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THE CHANGES OF AEROBIC CAPACITY IN COMPARISON WITH THE RESTRUCTURING OF THE LOCOMOTION STRATEGIES AFTER THE LONG-DURATION SPACE FLIGHT

Abstract

In accordance with the fact that the search for the optimal methods of hypogravity disorders countermeasure continues on the basis of the concept about the support afferentation trigger role, we have shown that the effective countermeasure was achieved when cosmonauts performed the run in interval mode, when an axial load was more than 64% of body weight, and when the passive mode share (i.e., belt move with the leg power) was more than 29%. In the present study inflight relative exposure time of the entire spectrum of vGRF values per day and the parameter of integral stimulation of support receptors throughout the locomotor training was calculated. The post-flight changes in the motor system were studied in comparison with the restructuring in the energy supply systems of muscular activity for cosmonauts who made a long-duration space flight. We performed analysis of changes in individual strategies of locomotion after space flight, changes in the electromyographic cost of walk, changes in oxygen uptake, carbon dioxide production, ventilation and heart rate. We have suggested that vegetative maintenance of muscular activity and neuromuscular status can be connected with variability of locomotion pattern. The change of individual locomotion strategy during and after a long stay in microgravity was revealed. After returning to the Earth's conditions, the cosmonauts observed both an increase in closeness of vGRF curves and an increase in their variability. The most pronounced increase in the variability of steps at a speed of 10 km/h is accompanied by the lowest increase in the myographic cost of walking and changes in the parameters of gas exchange, indicating a decrease in the aerobic abilities of the body. While the increase of the standard step is accompanied by the most pronounced post-flight increase in the myographic cost of walking. It should be noted that the increase in the standard step at our study was accompanied by a smaller request to the cardiovascular and respiratory system in the supply of muscle activity, which was reflected in a smaller increase in the parameters of gas exchange and heart rate. In addition during the locomotive training in flight, this cosmonaut was differed with the greatest time of running with the magnitude of vGRF greater than body weight. In all cases, after the flight a decrease in aerobic capabilities compared to the pre-flight period was observed. This work was supported by a grant Russian Foundation for Basic Research 17-04-01826.