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Challenges of Life Support/Medical Support for Human Missions (8)
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WALKING STRATEGY DURING THE REPEATED LONG-DURATION SPACE FLIGHTS

Abstract

Walking is a traditional model for the studies of sensory-motor system, since it is stereotype motor process, that has a cycle structure, during which various elements of musculoskeletal system and nerve centers interact with each other. The study was conducted as a part of the onboard experiment "Motokard". During the space flight (SF), locomotor tests were performed on a monthly basis onboard the Russian Segment of International Space Station; moreover, two sessions of the experiment were performed before the SF and two sessions – on the 8th and the 12th day - after landing. Preflight sessions were conducted 30 and 60 days before the expedition. An experimental session included the locomotor test consisting of 3 min of walking in the active treadmill mode. In the active mode the treadmill was moved by the electric drive. In preflight sessions, the cosmonaut himself was choosing a walking speed comfortable for him (a speed of 3 km/h was recommended by the researchers). In the following sessions (inflight and post-flight), he was recommended to maintain the same speed. To estimate the biomechanical parameters of walking, the data of the podogram was used, recorded by 190-197 pressure sensor of measuring insoles under the feet of cosmonauts. Five cosmonauts aged 42.34.7 years (mean SD) who flew long-duration missions onboard the Russian segment of the International Space Station at least twice (from 115 to 340 days) took part in the study. All participants of the experiment performed locomotor tests according to the protocol of the present study in two SFs following each other (SF1 and SF2). The aim of this study was to compare the walking strategies of cosmonauts obtained during the SF1 and SF2. The analysis of the obtained data revealed differences in the walking strategy during SF2 compared to SF1. For example, during SF1, the walking speed in the first month of SF increased by 18.15The results of the study demonstrate how the previous space flight experience effects the process of sensory-motor adaptation to the conditions of SF, and also demonstrate the possibility of sensory-motor system training in microgravity environment. The study was supported by Roscosmos.