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# **The Issue of Reducing Injuries by Improving the Training of Young Boxers**

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**ABSTRACT:** In the initial stage of preparation and in training matches young boxers because of the low level of technical, tactical and psychological preparation are afraid and sometimes can, will get serious injuries. In order to avoid serious injuries to young boxers during training matches and at the same time to increase their level of training in training sessions, it is advisable to use sports games instead of training fights.

**KEYWORDS:** training sessions, biomechanical chain, locomotor apparatus, fight, cockfighting, injury, fear, sports movements, similarity, motor skills, technique, tactics, psychological training, analysis, young boxer.

## **I. INTRODUCTION.**

The development of physical qualities and the upbringing of character traits are interrelated. Will, as well as muscles, develops only in the process of manifestation of motor activity as a result of overcoming objective and subjective difficulties. For technical, tactical and psychological preparation of young boxers in training sessions educational fights are constantly conducted. In the initial stage of preparation and in training fights young boxers because of the low level of technical, tactical and psychological preparation are afraid and sometimes can, will get serious injuries of musculoskeletal system. Fear and various injuries are quite real, as the impact force of a boxer reaches a significant value.

### **AIM AND OBJECTIVES OF THE RESEARCH.**

To improve training sessions for young boxers. The task of the research is to select a complex of motor sports games based on the similarity of biomechanical chains of motor activity of a boxer and motor sports game.

### **RESULTS OF THE RESEARCH AND THEIR DISCUSSION.**

If we consider a boxer's impact in time, the interaction lasts for a very short time - from ten thousandths of a century (instant quasi-elastic strikes) to tenths of a second (inelastic strikes). However, the main measure of shock interaction is not the force, but the shock pulse [1]. Impulse (number of motion) is a vector physical quantity, which is a measure of mechanical motion of the body. In classical mechanics, the body impulse is equal to the product of mass  $m$  of this body by its velocity  $v$ , the direction of the impulse coincides with the direction of the velocity vector:

$$\vec{p} = m \cdot \vec{v} \quad (1)$$

A punch in a boxing glove causes a larger impulse in a  $53.73 \pm 15.35$  N-s bag, considering that the punch of a boxer lasts only a hundredth of a second (see Figure 1)

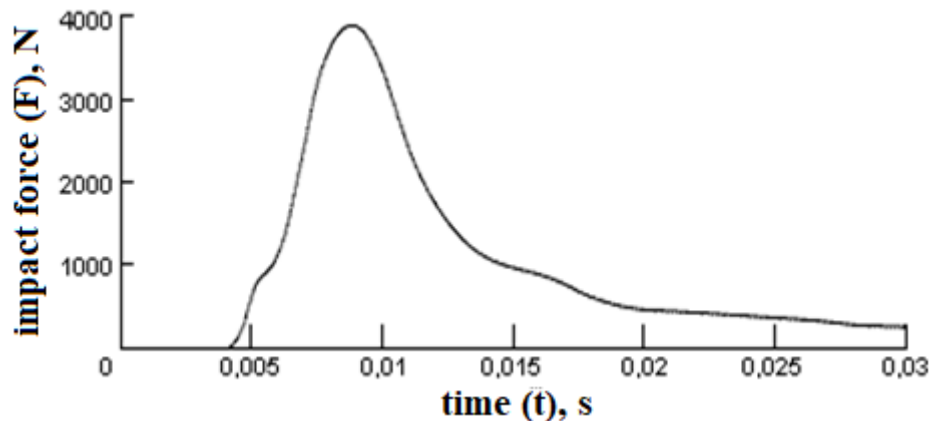


Fig. 1. Impact force development curve in time[1]

The impact force is up to 400-500 N. Therefore, in order to avoid serious injuries to young boxers during training matches and at the same time to increase the level of their technical, tactical and psychological training in training sessions in the place of training fights it is advisable to use sports games. And thus efficiency of sports game for development of level of technical, tactical and psychological preparation of the young boxer to a considerable degree is defined by similarity of biokinematic chains of movements of the boxer and the participant of sports game.

