure raises by 20-55 mmHg, the diastolic falls simultaneously. Energy expenditure accounts for 200 kcal over three rounds. Breathing rate reaches 40-60 cycles per min, lung ventilation – 90 liters per min, oxygen consumption – up to 2.3 liters per min.

Boxing makes sufficient demands on the system of oxygen supply. The biggest changes in the cardiovascular and respiratory systems are caused by sparring, free fights and punch bag work.

The boxers have the highest indicators of excitability and lability of the nervous system, as well as the motor reaction speed, comparing with the athletes from other sports. During the fight, a significant neuro-emotional stress is noted which makes great demands on the central nervous system and the nervous regulations of the vegetative functions of the body.

Studies of the recovery after muscle work associated with strong emotional stress indicated that significant physiological shifts in the vegetative and somatic spheres of the human body which happened together with the emotional arousal, by virtue of its inertia, leaves an imprint on the course of the recovery period and lengthen it compared with the recovery time after muscle work not related to intense emotions.

The process of recovery after heavy physical loads is extremely complicated. The duration of the recovery is of a phase nature. It has its own characteristics in physiological, biochemical and pedagogical researches. Dakhnovsky (1979) studied the influence of the heavy physical loads on the sportsman's body before and during seven days afterwards. It was estimated that even on the seventh day, normal work ability was not restored. According to subjective estimates of the athletes themselves, recovery occurred on the day 4-5. The author suggests necessary to reduce the intensity of the training for 4 - 5 days after the heavy loads, since average loads of a specific nature during this period cause the same shifts of the internal environment as the large ones.

Ostyanov (1980) studied the influence of boxing competitions and revealed several characteristic features. It is difficult to identify a distinctive boundary between physical and emotional stress by any objective method during the competition; that is why they estimated the physical work rate by the quantity of protein in the blood. Emotional stress was studied by changes in blood sugar. We studied the dynamics of indicators after the first, second and third fights. The recovery of the identified changes was studied on the first and third days of rest after the last fight. The number of fights for each participant was taken into account. Studies have shown that for the first fight, the leading indicator was the one reporting the emotional stress: the sugar in the blood level increased by 1.5 times and did not return to normal on the following day. The increase of the protein in the blood remained within the normal range. On the second day after the first fight, the quantity of protein remained stable.

After the second fight, there was a balance between physical and emotional stress: with a decrease in sugar level there was an increase in the level of protein in the blood.

In the third competitive fight, the predominance of physical fatigue against a slight emotional stress was quite obvious.

The period of restoration of the functional state of boxers should be identified individually, taking into account the readiness of individual athlete for the specific competition.

However, even on the third day, the athletes who had 3 fights did not have a complete recovery of the studied indicators, comparing to the background measurements (2 days before the start of the competition). It should be noted that the process of recovery of the physical work ability was longer than the emotional stability. The recovery of the blood sugar depended on the character of each fight.

Summarizing the foregoing, we can highlight the fact that recovery processes after heavy loads are uneven, phased and heterochronous for the different body systems.

The recovery period after muscle work associated with strong emotional arousal lasts longer than after the same work not related to an emotional stress. At the same time, during many days of competitive battles, physical fatigue prevails against a background of slight emotional tension.

Degtyarev et al. (1978) interviewed 80 highly qualified coaches and 217 athletes. 2 questions were asked on

1. The time intervals of rest after competitions.
2. Structure of the post-competition training.

The questionnaire aimed to reveal whether the boxers rest after competition. The answers were affirmative. Moreover, it was discovered that many athletes also rest after the first lost fight. 81% of coaches questioned advised their athletes not to come to the gym immediately after defeat. 67.5% of athletes, members of the national team, also noted that they rest after the first defeat.

In the methodology of training boxers, the post-competition stage has an unwinding, recovery, or supporting orientation.

The planned structure of training after competitions is of a great importance. When planning, in our opinion, the training loads and their orientation in each particular training session and during the whole stage are important. An analysis of the questionnaire showed that the coaches disagree on the direction of training during a short period between competitions: 41.4% of coaches questioned chose general physical training, 41.2% - combined one and only 12.3% favor specialized physical training and 5.2% use special technical and tactical sessions. Athletes choose a focus on general physical training (72.5%) and, to a lesser extent, combined one (27.5%). The focus of the training on improving technique and tactical skills is not so popular among athletes (2%), or coaches (5.4%) post-competition.

Questioned about the volume and intensity of training at post-competition stage, the coaches unanimously advised average ones.

A post-competition type of rest is very important, when planning training of boxers. 3.5% of questioned coaches prefer passive rest at this stage, 96.5% prefer active one including morning walks and games. 7% of coaches prefer a cross-country running.

On the subject of length of intervals of rest at the post-competition stage, most coaches were inclined to believe that three days' after the first lost fight were required. After 3-4 fights, depending on how hard they were, the athletes rested for 6 to 9 days.

The results of the questionnaire survey confirmed the opinion that in the practice of sports there was a post-competitive stage with its own features in direction, duration and structure of training. The planning of training sessions at the post-competitive stage should be based on the patterns of dynamics of fitness indicators.

Experimental results show that the physical and mental fitness indicators of boxers at the post-competitive stage change in different directions, while maintaining individual dynamics. So, the majority of indicators of mental functions and speed of punches approach the state of competition fitness by the 7th day of the post-competitive stage. The absolute values of the specialized performance indicators measured in a specialized tests approach the state of readiness for competition at different times. For example, indicators of normal work (20 seconds intervals) are close to pre-competition values on the 7th day after the competition, but indicators of 10 seconds work - on the 14th day. 20 second intervals in a specialized test are performed at a natural pace, but 10 second intervals at maximum speed, when working on a testing punch bag.

Studies of the dynamics of restoration of the special performance at the post-competitive stage revealed a significant deterioration in performance (20- and 10-second intervals) on the 1st day post-competition, and their recovery at different times. So, the indicators of 20-second intervals approached the pre-competition level by the 7th day and then remained almost unchanged until the end of the post-competitive stage (14 days). A slightly different was the dynamics of the restoration of indicators of 10-second intervals. From the 1st to the 7th day of recovery, these practically remained at the same level (below the pre-competition level) and only from the 7th day their monotonous recovery began (up to 14 days).

The data presented allow us to identify the following features of the recovery of boxers at the post-competitive stage. Indicators of mental functions (attention, memory, a complex reactions with the switching of a signal stimulus, reaction to a moving object and time reaction), indicators of speed of punches (1, 5, 10, 50 punches) and 20-second intervals of a specialized test are restored by the 7th day. Indicators of "explosive" speed-strength special work, which is more adequate to the competitive activity of boxers and requires high energy and mental costs, are restored on the 14th day of the post-competitive stage.

Studies allow recommending rest of athletes for 7 days at the post-competitive stage, which according to the researchers is optimal, justified and appropriate. After 7 days, it is possible to begin the next stage of training applying harder tasks including sparring. When planning this stage of training, one should take into account the dynamics of physical and mental indicators of boxer fitness at the post-competitive stage. The greatest changes affect indicators of mental functions, the speed of a single punch and 10-second intervals of work.

This microcycle should be considered and used as a stage, which creates conditions to realize the cumulative effect on the previous competitive load and as a recovery period. Even low intensity and volume training at this stage have the same effect on the body as large ones. Participation in the following competitions is allowed after 15 days in the case of 2 fights, and 30 days after 5 fights. In this case, we are considering the option of preparing for the next competition taking place 25-30 days after the previous ones.

The 1st week of the post-competition period (fig. 44)

The 1st week is devoted to active rest. The task of the micro-cycle is a recovery of the sportsmen in a natural and medical ways supporting functional levels by means of active rest such as general physical exercises, morning walks and sports games. Preference is given to easy walks in a forest or park, and general exercises. Training in a purpose-built gym is of lesser importance. Besides morning walks, sportsmen should have 2 – 3 emotional gaming

training sessions of a smaller volume (two periods of 20-25 min) in a shorter field.

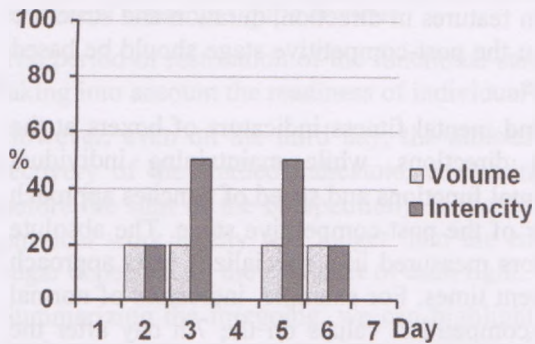


Fig. 44. A chart of the volume and intensity of training during the post-competition stage of recovery/supporting microcycle (the 1st week)

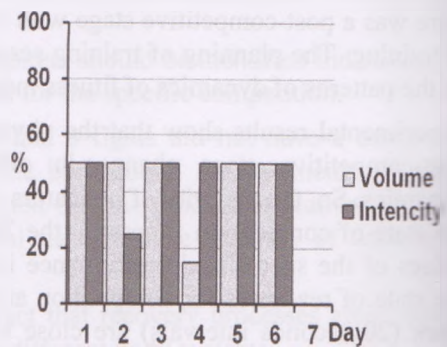


Fig. 45. A chart of the volume and intensity of training during the stage of perfecting the technical-tactical mastery (2nd week)

At this stage, one should avoid specialized training, especially with a partner.

The 2nd week of the post-competition period (fig. 45)

Monday. High volume and intensity training.

Early morning (before breakfast). General exercises. Boxing school: an individual work with a coach on pads.

Early afternoon (before lunch). Boxing gym - 4 approaches of 3 min. Conditional and open sparring swapping partners to improve the individual technical and tactical mastery - 3 rounds of 3 min (heart rate 180-200). Exercises with «light» weights. Throwing medicine balls to a partner.

Tuesday. High volume and an average intensity training.

Early morning (before breakfast). General exercises. A walk. Games - 2 periods of 20 min.

Early afternoon (before lunch). Improving technical and tactical mastery with a partner: 5 rounds of 3 min. Boxing gym - 3 attempts of 2 min (heart rate 170-180). Circular training to develop speed-strength qualities of the punching movements (5 stations at least). Relaxation exercises.

Late afternoon - early evening (before dinner). Improving the individual technical and tactical mastery with a coach on pads and in front of the mirror.

Wednesday. High volume and intensity training.

Early morning (before breakfast). General exercises. Individual work with a coach on pads.

Early afternoon (before lunch). Sparring - 4 rounds of 3 min. Boxing gym - 3 attempts of 2 min (heart rate 200-220). Relaxation exercises.

Late afternoon - early evening (before dinner). Games (heart rate 150-160) - 2 periods of 20 min.

Thursday. Low volume and high intensity training.

Early morning (before breakfast). General exercises. Boxing school. Exercises with light weights.

Early afternoon (before lunch). Interval training in gym. Short spurts of 8 and 10 s. Weight-bearing whilst punching and throwing medicine ball.

Late afternoon - early evening (before dinner). Russian steam bath. Recovery.

Friday. High volume and intensity training.

Early morning (before breakfast). General exercises. Boxing school. Individual work with a coach.

Late afternoon - early evening (before dinner). Improving technical and tactical mastery with a partner in conditional and open fights – 8 rounds of 3 min (heart rate 180-200). Exercises with medicine balls and in the boxing gym – 3 attempts of 2 min. Relaxation exercises.

Saturday. High volume and intensity training.

Early morning (before breakfast). General exercises. A walk. Boxing school. Exercises weights-bearing.

Early afternoon (before lunch). Speed-strength (explosive) work in boxing gym in 20 and 10 s bursts (heart rate 180-200). Exercises with medicine balls and in the boxing gym. Relaxation exercises.

Late afternoon - early evening (before dinner). Games – 2 periods of 20 min. Individual work with a coach on pads.

Sunday. Rest.

The 3rd week of the post-competition period (fig.46)

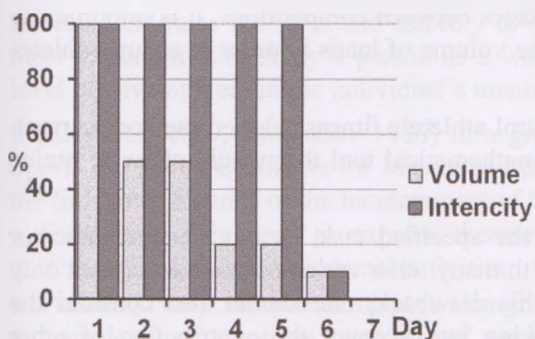


Fig. 46. A chart of the volume and intensity of the specialized training perfecting technical and tactical mastery (the 3rd week)

Monday. High volume and intensity training.

Early morning (before breakfast). General exercises. Individual work with a coach on pads.

Early afternoon (before lunch). Sparring (heart rate 200-220) – 4 rounds for 3 min. Boxing gym – 3 attempts of 2 min (individually). Relaxation exercises.

