

Lunar Exploration (2)
Lunar Exploration (1) (1)

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”DRY” IMMERSION AS A PHYSIOLOGICAL MODEL FOR LUNAR MISSION

Abstract

Studies of the mechanisms of vertical posture maintenance after space flight revealed the deep disorders of equilibrium function (Kozlovskaya et al., 1981; Kozlovskaya et al., 1982; Kozlovskaya et al., 1985; Kozlovskaya et al., 1990; Paloski et al., 1992; Wood et al., 2012; Wood et al., 2015)

Dry immersion (DI) is one of the most widely used ground models of microgravity (Tomilovskaya, 2019). DI accurately and rapidly reproduces most of physiological effects of short-term space flights. The model simulates such factors of space flight as lack of support, mechanical and axial unloading as well as physical inactivity. Ten healthy volunteers 20-40 years old with normal weight took part in 5-day DI. To register postural characteristics stabilometric platform was used. The center of pressure (COP) displacement velocity and the average amplitude of COP deviation were registered; the ratio between baseline and post-DI values were analyzed. The subjects stood with eyes open and closed on the solid support and on the soft support (foam pad 20 cm thick) with eyes closed for 40 sec in each condition. Soft support was used for disturbing of the support input. The study was performed before DI and on the day of DI completion. The great increasing of both stabilometric parameters were observed. When standing with eyes open on the solid support COP velocity increased on 22%, with eyes closed – on 8%. The average amplitude of COP increased on 26%. When standing with eyes closed on the soft support the COP amplitude increased on 68%. After the detailed analysis we found, that volunteer’s group divided into 2 subgroups according to the ratio between the COP amplitude values with eyes open and closed on the solid support – Romberg Coefficient (RC). After observing these subgroups separately, we found, that in subgroup with $RC > 1$ COP amplitude in the test with eyes closed on the soft support increased on 39%, in group with $RC \leq 1$ - 212%. Such drastic increase could be interpreted by the absence of somatosensory overflow (Shishkin, 2020), which didn’t manifest in easier conditions (solid support).

DI could be a great method for cosmonauts, which can familiarize them with space flight consequences. Also, it can help to rate lunar team according to the degree of cosmonaut’s sensitivity to the space flight factors.

Supported by a grant from Russian Science Foundation No.19-15-00435.