

Methodology for Improving the Movement Techniques of Junior Boxers in The Ring Based on Elements of Information and Communication Technologies

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Abstract: The article examines the improvement of young boxers' ring movement techniques based on elements of information and communication technologies. The study used pedagogical observation, testing, video analysis, and mathematical-statistical methods. Boxers aged 15-16 participated in the study, who were divided into experimental and control groups. As a result of the methodology used in the experimental group, positive changes in physical and technical-tactical indicators were observed. The obtained results confirm the increase in the effectiveness of training based on information and communication technologies.

Keywords: Movement in the ring, maneuvering, technique, tactics, evaluation, model, preparation, cross, apron, shell, sparring, experiment, methodology, aerobic, universal.

Introduction: Currently, the digitalization of the sphere of physical culture and sports, the introduction of modern information and communication technologies into the educational and training process is becoming a global trend. In the Republic of Uzbekistan, innovative approaches are being widely implemented to develop the sports sector, train highly qualified athletes, and increase competitiveness in the international arena.

Achieving high results in boxing largely depends on the athlete's technical and tactical preparedness, especially their ability to effectively maneuver in the ring. Ring movement technique is an important factor that allows the athlete to effectively organize attacks and counterattacks, predict the opponent's actions, and take a comfortable position [18,19]. At the same time, analysis of the practice of training young boxers shows that the formation and improvement of their ring

movement technique is carried out on the basis of traditional methods, and modern information and communication technologies are insufficiently used in this process. As a result, the possibilities of identifying errors, in-depth analysis of actions, and ensuring an individual approach in the training process are limited [8,16].

In world practice, it is observed that through video analysis, digital movement modeling, sensor and monitoring technologies, the technical actions of athletes are accurately assessed, and the effectiveness of the training process is significantly increased. This indicates the importance of organizing athletes' training on a scientific basis through the use of ICT [15].

Another aspect of the problem is that a unified systematic methodology aimed at improving the technique of movement of junior boxers in the ring

based on information and communication technologies has not been sufficiently developed. This determines the need for scientific research in this area.

Therefore, the development and implementation of a methodology for improving the technique of movement of junior boxers in the ring based on elements of information and communication technologies is one of the urgent scientific and practical problems of today.

Research objective. Development of an effective pedagogical methodology aimed at improving the technique of movement of junior boxers in the ring based on elements of information and communication technologies and scientific substantiation of its effectiveness.

Research objectives

- Analysis of scientific and methodological literature on improving the technique of movement of junior boxers in the ring and determining the theoretical foundations of this process.
- Development of a methodology aimed at improving the technique of movement of junior boxers in the ring based on elements of information and communication technologies.
- Verification of the effectiveness of the developed methodology through pedagogical experimental work and analysis of the obtained results.
- Analysis of the obtained results based on mathematical and statistical methods and drawing scientific conclusions.

METHODS

The following scientific methods were used in the research process:

- analysis and generalization of scientific and methodological literature;
- pedagogical observation of the training and competitive activities of junior boxers;
- pedagogical testing to assess movement techniques in the ring;
- video analysis using digital tools, including frame-by-frame playback, slow-motion analysis, and comparison of movement patterns to assess technical actions;
- pedagogical experiment;
- statistical analysis of the obtained data.

Organization of the research.

The study involved 30 junior boxers aged 15–16 years. The participants were selected based on their sports qualifications (Grade I) and level of preparedness. They were randomly assigned to an experimental group (n=15) and a control group (n=15).

Inclusion criteria included regular participation in training, at least 2–3 years of boxing experience, and absence of injuries. Participants with injuries or incomplete data were excluded from the study.

The study was conducted in accordance with ethical standards for research involving human participants. Informed consent was obtained from all participants and their legal guardians.

The research was conducted on the basis of the training camps of the national team in the city of Chirchik. At the beginning of the study, no statistically significant differences were found between the groups in physical and technical-tactical indicators ($p > 0.05$).

In the experimental group, training sessions were conducted according to an improved methodology based on elements of information and communication technologies (video analysis and performance review). In the control group, traditional training methods were applied. At the end of the study, a comparative analysis of the results was carried out to evaluate the effectiveness of the proposed methodology.

RESULTS

Analysis of the conducted scientific and methodological literature showed that maneuvering movements are an important component of the technical and tactical training of boxers. However, in existing studies, the issues of formation and improvement of these movements, especially in young boxers, based on information and communication technologies, have not been sufficiently covered. The methodology developed during the study provided a comprehensive approach to improving the technique of movement of junior boxers in the ring. At the beginning of the training process, the level of physical, technical, and functional preparedness of the athletes was determined by entrance control. At the next stage, the training process was organized based on elements of information and communication technologies, in particular, video analysis and models developed on the basis of the possibilities of reviewing and comparing actions. This made it possible to

gradually and accurately improve the boxers' technique of movement in the ring.

