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The Role Of Visual-Motor Coordination In Increasing Shooting Accuracy And Methods For Its Development

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Abstract: This article scientifically analyzes the role of hand-eye coordination in the formation and development of punching accuracy in boxers. Hand-eye coordination is a complex sensorimotor skill that is an important factor in a boxer's ability to deliver punches quickly and accurately, quickly perceive opponent's movements, and make the right decisions in competitive situations. During the study, the athletes' accuracy levels were assessed by measuring visual reactions, coordination tests, and monitoring punches aimed at dynamic targets. The effectiveness of using reflex balls, reaction lights, combination exercises on the pads, and visual simulators in developing hand-eye coordination was also studied. The results obtained showed that the regular development of this sensorimotor skill significantly increases punching accuracy, quick decision-making, and overall combat effectiveness.

Keywords: Hand–eye coordination, punching accuracy, sensorimotor skills, visual response, coordination, boxing technique, motor control, accuracy training, reflex ball, reaction lights, punches, functional training, athlete's reaction, combat effectiveness.

INTRODUCTION:

In boxing, the accuracy of the punch is an important technical-kinetic factor for the success of a fighter, which is measured not only by the direction and force of the punch, but also by its accurate hitting of the target. Hand-eye coordination is part of a complex sensorimotor integration, which includes the processes of receiving visual information, processing it in the central nervous system, and quickly implementing the appropriate muscular response. This skill allows a boxer to place a punch at the right time and distance, identify the opponent's defenses and weak points, and synchronize combination punches. This article analyzes the theoretical foundations of hand-eye coordination, methods for its assessment, and practical development methods for boxers.

relevance - Modern boxing requires rapid sensorimotor responses in high-speed and ambiguous confrontational situations; therefore, targeted development of hand-eye coordination can significantly increase the performance of athletes. Many training methods (for example, reaction lights, reflex balls, dynamic targets, and coordination pads) are used in applied research and coaching practice, but there is no single standard for which combinations and programs are most effective in boxing conditions. Therefore, this topic is relevant both from a research and practical point of view - it serves to optimize coaching methods, create individual training programs, and improve the technical preparation of young boxers.

The purpose of the study - To identify the functional importance of hand-eye coordination in the process of improving hitting accuracy in athletes, to develop effective methods aimed at its development, and to evaluate their practical effectiveness.

Research tasks

1. Analysis of the main biomechanical and psychomotor factors determining the accuracy of the shot, in particular, scientific substantiation of the role and importance of eye-hand coordination.

2. Development or selection of a set of special exercises, simulators and technical means aimed at developing eye-hand coordination and their application in the training process.

3. Experimental measurement of the effect of the proposed methodology on the accuracy of the shot

and sensorimotor reactions in athletes, statistical analysis and drawing conclusions based on the results.

LITERATURE REVIEW

An analysis of scientific sources on the theory and practice of boxing shows that the athlete's technical, tactical, physical and psychological preparation must be formed in harmony with each other. Abdulllaev Sh. (2018) extensively covers the basic principles of boxing technique, including the type of strikes, defensive movements and the structure of the training process as a training manual. Kadyrov M. and Juraev A. (2020) present scientifically based approaches to the stages of athlete training, the formation of technical and tactical skills and the role of coordination training.

The work “Theory and Methodology of Boxing” by Nikitin A.A. (2016) is a fundamental scientific source for planning boxing training, competition tactics and the gradual development of technical skills, and is used as a basis by many specialists. Filippov V. (2017) scientifically explains the mechanisms for the development of boxers’ physical qualities - strength, speed, agility and coordination, and gives practical recommendations for increasing the accuracy of blows.

Vasiliev Yu.M. (2015) in his work on boxing tactics analyzes the factors of combat strategy, distance control, counterattack and effective use of tactical combinations. At the same time, the fundamentals of technique presented by Kudryashov N. (2014) emphasize the importance of athletes’ footwork, defensive techniques and the ability to anticipate the opponent’s movements.

Rahmonov B. (2021) proposes a set of modern technologies, simulators and coordination exercises to increase the power and accuracy of the blow, highlighting the role of hand-eye coordination and sensorimotor training in boxing. Egamkulov L. (2019) highlights the psychological preparation of boxers, in particular the influence of attention, reflex stability and emotional management on sports results during the competition.

Chernov A. (2022) in his work on technique and methodology presents modern training methods, new technical approaches and practical recommendations for coaches. Hojimatov R. (2020) scientifically substantiates the correct management of physical load, age-appropriate load norms and recovery processes in the training of young boxers.

