Influence of differently directed motor activity on indicators of external respiratory functions in the process of special physical training in boxing

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Abstract

Objective of the study was to analyze the influence of multidirectional muscle activity on the functional parameters of the external respiration apparatus during the performance of special physical training exercises in boxing.

Methods and structure of the study. Two equivalent groups were formed from boxers of the 1st category from 18 to 19 years old, 10 people in each group: the experimental group (EG) and the control group (CG). All athletes were represented by the weight category up to 71 kg. Within six months, the athletes were tasked with improving special physical training based on the tactical features of the fight. Boxers who use a playful style of fighting and achieve sports results by winning by beating an opponent on points (boxers-players) used means aimed at a more significant development of the muscles of the lower extremities when performing punches (EG). Athletes who use a strong blow to achieve the result (boxers-knockouts) performed exercises with a more significant involvement of the muscles of the upper limb girdle (CG) in the activity.

Results and conclusions. It has been noted that the use of agents that involve the muscles of the lower extremities in the activity contributes to the development of optimal functional training in boxing, which qualitatively affects the spirographic parameters after the performed motor work of athletes.

Keywords: *indicators of external respiration functions, multidirectional physical activity, special physical training in boxing.*

Introduction. Applying a direct blow in boxing, depending on the athletes using different tactics of the fight, is possible with a ballistic or non-ballistic type of muscle tension [3, 4, 6]. At the same time, to perform strikes of various types, different means of improving their motor and speed-strength qualities should be used [6, 9]. At present, a number of authors scientifically substantiate the influence of the type of muscle tension during the improvement of the impact movement on various systems of the vegetative support of the body, which implies a different time interval for the restoration of the body of athletes after muscle activity and its adaptation to the work done [2, 3, 5, 10].

Thus, the means used to improve strikes in athletes of different tactical manner of conducting a duel should correspond to an increase in their functional and motor-coordination capabilities [1, 3, 8, 9].

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muscles of the upper limb girdle (CG) in the activity.

At the end of the study, one-stage testing was carried out to assess the functions of external respiration during the performance of work, due to the different activity of the muscle groups used when involved in the impact movement. Boxers from the EG performed squats at the maximum pace for 30 seconds. With a similar time interval, the athletes from the CG performed push-ups from the floor from the floor support at the maximum pace.

The following research methods were used:

Spirography [3]. Determination of respiratory system parameters was carried out at the complex of functional diagnostics "Valenta-FVD", St. Petersburg. The study was conducted at rest and after the testing task. The indicators of the vital capacity of the lungs on inspiration (VCins), the forced vital capacity of the lungs (FVC), the volume of forced exhalation at 1 second (VFE1), the Tiffno index (TI), the peak volume exhalation rate (PVR), the maximum volume expiratory rate at 25, 50 and 75% of the FVC (MVR25, MVR50, MVR75), the average volume exhalation rate by 25-75% of the FVC (AVR25-75) [7].

The obtained data were processed using the Statistica 10.0 statistical analysis program. The nonparametric Mann-Whitney criterion was used to assess the reliability.

Results of the study and their discussion. Analyzing the results of lung volume for a multidirectional load in solving coordination and motor problems in senior athletes, we noted the following values. The VCins values recorded after testing with compared with the results at rest decreased in the EG by 24.4%, and in the CG by 31.5% (Table 1; $p<0.05$). This fact allows us to testify to the adequate reaction of the organism of athletes of various tactical manners of conducting a duel to the load performed for the needs of motor activity during the development of muscle groups involved in the work during the improvement of striking actions.

When evaluating the FVC indicator, which reflects bronchial conduction and involvement in the activity of expiratory muscles, we did not notice any significant differences after testing between groups that focus on the development of various muscle groups to increase the speed-strength characteristics of impact actions (table 1; p>0, 05).

When comparing the data recorded before and after the test load, we noted their decrease after the load in the EG by 24.3%, and in the CG - by 22.9% ($p<0.05$). This fact indicates a good elasticity of the lung tissue in athletes of various studied groups and indicates their sufficient functional training to perform specific exercises of a speed-strength nature.

