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FEMALE DRY IMMERSION: RESULTS OF A POSTUROGRAPHIC STUDY

Abstract

Historically, space flights and ground-based model studies were carried out with the participation of male subjects mainly. However, the number of female astronauts is steadily increasing. It seems relevant to study the reactions of female body to the factors of space flight. The purpose of this study was to investigate the effects of 5-day Dry Immersion (DI) on the characteristics of postural stability in female subjects. 10 healthy women 28.9 \pm 5.1 years age took part in the study. The study was performed before DI (BDC), 3 hours after its completion (R0), on the first (R1) and second (R2) days of the recovery period. The subjects stood on the stabiloplatform for 60 seconds with eyes open (EO), and then for 60 seconds with eyes closed (EC). Then the test was repeated on a soft support (foam cushion). Also, the tests were performed with dynamic tilts of the head of a given frequency and amplitude (0.3 Hz, 20 degrees) - 3 times for 20 seconds. In each condition, except for the first one (EO, hard support), a part of the sensory systems analyzing the body position in space was either turned off (no visual feedback), or noisy (soft support - noisy signals of the support afferentation, dynamic head tilts - noisy vestibular afferentation). Vertical stability indicators were recorded using the Stabilan-01 stabiloplatform (OKB Ritm, Russia). At R0, relative to BDC measurements, an increase in the average range of CP oscillations was observed in tests on the soft support with EO and EC (from 31.5 \pm 2.8mm to 40.4 \pm 2.5mm and from 55.3 \pm 4.2mm to 65.5 \pm 3.9mm, respectively). At R+2, there was a significant recovery of the range of CP oscillations relative to R0 with EO and EC on a soft support (from 40.4 \pm 2.5mm to 28.6 \pm 3.6mm, $p=0.0395$; from 65.5 \pm 3.9mm to 44.4 \pm 6.3mm respectively, $p=0.016$). When maintaining a vertical stance with EO on a hard platform, the effect of DI was not observed. In the test with head tilts on soft and hard support, the DI effect was no more pronounced than in other tests on soft support. Thus, the greatest influence of DI on vertical posture stability was only pronounced when standing on a soft support, which makes information from the proprioceptive system less reliable. This suggests that changes in postural control may be due to the changes in the proprioceptive sensory system activity. The study was supported by the Russian Science Foundation, project No. 19-15-00435, <https://rscf.ru/project/19-15-00435/>