Late afternoon - early evening (before dinner). Games – 2 periods for 20 min. Light weight-bearing specialized exercises. Relaxation exercises.

Tuesday. An average volume and high intensity training.

Early morning (before breakfast). General exercises. A walk. Boxing school.

Early afternoon (before lunch). Speed-strength (explosive) training. Boxing gym - 8 and 10 s bursts (heart rate 180-200). Individual work with a coach on pads. Relaxation exercises.

Wednesday. An average volume and high intensity training.

Early morning (before breakfast). General exercises. A walk. Individual work with a coach on pads.

Early afternoon (before lunch). Improving individual technical tactical mastery with a partner: 6 rounds of 3 min (heart rate 180-200). Boxing gym – 2 attempts of 3 min (heart rate 160- 180). Relaxation exercises.

Thursday. Low volume and high intensity training.

Early morning (before breakfast). General exercises. A walk. Individual work with a coach.

Early afternoon (before lunch). Improving individual tactical and technical mastery with a partner in conditional and free sparring – 4 rounds for 3 min (heart rate 180-200). Work on pads and boxing gym (individually).

Late afternoon - early evening (before dinner). Russian steam bath. Relaxation.

Friday. Low volume and high intensity training.

Early morning (before breakfast). General exercises. A walk. Individual work with a coach.

Late afternoon - early evening (before dinner). Improving individual tactical and technical mastery with a partner in conditional and free sparring (the number of rounds is individual for the boxers, heart rate 180-200). Boxing gym (individually, heart rate 170-180).

Saturday. Rest, or an individual training with a coach.

Early afternoon (before lunch). Russian steam bath (if one wants to).

Sunday. Departure.

When planning the training during the short stages between competitions, it is important to define the right direction of the training and the volume of loads in order to ensure athletes are well-prepared for the competition.

In addition to the well-known methods to control athlete's fitness (phased method, current, medical, etc.), one should have an objective mathematical tool that would allow to notice the deterioration or improvement in time.

Existing control methods cannot fully meet the specified task, as any studied indicator characterizing a biological object correlates with many other variables that can explain only a small part of the total change. To avoid this drawback, one should also consider the dependence of changes in one parameter taking into account the contribution of other variables, that is, to resort to multiple linear regressions.

In practice, this allows the trainer to pay attention to unsatisfactory state of the individual during the training.

We have calculated the equations of multiple regressions (Ostyanov et al. 1993) that allow calculating with a reasonable accuracy the quantitative values of the studied parameters at the stage of preparation on a given day, which allows to make corrections to the training process.

PSYCHOLOGICAL SUPPORT OF SPORTS TRAINING AND COMPETITIONS

To achieve a high level of fitness in elite athletes, mental stability, and reliability of performance in important competitions, a system of psychological and medical influences need to be a part of the training process. During training, the boxing skills are improved and corrected due to psychological influences: motivation, mental stability, social responsibility, perception, psychomotor skills, intelligence (quick response, accuracy of tactical tasks, perception, etc.); and mental states are optimized. A distinctive feature of general psychological training is that it is included in other types of training such as physical, tactical-technical, with practically no means, but has its own aims and objectives.

The most interesting, from a practical point of view, are the issues of psychodiagnostics, psychoregulation, and management of stressful conditions.

The most widely methods of psychodiagnostics used in the process of training. Without them, it is impossible to accurately define the loads and manage the process of an athlete's development to the highest level of fitness. The practical use of psychodiagnostics can reduce the time and cost of training, increase effectiveness, reduce the dropout of athletes, and raise the level and stability of results. To get a correct mental diagnosis, the most important is to study a person as a whole: the structure of their personality and the level of development in the individual's mental functions.

Studies (Kleshev, Khudadov 1986) in a group of more than 80 elite boxers (Master of Sports of USSR, Candidate for Master of Sports of USSR) allowed the authors to identify the following features of the temperament of boxers:

- Extraverts: they tend to express themselves, make contact with people, effectively develop and transform external activities;
- Plasticity: easy, flexible to adapt to changing requirements;
- Low level of emotions: stability of emotions, in most cases emotions are of sthenic nature.

Based on the fact that the characteristics of temperament are difficult to alter and to a large extent they are innate, the above results can be used as a guide for selecting sportsmen and predicting results.

In the course of a further evaluation of the data obtained, the authors found that individual athletes who had distinctly unfavorable features of temperament; rigid, emotional introverts showed very high results. This indicates that the influence of temperament on boxers' effectiveness is limited and can be regulated by means of training. Feeling superior over the main opponent in technique and tactics, confidence in an ability to counterattack any 'tricks', confidence in the training process, etc. reduce tensions in the athlete's psyche. In a certain sense, one can say that mastery is both means and, at the same time, the result of neutralizing the influence of negative characteristics on the psyche. The level of mastery is a fundamental compensator of negative features of temperament.

Fatigue and its effect on the psyche of athletes

The first signs of over training are the first symptoms of neurosis: increased irritability, fatigue, lack of desire to exercise, sleep disturbances, headaches. The decline in sports results comes later.

In the multi-stage process of preparing for the most important competition of the season, the general physical training occupies more time than specialized training. It comes to light that the need to maintain high levels of mental qualities, an optimal mental condition, comes into conflict with the need to timely increase functional capabilities and the level of physical fitness (Rodionov 1982). At the first stage, when the means of general physical preparation are used in a large volume, athletes, as a rule, are in the condition defined as 'mental freshness', and they desire to train. The increase in the intensity of general physical training, plus specialized physical training in the second stage, leads not only to an improved physical fitness, but also to a deterioration in the coordination of the most important mental functions, and the decreasing accuracy of the most delicate of them associated with specialized perceptions. Often, under the physical load of the last stage of pre-competitive training, there is a deterioration in the indicators of anticipation reactions, the most informative indicators of technical and tactical training in boxers. In this case, the heterochronous changes in physical and mental readiness cause the athlete's dissatisfaction with the quality of technical and tactical actions, with an excessive mental tension, and slow recovery after training as a result.

In such cases, reducing the overall physical load does not help optimizing mental preparedness and emotional comfort of athletes, but worsens the state of physical fitness. A more effective method is the use of psycho regulatory drugs along with a decrease in the volume of general physical training, with a short term increase in the intensity of specialized physical training, long before the competition.

Neurosis is a psychogenic personality disorder accompanied by neurological, somatic and emotional symptoms. I.e. fatigue due to overwork is a special case of neurosis. Overworked athletes have all these symptoms.

In the development of fatigue syndrome in athletes, two main stages are observed, which are in essence, the first stages of neurosis. The first stage manifests in general neurotic disorders: the athlete's mood changes, sleep is disturbed (insomnia at night, drowsiness in the daytime), an excited state occurs with an increased level of demands to the people around, with a tendency of increased reactions to small things in life. Other athletes, on the contrary, show lethargy and apathy, with a lack of desire to train. Often there are complaints of a headache.

A very characteristic feature for athletes is the dissimulation of symptoms of their condition, the desire to hide the deterioration. Only the athlete's exceptional trust in the trainer or doctor and their attentive attitude to the athlete can establish the onset of the disease. Therefore, trainers should carefully monitor the level of training and competition loads of each athlete. Individualization of the training process and appropriate and timely medical treatment allow to completely and very quickly stop the onset of the disease. If the necessary measures are not taken, the first stage very quickly passes into the second stage of the onset of the primary syndrome, when functions of organs in the body start suffering.

Mental Endurance and Recovery

One of the tasks when diagnosing mental conditions is to identify how strong the sportsmen's fatigue is, how overworked they are, in order to effectively manage training. One should distinguish between the interconnected concepts of *mental stress*, *mental stamina* (stamina in relation to long and intense stress), and *mental recovery*. The term *mental workload* refers to the process of work, which contains the psychic mechanisms for regulating the athlete's behavior, in connection with the extreme requirements that arise during the competitions. The state of emotional stress and nervous tension is characteristic

of athletes not only in the period of time when they are getting ready for a competition, or during a competition, but also often afterwards (regardless of the results), and can last for a long while. Boxing is an acutely situational, and emotional sport with great physical and mental stress.

A competition is one of the methods to enhance sportsmanship. Often, boxers in one tournament fight 5-6 competitive fights with only a one day rest between them. It is known that boxers manage two training sessions in one day relatively easily, even for a long time, when the volume and intensity of the work approaches to, and sometimes exceeds, the physical load of competitions. At the same time, frequent appearances in competitions exhaust them, adversely affecting both their health and athletic performance.

If we accept that emotional stress and nervous tension is a kind of physical load on the human body and accounts for the expenditure of a certain energy, then we can assume that the degree of fatigue, when participating in competitions, is determined not only by the physical work alone, but also by an additional load, which is in the form of nervous tension.

The recovery processes after muscle work associated with strong emotional stress are of undoubted practical interest: not only immediately after work, but also during the time afterwards. The emotional stress, strongly expressed in competitive combat and absent, or less pronounced in a fight during experimental training, is the main factor determining the length of the recovery period.

Studying the peculiarities of the recovery period of boxers after work associated with strong emotional stress (competitions), the author noted that the emotional excitation, due to its inertia, adds its mark on the course of the recovery period. From the data obtained by the author, it became clear that the recovery of the functions of the cardiovascular, respiratory, excretory and thermoregulatory systems, as well as the biochemical composition of blood and urine to their initial levels, was delayed after work with strong emotional excitement, comparing with the restitution time of the same functions after experimental loads not associated with strong emotional stress.

What changes occur in the body of athletes after competitions? What time is needed to recover? How do the athlete's mental and psychomotor functions change? These and other questions are of interest to a trainer, and they are especially relevant when a series of competitions are part of a multi-cycle of the boxers' training system. Given the heterochronous character of various systems recovery, one needs to know which of the main psychomotor functions, to what extent, and in what sequence, undergo changes in the recovery period. These and other questions were studied (Ostyanov 1980, 1988).

The study involved 52 elite boxers (Candidates for Masters of Sports and Masters of Sports of USSR) who took part in the main competitions of that season (multi-cycle periodization). The data of the preparatory period were recorded at the beginning of the season. The second recording was done immediately before the competition. The athletes were in good shape and the received data was accepted as the baseline. Further on, during the week, the athletes had 3-4 competitive fights with different partners. At the third stage, 14 days after the competition, the dynamics of their recovery were measured on the 1st, 3rd, 5th, 7th, 10th, and 14th days. Their mental, technical, and specialized physical skills data were taken. These indicators of the mental sphere were investigated:

- mnemonic functions (the participants were proposed to remember and reproduce 12 double digit numbers within 60s)
- attention, using a table of Landolt rings;

- complex choice sensorimotor reactions (CR), complex choice reactions with signaling stimulus switching (CRSS), time sense reactions (ST), and anticipation reaction (reaction to a moving object - RMO);
- the speed of a single blow (with the strongest arm) was considered the psychomotor indicator.

According to the conditions of the experiment, the subjects did not train for 14 days during the post competitive (3rd) stage. Their workouts included morning walks and 1-2 games during the week. A correction task was used to study the qualities of attention. The speed of processing information by the visual analyzer (S) was determined. A correctness coefficient (L) defined the attention's stability. The productivity of the work performed (U) was defined. As a result of the author's research, it was found that the processing speed of information (S) in a state of readiness for competitions (baseline), and in the beginning of the preparatory period (PP, lack of sports fitness), was practically at the same level (Fig. 47). It appears that when in a state of readiness for a competition, the physical work performed during training and the athlete's body weight adjustment caused temporary fatigue and, as a result, deterioration of attention properties. The preparatory period was preceded by vacations when the athletes were out of training, which also seemingly affected their results. After the competition, the athletes rested, the mental stress was removed and the speed of information processing improved until the end of the post competitive stage (PCS).

S - speed of information processing by the visual analyzer;

L - attention stability.

