

HABITABILITY IN MARS MISSION SIMULATION: SOUNDS AS STRESS COUNTERMEASURES.Ayako Ono¹, Irene Lia Schlacht², Jeffrey Hendrikse³ and Melissa Battler⁴.¹Tohoku University Graduate School of Medicine (Japan, a.ono@med.tohoku.ac.jp), ²Technische Universitaet Berlin (Germany, irene.lia.schlacht@gmail.com), ³ Astrium GmbH (Germany, jeffrey.hendrikse@astrium.eads.net),⁴Western University (Canada, mbattle@uwo.ca).

Summary: This paper presents the habitability research performed at the Mars Desert Research Station to increase crew performance, safety and well-being in human Mars missions.

Keywords: habitability, stress, noise, isolation, countermeasure, nature sounds

Abstract:

Summary. A series of campaigns in an extreme environment has been conducted at the Mars Desert Research Station (MDRS). The station is located in Utah in the San Rafael Swell desert, a place analogue to the Mars environment [1]. In particular, social aspects and music as stress countermeasures were the focus of the campaigns here presented.

Extreme Terrestrial Environment. Since psychological and stress-related problems are a serious issue on long-term missions, countermeasures are needed for future long-duration missions because astronauts may suffer from insomnia, depression, and stress, and these negative effects may reduce crew performance [2]. To counter those effects, the Moon-Mars habitability project performed research and worked on a methodology to increase the quality of life [3,4,5]. The project was conducted during the International Lunar Exploration Working Group (ILEWG) space mission simulation at the Mars Desert Research Station (MDRS) of the Mars Society during the EuroMoonMars campaign directed by Prof. Bernard Foing. The MDRS is located in the San Rafael Swell, a desert in Utah. It is an analogue Moon-Martian habitat for human exploration, where crews of six people work and live together in a closed-system environment simulating a space mission to carry out specific field research and experiments [6]. From 2010 to 2013, Crews 91, 100A, 100B, 113 and 125 of the Mars Desert Research Station (MDRS) performed human factor research in Utah [7].

From 2010, during each mission, human factors aspects were investigated, with a particular focus on social aspects, psychological stress countermeasures, problems and problem solving under stress conditions, and the role of music as a countermeasure [8, 9, 10, 11, 12, 13].

Noise. Noise is a common issue during space missions. There are also various kinds of stressful noisy environments such as intensive-care units (ICU) at

hospitals, factories, construction sites, traffic noise from highways and planes on earth. Crew 100A measured environmental noise at MDRS [14].

Methods. One- to two-hour crew debriefings were conducted two days before the missions ended at MDRS. During the debriefing, the main mission problems and possible solutions were discussed from the perspective of performance, well-being, and safety. Key words that were used most frequently were analyzed by the crews. Music, natural sounds, and effects against stress were investigated by means of a Profile of Mood States (POMS) questionnaire during the middle part of the mission [15].

Results. The results of this research identified clear problems and possible solutions [16]. For example, Crew 100A reported sad mood after one crew member quit because of his job. Jokes, hobbies (listening to music, singing, movies), and sports were proposed as possible solutions. Crew 125 made a plan for the sound environment before the mission started. Also, gathering funny stories from each country was suggested in advance. In each crew, music was found to be a relevant element for well-being [17]. For this reason, it became a major focus of the investigation during the last mission in 2013.

The results will be presented with comparison analyses between the different crews from 2010 to 2013. A particular focus will be on the effect of music and nature sounds on stress.

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