

SPACE LIFE SCIENCES SYMPOSIUM (A1)  
Human Physiology in Space (2)

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EFFICACY OF DIFFERENT REGIMENS LOCOMOTOR TRAINING IN PREVENTING THE  
NEGATIVE EFFECTS OF WEIGHTLESSNESS ON HUMAN PHYSICAL PERFORMANCE**Abstract**

The purpose of the study consisted of comparing the efficacy of two regimens of locomotor training in preventing negative effects of weightlessness on physical performance: i) the intensive interval training with number of short-term (1 min) intervals of high velocity running alternating with 2 min intervals of low velocity walking (group A, n = 8) and ii) the aerobic training consisted of long (up to 8-15 min) intervals of low velocity running (group B, n = 7). The data of 15 Russian members of long-term space flights were analyzed. All of them besides training on the treadmill – the key method of Russian countermeasure system - performed also cyclic and resistive exercises. The efficacy of locomotor training regimens used preferably by every cosmonaut was assessed with the treadmill test performed on TVIS in passive regimen of treadmill with the axial load of 60-70% of body weight. The test consisted of 5 steps, that included 3 min of walking with increasing speed, 2 min of slow running, 2 min of middle-rate running and 1 min of fast (close to a maximal) running that was concluded by 3 min of walking with declining speed. The rate of locomotions on every step was selected by cosmonauts themselves. Heart rate (HR) was recorded during locomotion, as well as 3 minutes before and 3 minutes after the test. The physiological cost of training was calculated on each test step as a ratio HR/velocity. The locomotor test was performed once before flight, 3 times – in the beginning, in the middle and at the end of flight, and once after flight. EMG of mm. tibialis anterior, gastrocnemius medialis and soleus were recorded additionally in stepping test (walking on the floor with the rate of 90 steps/min) that was performed before flight and 3 times after landing. No changes have been found in flight in characteristics of the treadmill test in group A. In the group B, on the opposite, the physiological cost of middle and high velocities running increased considerably in flight along with the significant decline of locomotion velocities. Peak amplitude of EMG-activities of all muscles under study did not change significantly after flight in group A and increased significantly in m. soleus after landing in group B. The results of the study have shown that the efficacy of a high-intensity interval locomotor training in space flights is higher than the efficacy of the aerobic training.