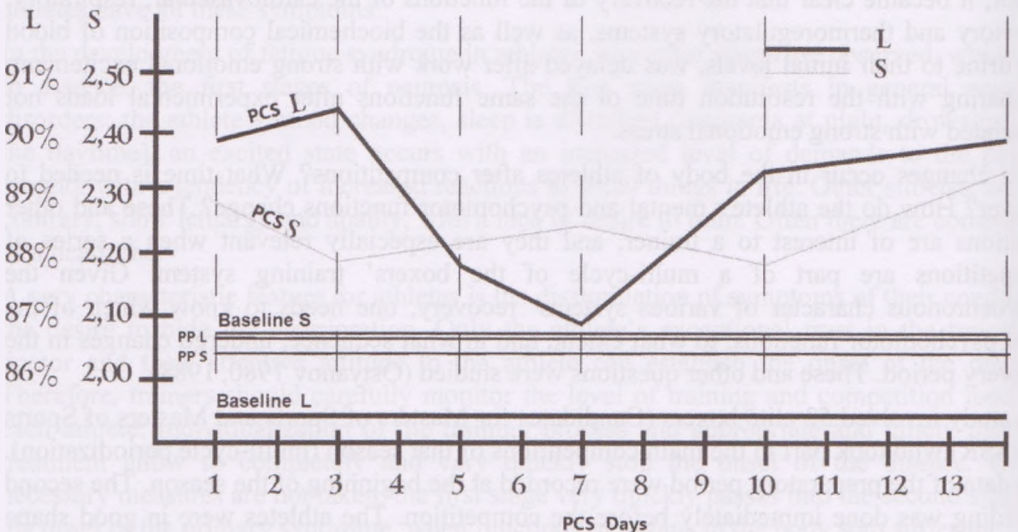


Fig. 47. The dynamics of indicators of the attention properties during 14 days of the post competitive stage. The same indicators in the state of readiness for competitions (baseline), and the lack of sports fitness during the preparatory period (PP), are shown in the graph as straight lines

There were studies which indicated that the success of a boxing fight depended on the speed of information processing, among other indicators. We found the opposite: there is no correlation between the indicators S, L, U, and the 'combat tests' characterizing the technical and tactical skills of boxers, with the S indicator not being informative in relation to success in the ring.

These indicators are associated with strength and balance of nervous processes (Rodionov 1982), and to some extent, can reflect the general properties of the nervous system of the athletes.

The study of memory in the post competitive stage indicated a significant deterioration in comparison with the baseline data. On the 1st day the deviation was 4.6%, on the 3rd day - 1% (somewhat closer to the baseline), on the 7th day - 8%, and on the 14th day - 6%. Given the large time intervals of rest at the post competitive stage, one should consider a memory impairment of 6 - 8% significant.

The study of the properties of memory in the preparatory period showed a slight improvement (2.3%) compared with the baseline data.

The results obtained are easily explainable from the point of view of workouts corresponding to these measurements. As noted above, the preparatory period was preceded by a long vacation and as a result, the short term memory of the athletes was better than at the pre competition stage, or after the boxing tournament. The most sensitive to the physical loads were mnemonic functions, hence the memory impairment after too much physical exertion.

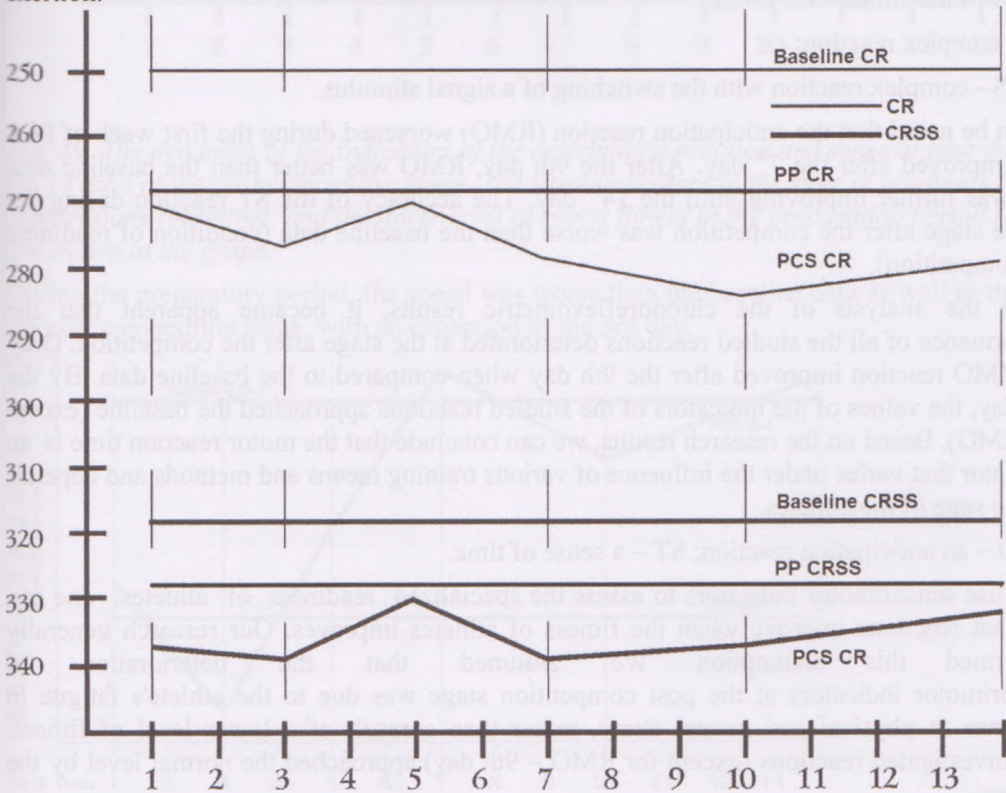


Fig. 48. The variations of chronoreflexometric indicators over the course of 14 days of the post competitive stage. The same indicators in the state of readiness for competitions (baseline), and the lower level of sports fitness in the preparation period are shown in the graph.

In a state of readiness for competitions, the physical loads were greater than in the preparatory period, respectively, memory impairment was observed. During the competition, athletes were subject to particularly heavy loads which explained the significant memory loss after the competition.

At the stage after the competition (PCS), attention indicators improved, but memory deteriorated in relation to the the state of readiness for competition (baseline data). The variations of chronoreflexometric indicators at different stages revealed the following: during the post competitive stage, complex reactions (CR and CRSS) changed similarly (Fig. 48): the indicators deteriorated throughout the entire post competition stage between 6–10%. These indicators approached the baseline data on the 5th and less so in the end of the 14 days period. The preparatory period (PP) data for the CR and CRSS reactions significantly deteriorated comparing to the baseline: 5%.

A study of the anticipation reaction (RMO) and the sense of time (ST) indicated significant deviations of these parameters from the baseline data during the preparatory period and the post competitive stage (Fig. 49). RMO during the preparatory period was much worse than the baseline, while the baseline ST almost did not differ from the preparatory period. As it was indicated above, the sportsmen had vacations before the preparatory period and the level of their fitness was lower.

CR - complex reaction;

CRSS - complex reaction with the switching of a signal stimulus.

It can be noted that the anticipation reaction (RMO) worsened during the first week of PCS and improved after the 7th day. After the 9th day, RMO was better than the baseline data and was further improving until the 14th day. The accuracy of the ST reaction during the whole stage after the competition was worse than the baseline data (condition of readiness for competition).

From the analysis of the chronoreflexometric results, it became apparent that the performance of all the studied reactions deteriorated at the stage after the competition. Only the RMO reaction improved after the 9th day when compared to the baseline data. By the 5th day, the values of the indicators of the studied reactions approached the baseline (except for RMO). Based on the research results, we can conclude that the motor reaction time is an indicator that varies under the influence of various training means and methods and depends on the state of the athletes.

RMO – an anticipation reaction; ST – a sense of time.

If to use sensorimotor indicators to assess the specialized readiness of athletes, one can see that reactions improve when the fitness of athletes improves. Our research generally confirmed this assumption. We assumed that the deterioration of sensorimotor indicators at the post competition stage was due to the athlete's fatigue in response to physical and mental stress, rather than a result of a lower level of fitness. The investigated reactions (except for RMO – 9th day) approached the normal level by the 5th day.

As an indicator of mental condition we used the speed of punch with the strongest hand. The coordination structure of straight punches is one of the most difficult. Comparison of the results of the speed of a punch with the baseline data showed a deterioration of this indicator in the first week of the post competitive stage (Fig. 50). On the first day after the competition, the speed worsened by 6.55%. On the 3rd day, the deviation was maximal: about 12.8%. After the 3rd day, the indicator started gradually approaching the baseline data. By the 7th day after the competition, it reached the baseline level and the deviation did

not exceed 1.2% further on.

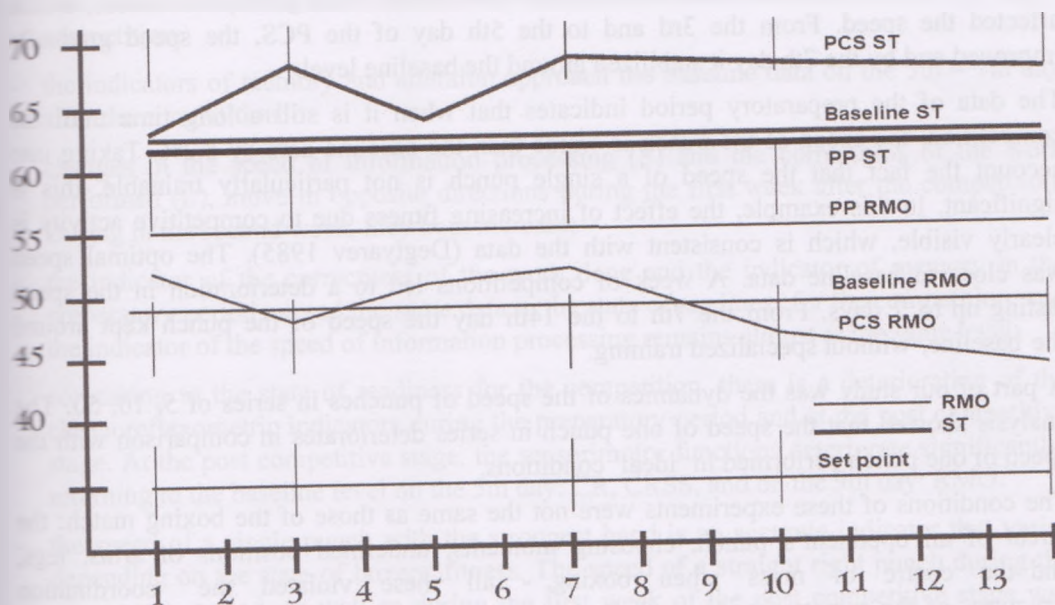


Fig. 49. The dynamics of the indicators of the anticipation reaction and sense of time during the 14 days of the post competitive stage. The same indicators in the state of readiness for competitions (baseline), and the lower level of sports fitness in the preparattion period (PP) are shown in the graph.

During the preparatory period, the speed was worse than the baseline data as well as during the post competition stage, with an exception of the 3rd day.

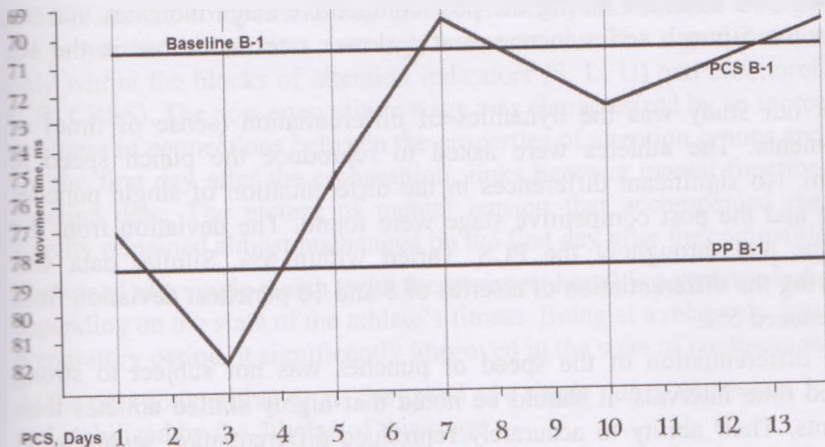


Fig. 50. Dynamics of speed of a boxing punch during the 14 days of the post competitive stage. The same indicator in the state of readiness for competition (baseline), and the lack of sports fitness in the preparatory period (PP) are also on the graph.

B-1 - the speed of a single punch.

Improving boxing punch speed is natural during the preparatory period. After the tournament, deterioration of the speed of a single punch is due to the fatigue after the fights

and a deterioration of specialized coordination. By the 3rd day of the post competitive stage, the punch time increased further since the athletes were still under stress, which affected the speed. From the 3rd and to the 5th day of the PCS, the speed gradually improved and by the 7th day it stabilized around the baseline level.

The data of the preparatory period indicates that when it is still a long time until the competition, the speed of the punch is worse than the baseline data by 8.2%. Taking into account the fact that the speed of a single punch is not particularly trainable, this is significant. In this example, the effect of increasing fitness due to competitive activity is clearly visible, which is consistent with the data (Degtyarev 1985). The optimal speed was close to baseline data. A week of competitions led to a deterioration in the speed lasting up to 7 days. From the 7th to the 14th day the speed of the punch kept around the baseline, without specialized training.

A part of our study was the dynamics of the speed of punches in series of 5, 10, 50. The analysis showed that the speed of one punch in series deteriorates in comparison with the speed of one punch performed in 'ideal' conditions.

The conditions of these experiments were not the same as those of the boxing match: the threat of an opponent's punch, choosing moments, undefined positions of arms, legs and the centre of mass when boxing, - all these violated the coordination structure of the movement. Nevertheless, the results indicated an increase of the time of delivering one punch in series.

