

## Abstract

**Introduction.** The stroke volume (SV) is an important indicator of the cardiovascular system activity, namely the maintenance of systemic hemodynamics. Its changes in the training process can indicate the formation of the level of training, or the processes of recovery of the body after loads. The purpose of this work was to determine the changes in the SV when performing tests with controlled breathing, as well as to investigate the correlations with the breathing pattern. **Methods.** 183 qualified male athletes who were engaged in various sports were under supervision. The study of indicators of the cardiovascular and respiratory systems was carried out using a Spiroarteriocardiograph device. The examination was carried out in a sitting position for 6 minutes, when three combined recordings of the cardiorespiratory system function (ECG in 1 lead, pulse curve with determination of beat-to-beat blood pressure and flows of inhaled and exhaled air) were sequentially performed during spontaneous breathing (SB), controlled breathing 6 (CB6) and 15 (CB15) per minute. **Results.** The analysis of the combined changes in the indicators of the cardiorespiratory system showed that the SV (cm<sup>3</sup>) when performing CB6 decreases from 66.0 (60.3; 73.9) to 65.7 (60.1; 72.9),  $p=0.010$ , and with CB15 it decreases to 63.6 (57.9; 71.2),  $p=0.000$ . Accordingly, the increments of SV (cm<sup>3</sup>) were -0.6 (-2.8; 1.7) and -2.2 (-5.3; 0.10),  $p=0.000$ . That is, with both variants of controlled breathing (CB6, CB15), SV decreased compared to SB. Subsequently, increments in pattern breathing indicators were determined, which, respectively, for CB6 and CB15 in comparison with SB were: for VT (L) 1.100 (0.700; 1.690) and 0.320 (0.120; 0.680); for  $V_e$  (L $\times$ s<sup>-1</sup>) 0.090 (0.022; 0.172) and 0.197 (0.099; 0.356); for (L $\times$ s<sup>-1</sup>) 0.082 (-0.013; 0.216) and 0.205 (0.080; 0.367); for V (L $\times$ min<sup>-1</sup>) 3.037 (0.932; 6.159) and 6.058 (3.004; 10.351). Spearman's correlation analysis at the level of  $p<0.05$  showed that the decrease in SV (cm<sup>3</sup>) at CB6 is associated with VT (L),  $r = -0.272$  and V (L $\times$ min<sup>-1</sup>),  $r = -0.242$ . At CB15, the decrease in SV (cm<sup>3</sup>) is associated with VT (L),  $r = -0.309$  and V (L $\times$ min<sup>-1</sup>),  $r = -0.288$ , as well as with  $V_e$  (L $\times$ s<sup>-1</sup>),  $r = -0.288$  and  $V_i$  (L $\times$ s<sup>-1</sup>),  $r = -0.309$ . **Conclusion.** With CB6 and CB15 times per minute, there is a significantly decrease in SV (cm<sup>3</sup>). Given that breathing in CB6 and CB15 is deep, the differences in changes may indicate the specifics of switching on postganglionic sympathetic activity, which may be useful in the diagnosis of overstrain states. **References** Guzii O, Romanchuk A. Determinants of the functional state of sportsmen using heart rate variability measurements in tests with controlled respiration. *Journal of Physical Education and Sport*. 2018;18(2):715-724.

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