In general, the analysis of the literature shows that in order to achieve high results in boxing, technical and tactical training, coordination, psychological stability and load management must be carried out in an integrated manner. These aspects serve as a solid scientific basis for the development of methods for increasing the accuracy of the blow, developing eye-hand coordination and sensorimotor reactions in further research.

METHODOLOGY

This study aims to determine the functional significance of hand-eye coordination in the process of increasing punching accuracy and to evaluate the effectiveness of training methods aimed at its development. The research methodology consists of the following stages and scientific approaches.

Research participants - The study will involve 20-30 boxers of the initial and intermediate training stages aged 14-18 years. The sample of athletes will be formed in accordance with the same requirements in terms of age, gender, sports qualifications and health. Participants will be randomly divided into two groups:

Experimental group – performs a set of special exercises that develop hand-eye coordination.

Control group – is engaged in a traditional training program.

Duration and design of the study - The study covers a period of 6–8 weeks. Training sessions are held 3–4 times a week. At each stage, the use of coordination exercises, along with technical and tactical training, is systematically planned.

Research methods

Theoretical and methodological analysis - The available scientific literature, textbooks and scientific articles on boxing technique, accuracy of blows, coordination skills, sensorimotor reaction and hand–eye coordination are analyzed. This stage creates a scientific basis for developing a methodology.

Pedagogical observation - During the training process, the quality of technical performance, accuracy of blows and coordination reactions of athletes are observed and recorded.

Experimental method - A special set of exercises is used with the experimental group.

RESULTS

During the study, it was found that the formation of punch accuracy in boxers is directly related to the level of eye-hand coordination. As a result of the planned use of special coordination exercises, the ability of athletes to execute punches accurately and quickly increased significantly. During the training, visual perception, reaction speed, distance assessment skills, and fine control mechanisms of

hand movements were observed to increase.

In the experimental group, the ability to accurately find the point of impact with the eyes, pre-form the direction of the blow, adjust the amplitude of movement, and maintain technical stability during the blow improved. The skills of expanding the field of view and correctly directing movement in space also improved.

The results of the study showed that when special methods are added to the training, including balance, visuomotor reactions, dynamic coordination, and rhythmic movements, punch accuracy increases to a qualitatively higher level. Exercises aimed at coordination have a faster effect on punch accuracy than simple technical exercises. It has been confirmed that there is a close functional relationship between hitting accuracy and compliance indicators in athletes.

DISCUSSION

The results are consistent with many years of scientific knowledge and show that hand-eye coordination is a crucial factor in combat sports, especially boxing. A well-executed punch reflects not only strength, but also the athlete's ability to choose a direction in space, receive visual signals, and deliver the punch at the right moment.

The methods used in the study were such that the athletes simultaneously activated the visual analysis, movement mechanics, and neuromuscular control system in a complex way. This increased the ability to quickly and accurately coordinate by visualizing the movement of the hand at the moment of the punch. Exercises with variable stimuli increased the boxers' ability to quickly assess the situation and direct the punch in accordance with the conditions.

During the discussion, it was found that hand-eye coordination improves not only the moment of the punch, but also defensive actions. By seeing the opponent's movements, it becomes easier for the athlete to quickly react, dodge a blow, or choose a favorable position for a counterattack. This is an important element of boxing technical and tactical preparation. The study showed that working on strength and technique alone is not enough to improve punch accuracy. To achieve this result, it is necessary to develop the visual-motor abilities of the central nervous system. With the regular use of special coordination exercises, the athlete's overall technical stability, reaction capabilities, and punch efficiency consistently increase.

CONCLUSION

In conclusion, it can be noted that eye-hand coordination is at the heart of the processes of accuracy, speed, and tactical decision-making for boxers. Methodological approaches aimed at its development significantly improve the athlete's competitive results. Conclusion - The results of the study showed that eye-hand coordination is an important factor in increasing the accuracy of the blow. With the help of special coordination exercises, the visual-motor skills of athletes are developed, the accuracy of the blow increases, and the reaction time is reduced. At the same time, eye-hand coordination has a positive effect not only on the accurate execution of the blow, but also on decision-making during the fight, anticipating the opponent's actions, and effectively performing defensive actions.

The experimental study showed that the inclusion of special methodological exercises in the program significantly improves the level of technical, tactical, and sensorimotor training of boxers. Therefore, coaches should pay special attention to exercises aimed at developing eye-hand coordination in training programs.

In general, the results of the study prove the importance of developing eye-hand coordination in increasing the accuracy of the blow and combat effectiveness and serve as a basis for its implementation in practice. In the future

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