When comparing the speed of one punch in series at different stages, one should note that in the state of readiness for competitions they are worse than at the post competition stage or in the preparatory period. Moreover, the longer the PCS lasts, the better the speed of one punch in series. On the first day, the improvement comparing to the baseline was 1.5% and by the 14th day it was significant: 6.7%, 7.3% and 16.8% in 5, 10 and 50 punches series, respectively. Of the studied series, the 5-punch series' are the closest to 'real' boxing. The data obtained during the post competitive stage indicates that the time of one punch in the 5-punch series increased at a slower rate than those in the 10 or 50 punch series.

Another objective of our study was the dynamics of differentiation (sense of time) of boxing punch movements. The athletes were asked to reproduce the punch speed at 80% of the maximum. No significant differences in the differentiation of single punches between the baseline and the post competitive stage were found. The deviation from the set value, both baseline and throughout the PCS, varied within 6%. Similar data was obtained when studying the differentiation of a series of 5 and 10 punches: deviation from the set value did not exceed 5%.

The accuracy of the differentiation of the speed of punches was not subject to strong changes in the studied time intervals. It should be noted that highly skilled athletes took part in the experiments. Their ability to accurately reproduce differentiation seems to be inherent at this high level. Our studies were consistent with the data (Degtyarev 1985), which stated that "... in a specific type of activity, highly qualified boxers are equally oriented in predetermined time limits."

According to the results of the research, we can conclude:

- the studied mental functions of boxers have individual dynamics at all stages and depend on the mental and physical condition of the athletes;

- at the stage after the competition (PCS), attention indicators improve, and memory deteriorates comparing to the data characterizing the state of readiness for the competition;
- the indicators of memory and attention approach the baseline data on the 5th – 7th day after the competition;
- changes in the speed of information processing (S) and the correctness of the work performed (L), move in opposite directions during the first week after the competition. During in the second week, they both increase;
- the indicator of the correctness of the work done and the indicator of memory in the preparatory period exceed the same data in the state of readiness for the competition, and the indicator of the speed of information processing remains almost at the same level;
- comparing to the state of readiness for the competition, there is a deterioration of the chronoreflexometric indicators during the preparatory period and at the post competitive stage. At the post competitive stage, the sensorimotor functions deteriorate significantly, returning to the baseline level on the 5th day: CR, CRSS, and on the 9th day: RMO.
- the speed of a single punch with the strongest hand is an accurate indicator that varies depending on the state of boxers' fitness. The speed of a straight right punch during the preparatory period, as well as during the first week of the post competitive stage was significantly worse than in the period of readiness for competitions (baseline). The restoration of speed during the post competitive stage occurred by the 7th day;
- the accuracy of reproducing differentiation of speed of punches was not subject to significant changes at different stages.

Overall, the studied mental indicators changed differently and at different times during the post competitive stage. A decrease in the level of mental functions was observed.

Mathematical correlation analysis showed that the state of mental functions when athletes were ready for competition was characterized by the absence of significant links between the properties of attention, memory, and reactions. The significant connections were noted only within the blocks of attention indicators (S, L, U) and chronoreflexometric indicators (CR, CRSS). The post competitive stage was characterized by an increase in the number and tightness of connections between the properties of attention groups and chronoreflexometry. On the first day after the competition, links between mental functions were similar to the baseline data. The picture of mental tension that accompanied the boxer's competitive activity remained almost unchanged on the first day after the competition.

The speed of a single punch (with the strongest hand) is a variable indicator, which varies depending on the state of the athlete's fitness. Being at a relatively low level in the preparatory period, it significantly improved in the state of readiness for competitions.

At the post competitive stage, the speed of a single punch decreased. It was reliably restored and stabilized by the 7th day of this stage.

Thus, by the 5th - 7th day of the post competitive stage, the indicators of the studied mental functions and the speed of a single punch (as well as some indicators of specialized fitness) were mainly restored. This gives a reason to argue that active rest for 7 days after an intense boxing tournament is optimal and justified. Active rest promotes faster recovery, gives the opportunity to plan the training process based on the identified dynamics of the main mental qualities of boxers, taking into account the cumulative effects of mental and physical stress. Taking into account the dynamics of mental and physical qualities when planning large

cycles of training helps to prevent such a phenomenon as overwork and overtraining, if active recreation is used.

How to prevent burnout

Effective management of the training process is impossible without taking into account the influence of mental and physical stress on the athlete's body. Ignorance of the mechanisms of the adaptive processes, and the cumulative effects can lead athletes to such phenomena as overstrain, burnout, and overtraining. To prevent these phenomena, it is necessary to use several measures. Due to the fact that psychological and biological mechanisms play an important role in the occurrence of overworking of athletes, its prevention and treatment should include methods of psychotherapy, pharmacotherapy, and individual observations by the doctor and team psychologist.

At the same time as realizing the significance of the above methods, one should not forget about the first link in this chain: this is the participation of the coach, whose role and importance as the person closest to the athlete, is paramount. It is the trainer, as the person most knowledgeable of his sportsmen, who can notice in time the peculiarities in the behavior of an athlete, identifying the deviations that prevent maximum results.

The coach can help overcome, or mitigate the unwell state of the sportsman. The main method a coach can use is to set real tasks and specific and feasible goals. It is extremely important that, along with the training, the coach should pay due attention to the development of the athlete's personality and to correct its deviations. It is important to develop an ability of the athlete to adequately respond to any life and sports situations, especially failures, to develop fighting qualities leading to achieve the maximum sports results. Especially important are the coach's tactics before the competition and when seconding between rounds. The coach must remember that his emotions, lack of confidence, are transmitted to the boxer. Conditioning to fight and building a tactical battle plan should be clear and concise, taking into account the opponent's strengths and weaknesses. Remarks and instructions should be concise and clear. One should not give a lot of advice between rounds or be nervous. Especially important is the behavior of the coach after the competition. A rational approach, analysis of the mistakes and the prospects for their elimination would allow the athlete to avoid a nervous breakdown. On the other hand, one needs to teach the athlete not to overestimate their success. The 'star struck' athlete ignoring the recommendations of the coach and the doctor, as a rule, goes very quickly into a series of failures, which also may contribute to the development of neurosis.

In his research, Henschen (1992) proposed a system of measures for trainers to reduce the level of post competitive stress:

1. Ensure a positive, supportive atmosphere immediately after the competition.
2. Focus on the emotional state of athletes, not on your own.
3. Be with the team after the competition.
4. Provide a realistic assessment of the actions of each player.
5. Talk with all of the players of the team, including those who did not take part in the competition.
6. Organize the joint activities together with all team members after the competition (for example, dinner together, going to the movies, etc.).
7. Do not let the team members admire their success, or become depressed due to a loss.
8. Start psychological preparation for the fight with the next opponent in the very next training session.

9. Do not allow athletes to communicate with parents and friends straight after the competition.

It is very important to organize the life and recreation of athletes in training camps, especially during competitions. A coach should be a reasonable guide, organizing athletes' activities, distracting them from obsessive, sometimes exhaustive thoughts of upcoming fights. Both opinions: a complete rejection of all the joys of life, or leaving athletes to be free in their actions, are equally harmful. It is necessary to individualize the training loads, taking into account the athlete's functional capabilities, physiological characteristics, and age.

In the conditions of modern training, when the large volumes and intensity of loads are used, doing 2 to 3 workouts a day, the rehabilitation measures are extremely important. The effectiveness of the latter are only high when they are comprehensive and include biomedical and psychological means and methods.

Proposed measures to reduce psychological stress on athletes:

1. Clear short-term competitive and training goals. When the coach gives short-term goals, this not only provides feedback allowing to check whether the athlete is on the right track or not, but also increases long-term motivation.
2. Communication. Coaches, athletes, referees, team leaders should be encouraged to share their feelings with colleagues, to seek social support from them. When you share negative feelings with your colleagues, they can help you find a reasonable solution to your problem.
3. The use of 'time outs'. To ensure mental and physical well-being, it is very important to take a 'time out', to take a break. The myth that the more an athlete trains the better is still prevalent, but daily training and competitive activities lead to mental and physical fatigue. Reducing the volume of training loads, as well as the intensity of physical exercise contributes to mental health.
4. Mastering the skills of self-regulation. Mastering such psychological skills as relaxation, ideomotor techniques, setting goals, and positive thinking significantly reduces the stress level leading to 'burnout'. Overtraining of athletes very often reduces the time they can spend on their personal life. *Defining realistic goals, the athlete should find time for both: sport and personal life, which helps to prevent a 'burnout'.*
5. Maintaining a positive perspective. Find people (they can be colleagues) who can provide social support and therefore help maintain a positive point of view regarding your actions.
6. Control of emotions. Most coaches and athletes know how necessary it is to control the sense of anxiety and tension during a competition, but few people pay attention to their emotions afterwards. Emotions very often grow higher, become excessive, and even lead to depression.
7. Maintaining a high level of fitness. Chronic stress has an effect on the human body. Therefore, it is very important to maintain a high athletic form with the help of physical exercises and a healthy diet. Improper nutrition, especially after competitions, weight gain, negatively affect self-esteem and contribute to the development of 'burnout' syndrome and 'overwork'.

Management of pre-competition state and psychoregulation

The positive or negative effect of the pre competition state on an outcome depends on the degree of excitement of the athlete's nervous system. Depending on the intensity, it can be distinguished in various forms, for example: start fever, start alertness, and start apathy. The quantitative and qualitative functional shifts and the specifics of the starting states depend on features of the nervous system of the athletes. Many researchers believe that the type of higher nervous activity should be considered as the biological basis on which the starting reaction is created. Before the start of the competition, the level of mental tension of the athlete increases, which is determined by the balance of the processes of excitation and inhibition.

The level of mental tension in competitions, especially among qualified athletes, depends mainly on factors affecting the psyche (Platonov 1997). According to the author's data, four states of the athlete's readiness can be distinguished: 1) insufficient excitation; 2) optimal excitation; 3) over excitation; 4) inhibition due to over excitation.

The state of insufficient excitation is manifested in certain lethargy, lack of concentration, the inability of the athlete to focus on the upcoming fight. Outwardly, the athlete is calm, even indifferent, and friendly to others, even to opponents. However, he is not able to maximize his potential in competitions, his actions are often untimely and inadequate.

- The state of optimal excitation: a sense of readiness and a desire to compete. The athlete is able to objectively evaluate their own actions and the actions of their opponent, to receive satisfaction from movements and actions. He or she is confident to achieve the planned result.
- The state of over excitation: athletes are overly excited, overly active, irritable, often lose their temper, and are intolerant to others. Calm when training, an athlete becomes stubborn, angry, rude, excessively picky, and demanding.
- Inhibition due to over excitation. The mechanism here is opposite to the one responsible for the state of insufficient excitation. It manifests itself in the same reactions, which result from traumatic experiences, unpleasant associations, unwillingness to train, etc. Apathy, mental and physical lethargy, sometimes neurotic reactions occur. The athlete understands the uselessness of obsessive thoughts, has fears of not showing the planned result, but cannot get rid of them.

Each of the conditions vary depending on the individual characteristics of the athlete, level of preparedness, specific condition, the nature of the competition, etc. There are cases when all four types of mental stress (to a degree) are manifested in the same athlete during a long tournament or across several different competitions.

To regulate the pre competition excitation, various methods are used: a specialized warm-up, self-massage, breathing exercises, autogenic training, etc. One should take into account that this is not only a psychic phenomenon, but also an extensive state of the whole body, including shifts at the level of functions from organs and tissues.

