

Abstract

Research on national-level professional boxers focused on assessing the impact of training in a hypoxic chamber on their motor skills, endurance, and adaptation to oxidative stress. The experiment aimed to determine whether hypoxia could improve performance parameters such as aerobic and anaerobic endurance and influence changes in the oxidative-reductive balance of the body.

The main objective of this study was to evaluate the effects of an experimental training program, conducted under normobaric hypoxic conditions during the preparatory period, on selected motor skills, endurance, and the body's adaptive capabilities to oxidative stress in national-level elite boxers.

Based on existing scientific evidence, the main hypothesis was that specialized training during the preparatory period in a hypoxic chamber affects motor skills, endurance, and the body's adaptive capacity to oxidative stress in national-level boxers. Specific hypotheses included:

1. The experimental training conducted under normobaric hypoxic conditions improves the level of the tested motor skills.
2. The experimental training improves the aerobic and anaerobic capacity of the tested athletes.

To accept or reject the above research hypotheses, the following research questions were posed during the project planning:

1. Did the experimental training conducted under normobaric hypoxic conditions affect the level of the tested morphological and functional parameters of the body?
2. Does boxing training during the preparatory period, conducted under normobaric hypoxic conditions, cause changes in aerobic and anaerobic capacity in athletes from the experimental group, and if so, what is the direction of these changes?
3. Did the experimental training affect the studied motor skills, and if so, to what extent and in what direction?
4. Does the experimental training in hypoxic conditions affect oxidative stress and the oxidative-reductive balance of the body?
5. Does the proposed training, due to its intensity, lead to damage to organs such as the heart, kidneys, pancreas, or liver in the participating boxers?

The study was conducted on a group of 20 boxers divided into experimental (hypoxia) and control (normoxia) groups. The athletes were monitored for somatic, biochemical, and

endurance parameters before, during, and after training. In the six-week training program, variables such as body weight, body composition, and motor skills were considered, assessed using Eurofit tests, including standing long jump, hand grip strength, and pull-ups.

The findings indicated that hypoxic training did not lead to significant changes in body mass, body fat composition, or blood parameters compared to normoxic training. Observed changes were minimal and not statistically significant. Regarding physical endurance, there were no significant differences in maximum heart rate (HR max), lung ventilation, or VO_{2max} between the groups. Results showed a trend towards decreased HR max and changes in lung ventilation in the hypoxia group, but the effects were minor.

In terms of anaerobic endurance, both hypoxic and normoxic training improved anaerobic capacity, lactate elimination, and power, but differences between conditions were minimal. Hypoxic training did not provide significant benefits compared to normoxic training. The results suggest that hypoxic training did not significantly impact motor skills and aerobic endurance, which may be attributed to the short training period and small sample size. Further research is needed to better understand the potential benefits and limitations of hypoxic training.

Keywords: aerobic endurance, anaerobic endurance, boxing, normobaric hypoxia, hypoxia, normoxia, motor skills, biochemical indicators, morphological indicators, experimental training, pro-oxidative balance