When analyzing the VFE1 values, we noted the predominance of the values recorded after testing in the EG over the level observed in the control by 43.3% (Table 1; $p<0.05$). When comparing these values with the results at rest, we did not note their statistical difference in the EG, while in the CG they decreased by

Table 1. *Spirographic indicators in athletes-athletes with multidirectional load to assess the improvement of speed-strength and motor capabilities of shock movements,* X±m

Boxers of the 1st category				
Indicators	Control group		Experimental group	
	Rest	Load	Rest	Load
VCins (l)	6±0,3	4,11±0,4#	6,1±0,2	4,61±0,3#
FVC (l)	5,2±0,3	4,01±0,2#	5,8±0,2	4,39±0,3#
VFE_1 (l)	4,8±0,2	3±0,1#	5±0,2	4,3±0,2*
TI (%)	79,9±5,1	73,4±4,4	78,5±3,6	94±5,3*
PVR (l/s)	9,7±1,2	6±0,5#	11,1±1,1	10,6±1,01*
MVR_{25} (l/s)	7,8±0,8	5,2±0,3#	9±1,1	9,1±0,9*
MVR_{50} (l/s)	5,4±0,4	4,1±0,1#	5,9±0,4	6,1±0,5*
MVR_{75} (l/s)	3,2±0,3	2,9±0,09	3,7±0,2	4,5±0,3*#
AVR_{25-75} (l/s)	5,4±0,3	3,8±0,2#	6,2±0,3	5,6±0,4*

* – reliability of differences between EG and CG data, P<0.05;
# – reliability of load data relative to rest level, P<0,05.

37.5% (p<0.05). This allows us to make an assumption about a more significant efficiency of the work performed with the involvement of the muscles of the lower extremities in the activity of the athletes from the EG.

In the study of the Tiffno index after exercise, we noted its predominance by 28.1% in athletes from the EG over the values of the CG (table 1; p<0.05). The EG values observed after testing increased significantly, but were not marked by significant differences relative to the data recorded at rest. In the CG, the results after exercise were not noted by us as statistically significant differences relative to background values and remained at the same level. This fact does not allow us to testify to obvious respiratory disorders, but it characterizes the lower efficiency of activity with a significant involvement of the arm muscles in the CG.

When analyzing a number of indicators characterizing bronchial conduction on expiration after a multidirectional load, we noted a 76.7% predominance of the values of the peak volumetric velocity and expiration of the EG boxers over the control level (Table 1; p<0.05). When comparing these values with the values observed at rest, we did not record their significant differences in the EG, while in the CG they decreased by 38.1% (p<0.05). When considering the values of the air velocity in the large bronchi after testing, we noted the predominance of 75% of the MVR25 values of athletes from the EG over the CG (see table; p<0.05). These results practically did not change relative to the background values in the EG, while in the CG they became 33.3% lower (p<0.05).

When analyzing the air flow rate in the middle bronchi during expiration, we noted the predominance of MVR50 values by 48.8% in boxers from the EG recorded after testing over the control data (see table; p<0.05). When comparing these results with the values recorded at rest, we did not notice their statistical difference in the EG, while in the CG they decreased by 24.1% (p<0.05).

MVR75 values after exercise in the EG were 55.2% (p<0.05) higher than the results in the CG (see table). In the EG, the results, after testing, became higher than the initial values by 21.6%, while in the CG they were not marked by significant differences (p<0.05).

The values of AVR25-75 observed after exercise in the EG were 47.4% higher than the control values, remaining almost at the level observed at rest (see table; p 0.05). In the CG, these results were 29.6% lower than the background values (p<0.05).

Thus, the results obtained allow us to assume that a specific physical activity performed with a more significant involvement of the leg muscles in the activity is more economical, which contributes to a more adequate functioning of the respiratory system during the recovery of athletes after muscle activity.

Conclusions. The results of the study allow us to state the fact that the performance of special physical training exercises with a more significant involvement in the activity of the leg muscles contributes to a more adequate functioning of the external respiration system, which ensures the rapid recovery of the body of athletes and the improvement of its speed-strength characteristics while simultaneously developing the muscle groups necessary for improvement of motor-coordination training.

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