APPENDIX

A table of educational and training times for beginners groups of the first year, min

Table 1

Type of activity	September					October					November					December			
	Week of training																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
The number of training days	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
The number of training classes	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
General physical training total	120	120	120	130	120	120	120	120	120	120	120	120	120	120	120	120	120	120	
Warming up	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	
Games	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	
Gymnastics of boxers	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
Exercises with ball and medicine ball	-	10	10	10	10	10	5	5	5	5	5	5	5	5	5	5	5	5	
Exercises with skipping rope	15	10	10	10	5	5	10	10	10	10	10	10	10	10	10	10	10	10	
Short distance race	10	10	-	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
Jumping	-	-	10	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
Fighting in boxing stance	-	-	-	-	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
The final part of training sessions	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	
Special physical training total	45	40	100	100	100	110	100	90	100	100	100	100	100	90	100	90	100	90	
Boxing school	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	
Boxing gym	-	-	10	20	10	20	30	30	30	30	30	30	30	30	30	30	30	30	
Exercises on pads	-	-	40	30	40	40	20	20	20	20	20	20	10	-	10	-	10	-	
Shadow fighting	5	-	10	10	10	10	10	-	10	10	10	10	10	10	10	10	10	10	
Conditional fighting	-	-	-	-	-	-	-	-	-	-	-	-	10	10	10	10	10	10	
Free fighting	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
With the opponent in boxing gloves	10	20	40	40	40	40	50	50	50	40	50	40	50	50	50	50	50	50	
Theory	5	-	10	-	10	-	-	10	-	10	-	10	-	10	-	10	-	10	
Entry and other tests	90	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

A table of educational and training times for beginners groups of the first year, min

Table 1 continued

Index and type of training	January				February				March				April					
	Week of training																	
	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
The number of training days	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
The number of training classes	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
General physical training total	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
Warming up	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Games	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Gymnastics of boxers	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Exercises with ball and medicine ball	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Exercises with skipping rope	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Short distance race	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Jumping	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Fighting in boxing stance	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
The final part of training sessions	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Special physical training total	100	30	90	100	90	100	90	90	90	100	90	90	90	90	90	90	100	90
Boxing school	40	20	40	40	30	40	40	30	30	30	30	30	30	30	30	30	30	30
Boxing gym	30	10	30	30	30	10	-	10	10	-	10	5	5	5	10	5	5	5
Exercises on pads	10	-	-	10	10	30	30	30	30	30	30	30	30	30	30	30	30	30
Shadow fighting	10	-	10	10	10	10	10	10	10	10	10	10	10	10	5	10	20	10
Conditional fighting	10	-	10	10	10	10	10	10	10	15	10	10	10	10	15	10	10	10
Free fighting	-	-	-	-	-	-	-	-	-	15	-	5	5	5	-	5	5	5
With the opponent in boxing gloves	50	20	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Theory	-	10	10	-	10	-	10	10	10	-	10	10	10	10	10	10	-	10
Entry and other tests	-	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

A table of educational and training times for beginners groups of the first year, min

Table I continued

Index and type of training	May				June				July				August				Total
	Week of training																
	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	
The number of training days	3	3	3	3													120
The number of training classes	3	3	3	3													120
General physical training total	120	120	120	120													4810
Warming up	40	40	40	40													1600
Games	25	25	25	25													1000
Gymnastics of boxers	10	10	10	10													405
Exercises with ball and medicine ball	5	5	5	5													220
Exercises with skipping rope	10	10	10	10													395
Short distance race	5	5	5	5													210
Jumping	5	5	5	5													200
Fighting in boxing stance	5	5	5	5													180
The final part of training sessions	15	15	15	15													600
Special physical training total	100	90	90	90													3635
Boxing school	30	30	30	30													1420
Boxing gym	10	-	-	10													650
Exercises on pads	30	30	30	30													840
Shadow fighting	15	15	15	10													385
Conditional fighting	15	15	10	10													290
Free fighting	-	-	5	-													50
With the opponent in boxing gloves	50	50	50	50													1840
Theory	-	10	10	10													245
Entry and other tests	-	-	-	-													270
Total for the year	10800																

Table of educational and training times for beginner groups of the second year of training, min

Table 2

Index and type of training	September				October				November				December					
	Week of training																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
The number of training days	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
The number of training classes	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
General physical training total	160	150	160	160	160	160	150	170	160	160	160	160	160	160	160	160	160	
Warming up	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	
Games	50	50	50	30	30	30	30	30	30	30	30	30	30	30	30	30	30	
Gymnastics of boxers	10	10	10	10	20	20	20	30	20	20	20	20	20	20	20	20	20	
Exercises with ball and medicine ball	20	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
Exercises with skipping rope	10	10	10	15	15	15	10	10	10	10	10	10	10	10	10	10	10	
Short distance race	10	10	20	10	15	15	10	10	10	10	10	10	10	10	10	10	10	
Jumping	-	-	-	15	-	-	10	10	10	10	10	10	10	10	10	10	10	
Fighting in boxing stance	-	-	-	10	10	10	-	10	10	10	10	10	10	10	10	10	10	
The final part of training sessions	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	
Special physical training total	90	120	130	110	150	140	115	120	150	140	130	130	120	140	130	130	120	
Boxing school	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	
Boxing gym	30	30	30	30	30	30	20	30	10	10	10	10	30	20	10	10	30	
Exercises on pads	-	-	10	-	10	20	5	20	20	20	20	20	20	20	20	20	20	
Shadow fighting	10	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	
Conditional fighting	-	20	20	10	30	20	20	-	40	40	-	30	-	30	-	30	-	
Free fighting	-	-	-	-	10	-	-	-	10	-	30	-	-	-	30	-	-	
With the opponent in boxing gloves	20	45	70	80	50	50	40	60	50	50	60	25	70	60	60	60	70	
Theory	-	-	-	10	-	10	10	10	-	10	10	-	10	-	10	10	10	
Entry and other tests	90	45	-	-	-	-	45	-	-	-	-	45	-	-	-	-	45	

A table of educational and training times for beginner groups of the second year of training, min

Table 2 continued

Показатель и вид подготовки	January				February				March				April					
	Week of training																	
	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
The number of training days	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
The number of training classes	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
General physical training total	160	160	150	170	160	140	160	170	160	150	160	170	160	160	160	160	160	
Warming up	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	
Games	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	
Gymnastics of boxers	30	30	20	30	30	20	30	30	30	30	30	30	30	30	30	30	30	
Exercises with ball and medicine ball	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
Exercises with skipping rope	10	10	10	20	20	10	10	10	10	10	10	10	10	10	10	10	10	
Short distance race	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
Jumping	10	10	10	10	5	10	10	10	10	10	10	15	10	10	10	10	10	
Fighting in boxing stance	10	10	10	10	5	10	10	20	10	10	10	15	10	10	10	10	10	
The final part of training sessions	20	20	20	20	20	10	20	20	20	10	20	20	20	20	20	20	20	
Special physical training total	140	150	140	110	140	115	140	180	140	125	140	180	140	140	140	135	140	
Boxing school	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	
Boxing gym	30	30	20	20	20	20	20	20	20	15	20	30	20	20	20	20	20	
Exercises on pads	20	20	20	20	20	10	20	20	20	20	20	30	20	20	20	20	20	
Shadow fighting	10	20	20	20	20	10	20	20	20	20	20	30	20	20	20	10	20	
Conditional fighting	30	30	-	-	30	-	30	30	30	20	30	-	30	-	30	-	30	
Free fighting	-	-	30	-	-	25	-	35	-	-	-	40	-	30	-	35	-	
With the opponent in boxing gloves	50	50	15	80	50	50	60	-	60	30	60	-	60	50	60	-	60	
Theory	10	-	10	-	10	10	-	10	-	10	-	10	-	10	-	20	-	
Entry and other tests	-	-	45	-	-	45	-	-	-	45	-	-	-	-	-	45	-	

A table of educational and training times for beginner groups of the second year of training, min

Table 2 continued

Index and type of training	May				June				July				August				Total
	Week of training																
	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	
The number of training days	4	4	4	4													160
The number of training classes	4	4	4	4													160
General physical training total	160	160	170	160													6390
Warming up	40	40	40	40													1600
Games	20	20	30	20													1050
Gymnastics of boxers	30	30	30	30													970
Exercises with ball and medicine ball	10	10	10	10													410
Exercises with skipping rope	10	10	10	10													435
Short distance race	10	10	10	10													420
Jumping	10	10	10	10													355
Fighting in boxing stance	10	10	10	10													370
The final part of training session	20	20	20	20													780
Special physical training total	140	130	140	130													5360
Boxing school	40	40	40	40													1960
Boxing gym	20	20	20	20													845
Exercises on pads	30	30	30	30													745
Shadow fighting	20	10	20	10													740
Conditional fighting	-	30	-	-													670
Free fighting	30	-	30	30													395
With the opponent in boxing gloves	60	50	50	50													1940
Theory	-	20	-	20													260
Entry and other tests	-	-	-	-													450
Total for the year																	14400

A table of educational and training times for training groups of first-year of training, min.

Table 3

Index and type of training	September						October				November				December			
	Week of training																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
The number of training days	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
The number of training classes	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
General physical training total	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195
Warming up	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Games	-	15	15	15	10	15	20	15	15	15	20	10	15	30	15	15	15	30
Gymnastics of boxers	15	15	15	15	15	15	15	15	15	15	20	15	15	30	15	15	15	30
Exercises with ball and medicine ball	5	10	10	15	15	10	10	10	15	15	15	15	15	15	15	15	10	10
Exercises with skipping rope	25	10	10	10	10	10	15	10	10	15	10	15	15	-	10	15	10	10
Short distance race	15	10	15	15	10	15	10	10	15	10	10	15	15	-	15	15	15	15
Jumping	15	15	10	15	15	10	10	15	10	10	15	15	10	15	15	10	15	15
Fighting in boxing stance	15	15	15	10	15	15	15	15	10	10	15	10	15	10	10	10	15	-
Boxing gym	15	15	15	10	15	15	10	15	15	15	15	15	10	10	15	5	15	-
The final part of training session	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Special physical training total	155	165	205	175	165	185	170	190	120	160	180	170	160	125	160	180	170	150
Boxing school	30	30	40	30	40	40	30	40	30	30	40	40	30	30	30	40	40	30
Boxing gym	25	25	45	25	30	45	20	30	25	30	30	20	40	25	40	40	20	30
Exercises on pads	20	30	50	30	30	30	30	30	20	30	40	40	20	10	20	30	40	20
Shadow fighting	20	20	30	30	35	30	30	30	15	30	30	30	30	20	30	30	30	30
Conditional fighting	20	40	30	50	30	30	-	60	-	40	-	40	-	40	40	-	40	-
Free fighting	40	20	30	10	-	10	60	-	30	-	40	-	40	-	-	40	-	40
With the opponent in boxing gloves	80	130	110	115	140	130	120	125	150	100	120	140	125	140	90	140	140	140
Theory	-	20	-	25	20	-	25	-	-	20	-	-	25	-	25	-	-	20
Entry and other tests	90	-	-	-	-	-	-	-	-	45	-	-	-	-	45	-	-	-
Instructor and referee training	-	-	-	-	-	-	-	-	45	-	-	-	-	45	-	-	-	-
Recovery activities	20	30	30	30	20	30	30	30	30	20	30	30	30	30	20	30	30	30

A table of educational and training times for training groups of first-year of training, min.

Table 3 continued

Index and type of training	January				February					March					April			
	Week of training																	
	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
The number of training days	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
The number of training classes	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
General physical training total	200	195	200	200	205	200	200	200	200	195	205	200	200	200	200	200	200	200
Warming up	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Games	15	15	15	15	30	15	15	15	30	15	15	15	30	15	15	15	15	30
Gymnastics of boxers	15	15	15	15	30	15	15	15	30	15	15	15	30	15	15	15	15	30
Exercises with ball and medicine ball	15	15	10	15	-	15	10	15	-	15	15	15	15	15	10	15	15	-
Exercises with skipping rope	10	10	15	10	10	15	10	10	10	10	15	10	10	15	15	10	15	10
Short distance race	15	10	10	15	-	15	15	15	10	15	15	15	10	10	10	15	10	-
Jumping	15	15	15	10	15	10	15	10	-	10	10	10	15	15	15	10	15	10
Fighting in boxing stance	10	15	15	15	15	10	15	15	15	15	15	15	-	10	15	15	15	15
Boxing gym	15	10	15	15	15	15	15	15	15	10	15	15	-	15	15	15	10	15
The final part of training session	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Special physical training total	125	160	170	170	135	170	160	160	160	160	160	160	160	160	160	160	170	150
Boxing school	30	30	40	40	30	40	30	30	30	30	30	30	30	30	30	30	40	30
Boxing gym	25	40	20	40	25	40	20	40	25	40	20	40	25	40	20	40	20	20
Exercises on pads	10	20	40	20	20	20	40	20	40	20	40	20	40	20	40	20	40	30
Shadow fighting	20	30	30	30	20	30	30	30	25	30	30	30	25	30	30	30	30	30
Conditional fighting	40	40	-	40	-	-	40	-	40	40	-	40	-	40	-	40	-	40
Free fighting	-	-	40	-	40	40	-	40	-	-	40	-	40	-	40	-	40	-
With the opponent in boxing gloves	140	100	140	140	100	150	125	130	105	120	120	130	105	115	125	130	140	115
Theory	-	20	-	-	25	-	25	20	-	-	25	20	-	-	25	20	-	-
Entry and other tests	-	45	-	-	-	-	-	-	-	45	-	-	-	45	-	-	-	-
Instructor and referee training.	45	-	-	-	45	-	-	-	45	-	-	-	45	-	-	-	-	45
Recovery activities	30	20	30	30	30	20	30	30	30	20	30	30	30	20	30	30	30	30

A table of educational and training times for training groups of first-year of training, min.