At the end of the experiment, the level of physical, technical-tactical, and functional preparedness of the athletes was assessed comprehensively, in which, along with expert assessment, digital analysis methods were also used. Also, the results of competitive activity were analyzed, and the effectiveness of maneuvering actions was determined. Based on the results obtained, errors and shortcomings in the technical and tactical training of boxers were identified, and appropriate decisions were made to eliminate them. The results of the study showed that the use of elements of information and communication technologies ensures high efficiency in improving the technique of movement of junior boxers in the ring, serves the precise and systematic organization of the training process, as well as the prompt identification and elimination of errors.

In the process of developing the methodology, we relied on the scientific works of such specialists as Martusciello F., Perazzetti A., Kaçurri A., Bushati S., Muçalliu A., Tessitore A., Madrimov I., and Ambrozy T., who highlighted the theoretical and practical foundations of boxers' training. The research of these scholars is significant for their scientific substantiation of the issues of technical and tactical training, maneuvering movements, and the organization of the training process in boxing [2,3].

At the same time, when forming the content of the methodology, the general theoretical provisions of sports training developed by L.P. Matveev and V.N. Platonov, including scientific approaches to planning the training process, distribution of loads, and organization of the preparatory stages, were used. These theoretical foundations served to effectively improve the technique of young boxers' movement in the ring by integrating elements of information and communication technologies into the training process [10,14].

The methodology for applying maneuvering movements at the pre-competition stage of technical and tactical training of young boxers was developed based on a comprehensive approach. Within the framework of this methodology, first of all, the level of development of physical and special (specific) qualities of athletes was determined through preliminary

control. At the next stage, the training process was organized based on the models developed in the study. Also, at the end of the training sessions, video analysis methods based on test trials and information and communication technologies were used to determine the technical and tactical training of young boxers, their conditioning and coordination indicators, as well as the level of mastery of maneuvering movements.

The preparation process for the main competitions was divided into three stages: the first stage - general physical training (2 weeks), the second stage - special physical training (2 weeks), the third stage - special technical and tactical training (2 weeks). At each stage, training loads were gradually increased, and the athletes' functional state and movement technique were improved.

When conducting training sessions based on the proposed methodology, the main attention was paid to exercises specific to the "boxing school." In particular, in order to create favorable conditions for attack and defense, the formation of correct, fast, and effective movement skills in the ring has been identified as a priority task. This process requires improving walking technique, increasing endurance, and developing strength and coordination of arms, legs, and the body.

In order to effectively improve the technique of movement in the ring during the first two weeks of the pre-competition period, exercises of an aerobic nature, performed at a certain speed, were applied to the boxers of the experimental group. These exercises were controlled using information and communication technologies, and the accuracy of the movements and the quality of their execution were assessed by video analysis. This made it possible to quickly identify errors in the training process and effectively eliminate them.

Within the framework of the methodology aimed at improving the maneuvering actions of young boxers at the pre-competition stage of technical and tactical training, the training process was organized meaningfully and in stages. The composition of the exercises included special exercises, such as forward jumps, leg movements with a cross to the left, right, forward, and backward, upward jumps with 90°, 180°, and 360° turns, as well as performing combinations of strikes on the instructions of the coach after the movement cycle. These movements were performed by

boxers with a weight of 1-1.5 kg attached to the legs, which increased the load on the leg muscles and contributed to the development of muscle endurance and maneuvering speed in the ring.

The exercises used within the framework of the methodology made it possible to choose the most comfortable position of the body for attacking and defensive actions of boxers, to effectively combine the force of the punch. In the first two weeks of training, general developmental exercises were of paramount importance. They included general physical training exercises, general developmental exercises, as well as elements of the "boxing school," performed on the basis of running various distances, rotational, variable, and repeated methods. At the same time, special exercises that develop leg movement were systematically used.

In the next two weeks of the pre-competition stage, training became more specialized and included medicine ball exercises, drills with various balls (such as football, basketball, and tennis balls), non-contact and contact technical exercises, fartlek training (including aquatic-based sessions), and controlled sparring against multiple opponents. These exercises contributed to improving the speed of movement, coordination, and the effectiveness of maneuvering actions in boxers.

At the final stage of training, the training was further specialized and such exercises as offensive and defensive techniques, on punching bags and pads, on punching bags and pads, as well as participation of one boxer in a conditional and free combat against two or three opponents were used. This process encouraged boxers to make quick decisions, increase the speed of movement, and use more maneuverable movements.

At the same time, such exercises as cross-country running, shuttle runs, continuous running, working on equipment with a change in direction of movement,

performing exercises in a circular method, freestyle fighting, and pad work were also used. In the process of pad work, boxers, performing combination movements at various distances, developed the skills of constant movement, changing positions, and transitioning to counterattacks.

When organizing the training process, we relied on the theory of mesocycles developed by V.N. Platonov. According to it, the structure of training is determined by the interrelationship of physical, technical-tactical, and special training, the volume and intensity of loads, and the sequence of stages [14]. This approach was also supported by such scientists as N.G. Ozolin, M.Ya. Nabatnikova, Yu.V. Verkhoshansky, V.P. Filin, and L.P. Matveev [11,13].

