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PHYSICAL PERFORMANCE OF PARTICIPANTS IN EIGHT-MONTH VOLUNTARY ISOLATION
(SIRIUS-21 EXPERIMENT)

Abstract

The dynamics of the physical performance of volunteers under conditions of 8-month isolation was studied in the SIRIUS-21 experiment. The aim of the study was to evaluate the effectiveness of a new system of countermeasure the negative effects of reduced level of physical activity. The study presents the results of 5 crew members, three men and two women aged 29 to 43 years. The average age of the volunteers was 36 years, height 171 cm, body mass index 26. Before and after the isolation period, as well as once a month during the isolation, the level of physical performance was assessed using a test with a step-increasing load on a bicycle ergometer and an integral locomotor test. During the first month of isolation, the participants did not perform any physical training in order to assess the impact of a reduced level of motor activity without the influence of countermeasures. From the second month, the SIRIUS-21 physical training system consisted of strength and locomotor training. The training alternated intervals of high-intensity running, low intensity and intervals of walking. Locomotor training was performed on treadmills with active and passive (no motor) modes of moving the belt. Strength training was performed on a strength simulator. Results. Maximum speed in the integral locomotor test after the isolation period was higher in comparison with the background data. Significant differences were obtained in the first test session compared to the background data, when the maximum speed was significantly lower. Also, significant differences in the first test session were obtained for VO₂max, when the lowest oxygen consumption was observed. After isolation, the maximum heart rate at the stage of running at maximum speed turned out to be lower than before isolation, against the background of an increase in running speeds. Thus, a reduced level of motor activity in isolation without the use of physical training has a negative impact on physical performance. Increased of maximum speed and power in physical performance tests, as well as decreased heart rate in response to physical load point to an effective system of countermeasure of the negative effects of reduced motor activity. The system of locomotor physical training of high intensity and short duration in combination with strength training made effectively counteract to the conditions of prolonged isolation. This work was supported by the basic funding of the RAS 63.1 and the RSF (project No. 23-65-10045).