Table 3 continued

Index and type of training	May				June				July				August				Total
	Week of training																
	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	
The number of training days	6	6	6	6													240
The number of training classes	6	6	6	6													240
General physical training total	200	200	200	215													7965
Warming up	60	60	60	60													2400
Games	15	15	15	30													690
Gymnastics of boxers	15	15	15	30													710
Exercises with ball and medicine ball	10	15	15	-													475
Exercises with skipping rope	10	10	15	10													465
Short distance race	15	15	10	15													485
Jumping	15	10	15	15													505
Fighting in boxing stance	15	15	10	15													515
Boxing gym	15	15	15	10													520
The final part of training session	30	30	30	30													1200
Special physical training total	160	170	160	150													6475
Boxing school	30	40	30	30													1330
Boxing gym	40	20	40	20													1205
Exercises on pads	20	40	20	30													1130
Shadow fighting	30	30	30	30													1130
Conditional fighting	40	-	40	-													940
Free fighting	-	40	-	40													760
With the opponent in boxing gloves	90	140	130	100													4925
Theory	25	-	20	-													405
Entry and other tests	45	-	-	-													360
Instructor and referee training	-	-	-	45													360
Recovery activities	20	30	30	30													1110
Total the year																	21600

A table of educational and training times for training groups of the 2nd year of training, min

Table 4

Index and type of training	September				October				November				December					
	Week of training																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
The number of training days	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
The number of training classes	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
General physical training total	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230
Warming up	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Games	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Gymnastics of boxers	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Exercises with ball and medicine ball	15	15	10	15	15	15	10	15	10	15	10	10	15	10	10	15	10	15
Exercises with skipping rope	10	10	10	10	10	15	10	10	10	10	10	10	10	15	10	10	10	10
Short distance race	15	15	15	10	15	15	15	15	10	15	15	15	10	15	10	10	15	10
Jumping	10	10	15	15	15	10	10	10	15	10	15	15	15	10	15	10	15	15
Fighting in boxing stance	15	15	10	10	10	10	15	10	15	10	10	15	10	15	15	15	10	15
Boxing gym	10	10	15	15	10	10	15	15	15	15	15	10	15	10	15	15	15	10
The final part of training session	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Special physical training total	180	180	180	180	190	200	200	200	200	200	200	200	200	200	200	200	200	200
Boxing school	40	40	40	40	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Boxing gym	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Exercises on pads	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Shadow fighting	30	30	30	30	30	40	40	40	40	40	40	40	40	40	40	40	40	40
Conditional fighting	30	-	30	-	30	-	30	30	-	30	-	30	30	-	30	-	30	30
Free fighting	-	30	-	30	-	30	-	-	30	-	30	-	-	30	-	30	-	-
With the opponent in boxing gloves	45	175	180	180	165	155	160	160	115	110	155	155	155	115	160	110	160	155
Theory	10	15	10	10	15	15	10	10	10	15	15	15	15	10	10	15	10	15
Entry and other tests	135	-	-	-	-	-	-	-	-	45	-	-	-	-	-	45	-	-
Instructor and referee training	-	-	-	-	-	-	-	8	45	-	-	-	-	45	-	-	-	-
Recovery activities	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30

A table of educational and training times for training groups of the 2nd year of training, min

Table 4 continued

Index and type of training	January				February					March				April				
	Week of training																	
	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
The number of training days	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
The number of training classes	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
General physical training total	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	240	240	240
Warming up	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Games	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Gymnastics of boxers	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Exercises with ball and medicine ball	15	15	15	10	10	10	10	15	15	10	10	10	15	15	15	10	15	10
Exercises with skipping rope	10	10	10	10	10	10	10	10	15	10	10	10	10	10	10	20	20	20
Short distance race	10	15	10	15	15	15	10	15	15	15	10	10	15	15	10	15	10	15
Jumping	15	10	15	15	15	10	15	15	10	10	15	15	15	10	15	10	15	15
Fighting in boxing stance	10	10	15	15	15	15	15	10	10	15	15	15	10	15	10	15	15	15
Boxing gym	15	15	10	10	10	15	15	10	10	15	15	15	10	10	15	15	10	10
The final part of training session	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Special physical training total	200	200	200	200	200	200	200	200	200	200	200	200	200	210	210	210	210	220
Boxing school	50	50	50	50	50	50	50	50	50	50	50	50	50	60	60	60	60	60
Boxing gym	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	50
Exercises on pads	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Shadow fighting	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Conditional fighting	-	30	-	30	-	30	-	30	-	30	-	30	-	30	-	30	-	30
Free fighting	30	-	30	-	30	-	30	-	30	-	30	-	30	-	30	-	30	-
With the opponent in boxing gloves	115	155	115	155	115	160	160	160	70	160	160	160	70	145	150	135	50	125
Theory	10	15	10	15	10	10	10	10	10	10	10	10	10	15	10	15	10	15
Entry and other tests	-	-	45	-	-	-	-	-	45	-	-	-	45	-	-	-	45	-
Instructor and referee training	45	-	-	-	45	-	-	-	45	-	-	-	45	-	-	-	45	-
Recovery activities	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30

A table of educational and training times for training groups of the 2nd year of training, min

Table 4 continued

Показатель и вид подготовки	May				June				July				August				Total
	Week of training																
	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	
The number of training days	7	7	7	7													280
The number of training classes	7	7	7	7													280
General physical training total	240	240	240	240													9270
Warming up	80	80	80	80													3200
Games	20	20	20	20													800
Gymnastics of boxers	25	25	25	25													1000
Exercises with ball and medicine ball	15	15	15	10													510
																	HOLIDAYS
Exercises with skipping rope	20	20	20	20													485
Short distance race	15	15	10	15													530
Jumping	15	10	15	10													520
Fighting in boxing stance	10	15	10	15													515
Boxing gym	10	10	15	15													510
The final part of training session	30	30	30	30													1200
Special physical training total	220	220	220	220													8050
Boxing school	60	60	60	60													2050
Boxing gym	50	50	50	50													1650
Exercises on pads	40	40	40	40													1600
Shadow fighting	40	40	40	40													1550
Conditional fighting	-	30	30	-													660
Free fighting	30	-	-	30													540
With the opponent in boxing gloves	125	125	75	85													5380
Theory	10	10	15	10													475
Entry and other tests	-	-	45	-													450
Instructor and referee training	-	-	-	45													360
Recovery activities	35	35	35	30													1215
Total the year																	25200

A table of educational and training times for the training groups of the third year, min

Table 5

Index and type of training	September					October					November				December			
	Week of training																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
The number of training days	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
The number of training classes	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
General physical training total	290	290	290	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Warming up	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Games	20	30	30	20	20	20	20	20	20	20	20	20	20	10	20	20	20	20
Gymnastics of boxers	20	20	20	20	20	20	20	20	20	20	20	20	20	30	30	30	30	30
Exercises with ball and medicine ball	10	20	10	20	20	20	20	20	20	20	20	20	20	20	20	10	10	10
Exercises with skipping rope	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Short distance race	15	20	20	20	20	20	10	20	10	20	20	20	20	10	20	20	10	20
Jumping	15	10	20	20	20	20	20	10	20	20	20	10	20	20	20	10	20	10
Fighting in boxing stance	15	10	10	20	20	10	20	20	20	10	20	20	20	20	10	20	20	20
Boxing gym	25	10	10	10	10	20	20	20	20	20	10	20	10	20	10	20	20	20
The final part of training session	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Special physical training total	265	265	265	260	260	270	270	270	270	270	270	270	270	270	270	280	280	280
Boxing school	60	60	60	60	60	65	65	60	65	65	65	65	65	65	65	65	65	65
Boxing gym	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Exercises on pads	60	60	60	55	55	60	60	65	60	60	60	60	60	60	60	60	60	60
Shadow fighting	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	50	50	50
Conditional fighting	45	-	45	-	45	-	45	-	45	-	45	45	-	45	-	45	45	-
Free fighting	-	45	-	45	-	45	-	45	-	45	-	-	45	-	45	-	-	45
With the opponent in boxing gloves	60	155	195	195	195	135	185	135	185	185	135	185	135	185	180	130	170	125
Theory	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Entry and other tests	135	45	-	-	-	45	-	-	-	-	45	-	-	-	-	45	-	-
Instructor and referee training	-	-	-	-	-	-	-	45	-	-	-	-	45	-	-	-	-	45
Recovery activities	45	40	45	40	40	45	40	45	40	40	45	40	45	40	45	40	45	45

A table of educational and training times for the training groups of the third year, min

Table 5 continued

Index and type of training	January				February				March				April					
	Week of training																	
	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
The number of training days	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
The number of training classes	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
General physical training total	300	300	300	300	300	300	300	250	300	300	300	300	300	300	300	300	300	300
Warming up	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Games	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Gymnastics of boxers	30	30	30	30	30	30	30	20	30	30	30	30	30	30	30	30	30	30
Exercises with ball and medicine ball	20	10	10	20	10	10	20	10	20	20	20	10	20	10	20	10	20	10
Exercises with skipping rope	20	20	20	20	20	20	20	10	20	20	20	20	20	20	20	20	20	20
Short distance race	10	20	10	20	10	10	20	10	20	20	20	10	20	10	20	10	20	10
Jumping	20	10	20	10	20	20	20	10	20	20	20	20	10	20	10	20	10	20
Fighting in boxing stance	10	20	20	10	20	20	10	10	10	10	10	20	20	20	10	20	20	20
Boxing gym	20	20	20	20	20	20	10	10	10	10	10	20	10	20	20	20	10	20
The final part of training session	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Special physical training total	280	280	280	280	280	280	280	250	280	285	285	285	285	285	285	285	285	285
Boxing school	65	65	65	65	65	65	65	55	65	70	70	70	70	70	70	70	70	70
Boxing gym	60	60	60	60	60	60	60	50	60	60	60	60	60	60	60	60	60	60
Exercises on pads	60	60	60	60	60	60	60	50	60	60	60	60	60	60	60	60	60	60
Shadow fighting	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Conditional fighting	45	-	45	-	45	-	45	-	45	-	45	-	45	-	45	45	-	45
Free fighting	-	45	-	45	-	45	-	45	-	45	-	45	-	45	-	-	45	-
With the opponent in boxing gloves	175	170	125	125	175	170	175	160	170	170	120	125	165	165	165	120	120	165
Theory	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Entry and other tests	-	-	45	-	-	-	-	45	-	-	45	-	-	-	-	45	-	-
Instructor and referee training	-	-	-	45	-	-	-	45	-	-	-	45	-	-	-	-	45	-
Recovery activities	40	45	45	45	40	45	40	45	45	40	45	40	45	45	45	45	45	45

A table of educational and training times for the training groups of the third year, min

Table 5 continued

Index and type of training	May				June				July				August				In all the year
	Week of training																
	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	
The number of training days	7	7	7	7													280
The number of training classes	11	11	11	11													440
General physical training total	300	300	300	300													11920
Warming up	100	100	100	100													4000
Games	30	30	30	30													850
Gymnastics of boxers	30	30	30	30													1060
Exercises with ball and medicine ball	10	20	20	20													650
	HOLIDAYS																
Exercises with skipping rope	20	20	20	20													790
Short distance race	20	10	20	10													645
Jumping	10	10	10	10													645
Fighting in boxing stance	10	10	10	20													635
Boxing gym	20	20	10	10													645
The final part of training session	50	50	50	50													2000
Special physical training total	285	285	285	285													11050
Boxing school	70	70	70	70													2625
Boxing gym	60	60	60	60													2390
Exercises on pads	60	60	60	60													2385
Shadow fighting	50	50	50	50													1850
Conditional fighting	-	45	-	45													990
Free fighting	45	-	45	-													810
With the opponent in boxing gloves	165	120	120	165													6200
Theory	15	15	15	15													600
Entry and other tests	-	45	-	-													540
Instructor and referee training	-	-	45	-													360
Recovery activities	45	45	45	45													1730
In all the year																	32400

A table of educational and training times for the training groups of more than 3 years in training, min

Table 6

Index and type of training	September				October				November				December					
	Week of training																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
The number of training days	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
The number of training classes	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
General physical training total	335	335	335	335	335	335	335	335	335	335	330	330	330	330	330	330	330	330
Warming up	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
Games	20	20	30	30	30	30	-	20	10	30	20	30	20	30	35	10	30	30
Gymnastics of boxers	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Exercises with ball and medicine ball	-	20	20	20	30	20	30	20	10	60	20	20	20	25	10	35	10	20
Exercises with skipping rope	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Short distance race	20	20	20	-	20	-	30	10	20	10	-	20	15	10	20	10	25	10
Jumping	20	30	20	20	30	-	30	-	20	-	30	10	10	10	10	20	10	10
Fighting in boxing stance	20	-	20	20	-	30	20	30	20	10	5	20	30	10	20	10	20	25
Boxing gym	30	20	-	20	-	30	-	30	30	-	30	5	10	20	10	20	10	10
The final part of training session	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55
Special physical training total	320	320	320	320	320	320	320	320	340	340	340	340	340	340	360	350	360	360
Boxing school	80	80	80	80	80	80	80	80	80	80	80	80	80	80	100	90	100	100
Boxing gym	60	60	60	60	60	60	60	60	80	80	80	80	80	80	80	80	80	80
Exercises on pads	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Shadow fighting	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Conditional fighting	60	-	60	-	60	-	60	-	60	-	60	60	-	60	-	60	60	-
Free fighting	-	60	-	60	-	60	-	60	-	60	-	-	60	-	60	-	-	60
With the opponent in boxing gloves	45	135	180	135	185	135	185	135	120	165	165	125	120	170	145	115	145	105
Theory	20	20	20	20	15	20	15	20	15	15	20	15	20	15	20	15	20	15
Entry and other tests	135	45	-	-	-	45	-	-	45	-	-	45	-	-	-	45	-	-
Instructor and referee training	-	-	-	45	-	-	-	45	-	-	-	-	45	-	-	-	-	45
Recovery activities	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45