Based on the above scientific and methodological approaches and practical experience, a 6-week model for preparing junior boxers for major competitions was developed. This model was also applied to the control group, but in the experimental group, more attention was paid to the improvement of maneuvering actions. In particular, such movements as long-distance maneuvers (retreat and side steps), frontal maneuvers (the combination of forward movement and defense), and winged maneuvers (squeezing the opponent into corners) were systematically developed. In the control group, such actions were performed in a smaller volume.

The effectiveness of the methodology was assessed by conducting a comparative analysis of the indicators of the control and experimental groups. Physical qualities were determined by running 100 meters, standing long jump, pull-ups, weightlifting, and 3000 meters. The obtained results showed a significant improvement in the technique of maneuvering movements and physical indicators in the experimental group.

Table 1 Physical training of junior boxers of the control and experimental groups after the completion of the pedagogical experiment

Physical quality	Movement test	Experimental group n=15 $\bar{X} \pm \sigma$	Control group n=15 $\bar{X} \pm \sigma$	Differences in mean (%)	t	p
Force	Pull-ups	19,3±1,7	17,2±1,5	12,2%	4,2	<0.001

Force	Barbell snatch (number of times)	11,32±1,2	9,4±0,7	20,4%	2,4	<0.05
Speed	100m Run (s)	13,4±0,1	13,9±0,2	3,6%	0,3	>0.05
Explosive force	Standing Long Jump (cm)	153,7±6,5	147,6±1,3	4,1%	2,8	<0.05
Endurance	3000m Run (s)	683,5±13,4	692,8±10,6	1,3%	4,3	<0.05

Note: X – mean value; σ – standard deviation.

Note: After the completion of the pedagogical experiment, it was established that the physical fitness indicators of adolescent boxers in the experimental group were higher than those of the control group. The magnitude of improvement varied across tests, ranging from 1.3% to 20.4%.

According to the results of the final testing, the junior boxers of the experimental group achieved higher results in pull-ups compared to their peers in the control group, and these differences were statistically significant. This is explained by the fact that in the experimental group, along with technical training, a large volume of strength exercises was used.

In the barbell snatch test, the participants of the experimental group demonstrated higher average results (11,32 repetitions) compared to the control group (9,4 repetitions). This indicates a higher level of development of strength abilities, particularly in the shoulder and upper limb muscle groups, in the experimental group. The observed differences may positively influence the effectiveness of punching actions in boxing. The results of the Student's t-test ($t = 2.4$, $p < 0.05$) confirm that the difference between the groups is statistically significant.

In the analysis of the 100-meter race results, no statistically significant differences were found between the experimental and control groups ($p > 0.05$). The average results were 13.4 seconds in the experimental group and 13.9 seconds in the control group. This can be explained by the relatively slow rate of development of speed abilities and their strong dependence on genetic factors. At the same time, the obtained results for this age group (15–16 years) can be considered satisfactory.

In the standing long jump test, the explosive strength of the leg muscles was assessed, and the participants of

the experimental group outperformed those of the control group. In particular, the boxers of the experimental group demonstrated an average result of 153.7 cm, whereas in the control group this indicator was 147.6 cm. The results of the Student's t-test ($t = 2.8$, $p < 0.05$) confirm that the observed difference between the groups is statistically significant.

In general, at the end of the pedagogical experiment, it was found that the physical fitness indicators of young boxers in the experimental group were higher than those of the control group. On average, the improvement ranged from 1.3% to 20.4% depending on the test performed. The obtained results indicate that the implementation of a methodology focused on maneuvering actions during the pre-competition stage contributes to improving the effectiveness of technical and tactical training of young boxers. These findings partially support the proposed scientific hypothesis.

CONCLUSION

The results of the study indicate that the inclusion of exercises aimed at developing maneuvering movements in the content of the pre-competition training stage of adolescent boxers is justified and effective. In particular, allocating approximately 25–30% of the total training load to the improvement of movement techniques can contribute to the more effective formation of technical skills in young athletes.

The implementation of the proposed methodology during the pedagogical experiment led to positive changes in the physical and technical-tactical indicators

of the experimental group. The improvements observed in different tests ranged from 1.3% to 20.4%, depending on the specific physical quality assessed. These findings suggest that the use of maneuvering-based training approaches at the pre-competition stage can enhance the overall effectiveness of the training process.

At the same time, the development of high sports performance in young boxers depends on the integrated improvement of their physical, technical, and cognitive abilities. In this context, special attention should be paid to the development of maneuvering skills at various distances (long, medium, and short), as well as to the ability to quickly adapt to changing competitive situations.

The results obtained allow us to conclude that the proposed methodology contributes to improving the quality of training and may be recommended for use in the practice of preparing young boxers. However, further studies with larger sample sizes and more controlled experimental conditions are required to confirm the obtained results.

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