If to look at kinematic structure of a body of the person, it is easy to present axes of rotation and points of support at blows. Participation of the bottom part of a body of the boxer in mechanics of blows occurs on the following kinematic chain with three joints: a foot - a shin - a thigh. This kinematic chain, transmitting the progressive motion of the torso, contributes to the acceleration of pelvis rotation. With the left leg support, rotation takes place around the vertical axis passing through the left foot and left hip joint; with the right leg support, rotation takes place around the axis passing through the right foot and right hip joint. The diagonal axis of rotation in the left foot support passes through the left foot and right hip joint; in the right foot support through the right foot and left hip joint. From the kinematical chain of the foot-foot-hip movement is transferred to the next chain with three joints: shoulder-forearm-hand. The links of the upper limb belt are flexible, e.g. one half of the belt can move independently of the other (right from left or left from right). When the force is applied, it is transmitted from the foot to the shin and thigh, then to the pelvis, torso to the upper limb belt and from it to the impact part of the hand. Thus, starting from the first moment of impact (from the shock with the foot) and up to the final moment (the impact part of the hand), the force and speed seem to increase in each chain. The smaller the muscles, the faster they can contract, but at the same time they must be strong enough to maintain the progressive effect of large muscles and accelerate the action, i.e. increase the force of the impact. In this case, the model of the musculoskeletal system, i.e. the executive mechanism of all complex boxer movements, consists of "link-joint-muscle" elements, which reflect the sequence of connected links of the body, which transmit all the generated forces from the point of application to the point of support of the body.

Figure 2 shows a kinematic chain for a person trying to strike from below or above with his hands standing on the surface. The forces of the hands can be directed horizontally or vertically [2]. They create moments relative to the wrist joint. These moments should be transmitted through the elbow (1), shoulder (2) and along the cervical (3), thoracic (4) and lumbar (5) parts of the spine. The moment is then transferred to the femoral (6), knee (7) and ankle (8) joints and finally meets its counteraction at the foot (9), where it can again be decomposed into horizontal and vertical strength with the appropriate lever arms. In this circuit, the weakest link determines the amount of force or torque that can be transmitted outward.

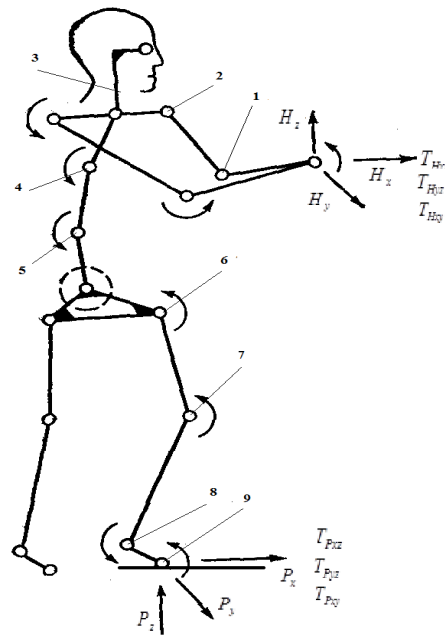


Fig. 2. Human kinematic chain during impact with your hands on the bottom or top, standing on the surface

If, for example, the shoulder geometry is not suitable, the moment that can be created here will be limiting for the whole system. Or if the lumbar region of the spine is only able to tolerate a limited amount of stress, the area will be a weak link in the chain. Finally, the coefficient of friction determines the ability of the entire system to transmit power or torque to the hands. The basis of the computational analysis for this system is given by a number of equations [2]:

$$H_x + P_x = 0 \quad H_y + P_y = 0 \quad H_z + P_z = 0 \quad (2)$$

$$T_{Hxz} + T_{Pxz} = 0 \quad T_{Hyz} + T_{Pyz} = 0 \quad T_{Hxy} + T_{Pxy} = 0 \quad (3)$$

The friction force with regard to the coefficient of friction is determined by the following formula [2]:

$$P_x = \mu \cdot P_z \quad \mu \leq 1 \quad (4)$$

Based on the results of the above analysis of the biomechanical chain and taking into account the biodynamics of boxer blows, it is possible to choose sports games for the development of technical, tactical, and psychological training in training sessions [3]. At the same time, the expediency and effectiveness of using a sports game for the development of technical, tactical, and psychological training of a young boxer is determined by the similarity of biomechanical chains of movements of a boxer and a participant in a sports game. For example, when the trunk is tilted sideways, the main work is done by the outer oblique abdominal muscle, but if it is tilted sideways with a slight forward tilt, a straight abdominal muscle is also connected; the tilting of the trunk sideways can be combined with a slight backward tilting; in this case, transversal-spiny and short interspiny muscles are connected. Muscles contract in different sequences and combinations and move individual parts (limbs, torso) of the body. If the same movements are repeated frequently, the muscles are improved qualitatively and the movements are made fast and accurate.

## II.CONCLUSION

The results of the analysis show that the biomechanical chains of the musculoskeletal system, i.e. the executive mechanism of all complex movements of a boxer and participants of various sports games, have an exceptional similarity. And in sports games, the participants of the game effectively develop all the motor qualities of the athlete: strength, speed, endurance, flexibility and agility. In addition to these qualities, the stability of balance, the ability to relax muscles at will, rhythmicity, jumping ability, softness of movements and coordination are also developed. And the main thing is that in the initial stage of preparation and in training fights young boxers without fear and not getting



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serious injuries of musculoskeletal system biosceles effectively increase the level of technical, tactical and psychological preparation.

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