A table of educational and training times for the training groups of more than 3 years in training, min

Table 6 continued

Index and type of training	January				February				March				April					
	Week of training																	
	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
The number of training days	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
The number of training classes	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
General physical training total	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	340	330	
Warming up	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	
Games	40	30	20	15	30	20	35	35	25	30	25	40	30	20	10	20	30	30
Gymnastics of boxers	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Exercises with ball and medicine ball	10	20	20	30	20	10	20	15	30	20	20	10	10	30	10	10	10	
Exercises with skipping rope	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Short distance race	10	10	20	10	10	15	20	10	20	10	20	15	15	10	10	10	15	20
Jumping	15	10	10	10	20	10	10	10	10	10	10	10	20	15	10	15	20	10
Fighting in boxing stance	10	25	10	20	10	20	10	15	10	15	20	10	20	20	15	30	20	20
Boxing gym	20	10	25	20	15	30	10	20	10	20	10	20	10	30	30	20	20	15
The final part of training session	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55
Special physical training total	360	360	360	360	365	400	400	340	405	375	400	370	370	405	405	400	370	375
Boxing school	100	100	100	100	85	100	100	100	105	105	100	100	100	105	105	100	100	105
Boxing gym	80	80	80	80	80	80	80	60	80	70	80	70	70	80	80	80	70	70
Exercises on pads	60	60	60	60	80	80	80	60	80	70	80	70	70	80	80	80	70	70
Shadow fighting	60	60	60	60	60	80	80	60	80	70	80	70	70	80	80	80	70	70
Conditional fighting	-	60	-	60	60	-	60	-	60	-	60	-	60	-	60	60	-	60
Free fighting	60	-	60	-	-	60	-	60	-	60	-	60	-	60	-	-	60	-
With the opponent in boxing gloves	150	100	150	100	100	105	110	125	60	130	110	90	95	100	105	105	85	90
Theory	15	20	15	20	15	20	15	15	15	20	15	20	15	20	15	20	15	15
Entry and other tests	-	45	-	-	45	-	-	-	45	-	-	-	45	-	-	-	-	45
Instructor and referee training	-	-	-	45	-	-	-	45	-	-	-	45	-	-	-	-	45	-
Recovery activities	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45

A table of educational and training times for the training groups of more than 3 years in training, min

Table 6 continued

Index and type of training	May				June				July				August				In all the year
	Week of training																
	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	
The number of training days	7	7	7	7													280
The number of training classes	13	13	13	13													520
General physical training total	330	330	335	335													13270
Warming up	120	120	120	120													4800
Games	30	30	30	20													1020
Gymnastics of boxers	30	30	30	30													1200
Exercises with ball and medicine ball	30	10	15	30													780
Exercises with skipping rope	20	20	20	20													800
Short distance race	15	20	10	20													575
Jumping	10	15	10	10													550
Fighting in boxing stance	10	20	20	20													680
Boxing gym	10	10	25	10													665
The final part of training session	55	55	55	55													2200
Special physical training total	390	390	385	385													14400
Boxing school	105	105	100	100													3730
Boxing gym	80	80	80	80													2970
Exercises on pads	80	80	80	80													2690
Shadow fighting	80	80	80	80													2670
Conditional fighting	-	45	-	45													1290
Free fighting	45	-	45	-													1050
With the opponent in boxing gloves	115	120	70	75													4800
Theory	20	15	20	15													695
Entry and other tests	-	-	-	45													630
Instructor and referee training	-	-	45	-													405
Recovery activities	45	45	45	45													1800
In all the year	36000																

A table of educational and training times for the sportsmanship groups of the first year of training, min

Table 7

Index and type of training	September				October				November				December					
	Week of training																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
The number of training days	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
The number of training classes	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
General physical training total	300	280	290	280	290	290	290	290	290	290	290	290	290	290	290	290	290	290
Warming up	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110
Games	20	20	20	20	15	15	20	10	20	15	10	20	15	10	30	30	30	-
Gymnastics of boxers	30	10	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Exercises with ball and medicine ball	10	10	20	10	20	10	20	20	15	20	10	20	20	5	20	20	10	20
Exercises with skipping rope	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Short distance race	20	20	10	20	20	20	5	15	5	20	20	30	-	30	10	10	20	10
Jumping	20	20	5	10	10	5	20	15	20	10	20	10	10	20	5	10	15	20
Fighting in boxing stance	5	5	10	10	10	20	10	5	15	10	5	-	20	20	-	10	-	20
Boxing gym	10	10	20	5	10	15	10	20	10	10	20	5	20	-	20	5	10	15
The final part of training session	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55
Special physical training in al.....:	490	490	490	490	490	490	490	490	490	490	490	490	490	490	490	490	490	490
Boxing school	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
Boxing gym	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Exercises on pads	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Shadow fighting	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Conditional fighting	-	60	-	60	-	60	60	-	60	-	60	60	-	60	-	60	60	-
Free fighting	60	-	60	-	60	-	-	60	-	60	-	-	60	-	60	-	-	60
With the opponent in boxing gloves	210	120	150	140	210	120	210	165	140	105	210	210	165	140	120	200	210	165
Theory	20	20	25	25	20	20	20	20	25	25	20	20	20	25	20	20	20	20
Entry and other tests	-	90	-	-	-	90	-	-	-	90	-	-	-	-	90	-	-	-
Instructor and referee training	-	-	45	-	-	-	-	45	-	-	-	-	45	-	-	-	-	45
Recovery activities	70	70	80	135	70	70	70	70	135	80	70	70	70	135	70	80	70	70

A table of educational and training times for the sportsmanship groups of the first year of training, min

Table 7 continued

Index and type of training	January					February					March					April			
	Week of training																		
	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
The number of training days	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	
The number of training classes	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	
General physical training total	290	290	290	290	290	290	290	290	295	290	295	295	295	295	295	295	295	295	
Warming up	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	
Games	-	-	15	20	30	30	-	-	20	20	15	20	15	-	30	-	-	30	
Gymnastics of boxers	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	
Exercises with ball and medicine ball	10	20	30	30	25	-	25	10	-	25	15	10	15	30	15	20	15	30	
Exercises with skipping rope	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	
Short distance race	20	20	30	25	-	5	20	25	15	15	15	15	15	15	15	30	15	5	
Jumping	15	20	10	10	20	25	10	25	25	15	15	15	15	15	-	15	15	15	
Fighting in boxing stance	20	10	-	-	-	25	15	20	25	-	15	15	15	15	15	15	15	-	
Boxing gym	20	15	-	-	10	-	15	5	5	10	15	15	15	15	15	10	30	10	
The final part of training session	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	
Special physical training total	490	490	490	490	490	490	490	490	490	490	480	490	490	490	490	490	490	490	
Boxing school	130	130	130	130	130	130	130	130	130	130	120	130	130	130	130	130	130	130	
Boxing gym	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
Exercises on pads	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
Shadow fighting	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
Conditional fighting	60	-	60	-	60	-	60	-	60	-	60	-	60	-	60	60	-	60	
Free fighting	-	60	-	60	-	60	-	60	-	60	-	60	-	60	-	-	60	-	
With the opponent in boxing gloves	145	120	200	165	145	120	210	165	140	110	200	160	140	110	205	205	150	140	
Theory	20	20	20	20	20	20	20	20	20	25	20	20	20	25	20	20	20	20	
Entry and other tests	-	90	-	-	-	90	-	-	-	90	-	-	-	90	-	-	-	-	
Instructor and referee training.	-	-	-	45	-	-	-	45	-	-	-	45	-	-	-	-	45	-	
Recovery activities.	135	70	80	70	135	70	70	70	135	70	80	70	135	70	70	70	80	135	

A table of educational and training times for the sportsmanship groups of the first year of training, min

Table 7 continued

Index and type of training	May				June				July				August				In all the year
	Week of training																
	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	
The number of training days	7	7	7	7													280
The number of training classes	13	13	13	13													520
General physical training total	295	295	295	295													11655
Warming up	110	110	110	110													4400
Games	25	15	15	20													640
Gymnastics of boxers	20	20	20	20													800
Exercises with ball and medicine ball	25	15	10	15													670
																	HOLIDAYS
Exercises with skipping rope	20	20	20	20													800
Short distance race	20	15	15	10													645
Jumping	20	15	15	15													590
Fighting in boxing stance	-	15	20	15													445
Boxing gym	-	15	15	15													465
The final part of training session	55	55	55	55													2200
Special physical training total	490	485	490	490													19585
Boxing school	130	130	130	130													5190
Boxing gym	100	100	100	100													4000
Exercises on pads	100	95	100	100													3995
Shadow fighting	100	100	100	100													4000
Conditional fighting	-	60	-	60													1320
Free fighting	60	-	60	-													1080
With the opponent in boxing gloves	105	210	160	145													6440
Theory	20	20	20	20													835
Entry and other tests	90	-	-	-													810
Instructor and referee training.	-	-	45	-													405
Recovery activities.	70	70	70	135													3445
In all the year																	43175

A table of educational and training times for the sportsmanship groups of the second year of training, min

Table 8

Index and type of training	September				October				November				December					
	Week of training																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
The number of training days	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
The number of training classes	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
General physical training total	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315
Warming up	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
Games	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Gymnastics of boxers	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Exercises with ball and medicine ball	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Exercises with skipping rope	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Short distance race	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Jumping	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Fighting in boxing stance	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Boxing gym	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
The final part of training session	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55
Special physical training total	490	490	490	480	490	490	490	505	490	490	490	490	505	490	490	510	510	560
Boxing school	120	120	120	120	120	120	120	205	120	120	120	120	205	120	120	120	120	200
Boxing gym	110	110	110	100	110	110	110	100	110	110	110	110	100	110	100	120	120	100
Exercises on pads	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Shadow fighting	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	110	110	100
Conditional fighting	-	60	-	60	60	-	60	-	-	60	-	60	-	-	60	-	60	60
Free fighting	60	-	60	-	-	60	-	-	60	-	60	-	-	60	-	60	-	-
With the opponent in boxing gloves	185	275	260	155	275	185	275	200	205	170	275	275	200	205	180	245	255	140
Theory	20	20	25	25	20	20	20	20	25	25	20	20	20	25	25	20	20	25
Entry and other tests	90	-	-	-	-	90	-	-	-	90	-	-	-	-	90	-	-	-
Instructor and referee training	-	-	-	60	-	-	-	60	-	-	-	-	60	-	-	-	-	60
Recovery activities	70	70	80	135	70	70	70	70	135	80	70	70	70	135	70	80	70	70

A table of educational and training times for the sportsmanship groups of the second year of training, min

Table 8 continued

Index and type of training	January				February				March				April					
	Week of training																	
	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
The number of training days	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
The number of training classes	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
General physical training total	315	315	315	315	315	315	315	315	315	315	315	320	320	320	320	320	320	320
Warming up	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
Games	15	15	15	15	15	15	15	15	15	15	15	20	20	20	20	20	20	20
Gymnastics of boxers	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Exercises with ball and medicine ball	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Exercises with skipping rope	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Short distance race	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Jumping	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Fighting in boxing stance	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Boxing gym	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
The final part of training session	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55
Special physical training total	495	460	540	460	495	490	510	460	495	520	540	495	490	520	530	530	485	490
Boxing school	120	100	120	100	120	120	120	100	120	120	120	120	120	120	120	120	110	120
Boxing gym	110	100	140	100	110	110	120	100	110	120	140	110	110	110	120	120	110	110
Exercises on pads	100	100	110	100	100	100	100	100	100	110	110	100	100	110	110	110	100	100
Shadow fighting	105	100	110	100	105	100	110	100	105	110	110	105	100	120	120	120	105	100
Conditional fighting	-	60	-	60	60	-	60	60	-	60	-	60	60	-	60	-	60	60
Free fighting	60	-	60	-	-	60	-	-	60	-	60	-	-	60	-	60	-	-
With the opponent in boxing gloves	200	215	215	245	200	185	255	245	200	150	210	200	200	235	135	225	200	200
Theory	25	20	20	20	25	20	20	20	25	25	25	25	25	25	25	25	25	25
Entry and other tests	-	90	-	-	-	90	-	-	-	90	-	-	-	-	90	-	-	-
Instructor and referee training	-	-	-	60	-	-	-	60	-	-	-	60	-	-	-	-	60	-
Recovery activities	135	70	80	70	135	70	70	70	135	70	80	70	135	70	70	70	80	135

A table of educational and training times for the sportsmanship groups of the second year of training, min

Table 8 continued

Index and type of training	May				June				July				August				In all the year
	Week of training																
	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	
The number of training days	7	7	7	7													280
The number of training classes	13	13	13	13													520
General physical training total	310	320	315	315													12635
Warming up	120	120	120	120													4800
Games	20	20	15	15													645
Gymnastics of boxers	30	30	30	30													1200
Exercises with ball and medicine ball	15	15	15	15													600
																	HOLIDAYS
Exercises with skipping rope	20	20	20	20													800
Short distance race	15	15	15	15													600
Jumping	15	15	15	15													600
Fighting in boxing stance	15	15	15	15													600
Boxing gym	5	15	15	15													590
The final part of training session	55	55	55	55													2200
Special physical training total	500	530	500	490													19975
Boxing school	120	120	140	130													5010
Boxing gym	100	120	100	100													4420
Exercises on pads	100	110	100	100													4080
Shadow fighting	120	120	100	115													4200
Conditional fighting	-	60	-	45													1305
Free fighting	60	-	60	-													960
With the opponent in boxing gloves	175	225	200	205													8480
Theory	25	25	25	25													915
Entry and other tests	90	-	-	-													810
Instructor and referee training	-	-	60	-													540
Recovery activities.	70	70	70	135													1115
In all the year																	16800

A table of educational and training times for the sportsmanship groups > 2 years of training, min

Table 9

Index and type of training	September				October				November				December					
	Week of training																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
The number of training days	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
The number of training classes	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
General physical training total	330	330	330	330	340	340	340	340	340	335	340	340	340	340	340	340	340	340
Warming up	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140
Games	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Gymnastics of boxers	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Exercises with ball and medicine ball	15	-	15	15	15	-	15	20	15	15	20	20	15	-	20	20	20	15
Exercises with skipping rope	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Short distance race	15	15	15	15	-	15	20	20	15	-	20	15	20	15	15	15	15	20
Jumping	15	15	15	-	15	20	20	-	-	20	15	20	-	20	-	15	-	-
Fighting in boxing stance	15	15	-	15	20	20	15	15	20	15	15	-	15	15	20	20	15	15
Boxing gym	-	15	15	15	20	15	-	15	20	15	-	15	20	20	15	-	20	20
The final part of training session	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65
Special physical training total	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
Boxing school	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
Boxing gym	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
Exercises on pads	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Shadow fighting	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Conditional fighting	60	-	60	-	60	-	60	-	60	-	60	-	60	-	60	-	60	-
Free fighting	-	60	-	60	-	60	-	60	-	60	-	60	-	60	-	60	-	60
With the opponent in boxing gloves	120	215	290	300	190	195	280	290	280	200	195	285	285	285	200	205	280	295
Theory	30	25	30	25	30	25	30	25	30	25	30	25	30	25	30	25	30	25
Entry and other tests	180	-	-	-	90	-	-	-	-	90	-	-	-	-	90	-	-	-
Instructor and referee training	-	90	-	-	-	90	-	-	-	-	90	-	-	-	-	90	-	-
Recovery activities	100	100	110	105	110	110	110	105	110	110	105	110	105	110	100	100	110	100

A table of educational and training times for the sportsmanship groups > 2 years of training, min

Table 9 continued

Index and type of training	January				February				March				April					
	Week of training																	
	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
The number of training days	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
The number of training classes	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
General physical training total	340	340	340	340	340	340	340	340	340	340	340	340	340	335	335	335	335	335
Warming up	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140
Games	15	15	15	15	15	15	15	15	15	15	10	15	15	15	15	15	15	15
Gymnastics of boxers	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Exercises with ball and medicine ball	15	15	20	15	10	15	15	15	15	10	15	15	15	15	15	10	10	15
Exercises with skipping rope	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Short distance race	10	20	10	10	15	15	15	15	10	15	15	15	15	15	10	15	15	10
Jumping	20	10	10	15	15	15	15	10	15	15	15	15	15	10	15	15	15	15
Fighting in boxing stance	15	10	15	10	20	15	10	15	15	15	15	15	10	10	10	10	10	10
Boxing gym	10	15	15	20	10	10	15	15	15	15	15	10	15	15	15	15	15	15
The final part of training session	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65
Special physical training total	500	500	500	500	500	500	520	520	535	520	530	520	535	525	525	520	535	540
Boxing school	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
Boxing gym	120	120	120	120	120	120	120	120	125	120	130	120	125	125	125	120	130	130
Exercises on pads	100	100	100	100	100	100	120	120	130	120	120	120	130	120	120	120	125	130
Shadow fighting	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Conditional fighting	60	-	60	-	60	60	-	60	-	60	-	60	-	60	-	60	60	-
Free fighting	-	60	-	60	-	-	60	-	60	-	60	-	60	-	60	-	-	60
With the opponent in boxing gloves	280	200	200	290	290	200	270	265	205	175	260	265	205	265	180	260	260	205
Theory	30	30	30	30	30	30	30	30	30	35	30	30	30	35	30	30	30	30
Entry and other tests	-	90	-	-	-	90	-	-	-	90	-	-	-	-	90	-	-	-
Instructor and referee training	-	-	90	-	-	-	-	-	45	-	-	-	45	-	-	-	-	45
Recovery activities	110	100	100	100	100	100	100	105	105	100	100	105	105	100	100	105	100	105

A table of educational and training times for the sportsmanship groups > 2 years of training, min

Table 9 continued

Index and type of training	May				June				July				August				In all the year
	Week of training																
	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	
The number of training days	7	7	7	7													280
The number of training classes	14	14	14	14													560
General physical training total	335	345	340	340													13530
Warming up	140	140	140	140													5600
Games	10	10	20	20													595
Gymnastics of boxers	30	30	30	30													1200
Exercises with ball and medicine ball	15	15	15	15	HOLIDAYS											570	
Exercises with skipping rope	20	20	20	20													800
Short distance race	15	15	15	15													570
Jumping	10	15	15	15													500
Fighting in boxing stance	10	15	15	15													550
Boxing gym	20	20	5	5													545
The final part of training session	65	65	65	65													2600
Special physical training total	520	520	530	535													20430
Boxing school	120	130	120	120													4810
Boxing gym	120	110	130	125													4855
Exercises on pads	120	120	120	130													4365
Shadow fighting	100	100	100	100													4000
Conditional fighting	60	-	60	-													1260
Free fighting	-	60	-	60													1140
With the opponent in boxing gloves	185	260	260	205													9575
Theory	30	30	30	30													1165
Entry and other tests	90	-	-	-													900
Instructor and referee training	-	-	-	45													630
Recovery activities	100	105	100	105													4160
In all the year	50390																

Table of training and educational material for elite groups, min

Table 10

Index and type of training	September				October				November				December					
	Week of training																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
The number of training days	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
The number of training classes	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
General physical training total	370	370	370	370	370	370	370	370	380	380	380	380	380	380	380	380	380	380
Warming up	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185
Games	-	-	-	-	-	-	-	-	10	10	10	10	10	10	10	10	10	10
Gymnastics of boxers	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Exercises with ball and medicine ball	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Exercises with skipping rope	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Short distance race	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Jumping	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Fighting in boxing stance	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Boxing gym	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
The final part of sessions	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
Special physical training total	530	550	550	550	550	530	550	530	540	530	550	550	530	540	550	550	550	530
Boxing school	120	140	140	140	140	120	140	120	130	120	140	140	120	130	140	140	140	120
Boxing gym	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Exercises on pads	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Shadow fighting	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Conditional fighting	60	-	60	-	60	-	60	-	60	-	60	-	60	-	60	-	60	-
Free fighting	-	60	-	60	-	60	-	60	-	60	-	60	-	60	-	60	-	60
With the opponent in boxing gloves	210	275	390	260	370	315	390	315	355	305	380	375	310	350	380	285	380	305
Theory	30	35	30	35	30	35	30	35	30	35	30	35	30	35	30	35	30	35
Tests	180	90	-	-	-	90	-	-	-	90	-	-	-	-	90	-	-	
Coaching and referee training	-	-	-	90	-	-	-	90	-	-	-	-	90	-	-	-	-	90
Recovery, active rest	120	120	100	135	120	100	100	100	135	100	100	100	100	135	100	100	100	100

Table of training and educational material for elite groups, min

Table 10 continued

Index and type of training	January					February					March					April			
	Week of training																		
	19	20	21	22	23	19	20	21	22	23	19	20	21	22	23	19	20	21	
The number of training days	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	
The number of training classes	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	
General physical training total	380	380	380	380	380	380	380	380	385	385	385	375	385	380	375	375	375	375	
Warming up	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185	
Games	10	10	10	10	10	10	10	10	15	15	15	15	15	15	15	15	15	15	
Gymnastics of boxers	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	
Exercises with ball and medicine ball	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	-	
Exercises with skipping rope	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	
Short distance race	10	10	10	10	10	10	10	10	10	10	10	-	10	10	10	10	-	10	
Jumping	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	-	10	10	
Fighting in boxing stance	10	10	10	10	10	10	10	10	10	10	10	10	10	10	-	10	10	10	
Boxing gym	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
The final part of training session	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	
Special physical training total	540	550	530	530	540	530	550	530	530	530	535	530	530	540	540	550	540	540	
Boxing school	130	140	120	120	130	120	140	120	130	120	140	120	130	140	130	140	130	130	
Boxing gym	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	
Exercises on pads	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
Shadow fighting	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
Conditional fighting	60	-	60	-	60	-	60	-	60	-	60	-	60	-	60	-	60	-	
Free fighting	-	60	-	60	-	60	-	60	-	60	-	60	-	60	-	60	-	60	
With the opponent in boxing gloves	355	375	310	305	355	305	375	310	355	300	385	315	355	385	280	360	300	355	
Theory	30	35	30	35	30	35	35	30	35	35	35	30	35	35	35	35	35	35	
Entry and other tests	-	-	90	-	-	90	-	-	-	90	-	-	-	-	90	-	-	-	
Instructor and referee training	-	-	-	90	-	-	-	90	-	-	-	90	-	-	-	-	90	-	
Recovery activities	135	100	100	100	135	100	100	100	135	100	100	100	135	100	120	120	100	135	

Table of training and educational material for elite groups, min

Table 10 continued

Index and type of training	May				June				July				August				In all the year
	Week of training																
	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	
The number of training days	7	7	7	7													280
The number of training classes	16	16	16	16													640
General physical training total	375	375	375	375													15095
Warming up	185	185	185	185													7400
Games	15	15	15	15													390
Gymnastics of boxers	30	30	30	30													1200
Exercises with ball and medicine ball	10	10	10	-					HOLIDAYS								380
Exercises with skipping rope	15	15	15	15													595
Short distance race	10	10	-	10													370
Jumping	10	-	10	10													380
Fighting in boxing stance	10	10	10	10													390
Boxing gym	-	10	10	10													390
The final part of training session	90	90	90	90													3600
Special physical training total	540	550	550	540													21605
Boxing school	130	140	140	130													5250
Boxing gym	150	150	150	150													6000
Exercises on pads	100	100	100	100													4000
Shadow fighting	100	100	100	100													4000
Conditional fighting	60	-	60	-													1200
Free fighting	-	60	-	60													1200
With the opponent in boxing gloves	280	385	290	350													13335
Theory	35	30	30	35													1320
Entry and other tests	90	-	-	-													990
Instructor and referee training	-	-	95	-													815
Recovery activities	120	100	100	140													4440
In all the year																	57600

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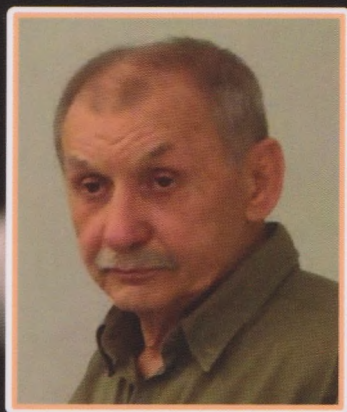
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Valentyn N. Ostyanov

Valentyn N. Ostyanov: PhD in Sport Sciences, Master of Sport in the USSR, Honored Trainer of Ukraine.

The author is a member of the AIBA coaching commission and a certified AIBA trainer.

As a member of the coaching team, the author has prepared the Ukrainian National Team for five Olympic Games (XXVI, XXVII, XXVIII, XXIX, XXX) and now works as a senior trainer/consultant for the team, responsible for scientific and methodological support.

