

Challenges of Life Support - Medical Support for Manned Space Exploration (9)
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Author: Dr. Carole Tafforin
Ethospace, France, ethospace@orange.fr

ETHOLOGICAL TOOLS APPLICATION ON CREWMEMBERS OVER 6-MONTH PERIODS OF CONFINEMENT FOR SPACE EXPLORATION

Abstract

Introduction: The challenge of space exploration involves technological and scientific requirements. The very long distance from Earth implies adequate interplanetary trajectories selection (Wooster et al. 2007; Landau and Longuski 2009) and the very long duration to outer planets requires effective knowledge of human crews adaptation and autonomy (Kanas et al. 2009; Gushin et al. 2011). Autonomy both at the environmental level involving closed loop model of life-support (Tamponnet and Savage, 1994), and at the social level involving new living and working habits of crews in confined habitats (Tafforin, 2015; Tafforin and Giner Abati, 2016) is a novative problematic of researches. Recent isolation and confinement experiments on Earth and current space flights aboard the International Space Station (ISS) are of 6-month duration and beyond. In a temporal dynamics, this first period needs to be considered with attention for a long trip to Mars, because in the human adaptive mechanism, the physiological system, the cognitive system and the behavioral system are interconnected with the goal of crew effectiveness. Since three decades, we applied the ethological tools in the interface. Today we give new examples of application in exceptional experimental paradigms: the Mars-500 experiment which took place in Moscow, Russia in 2010-2011 and the 180-day CELSS experiment which ended in Shenzhen, China in 2016. **Methodology:** The tools used in ethology are divided in three steps that are the observation, the description and the quantification of spontaneous sensori-motor activity in any real or simulated situation of daily life activities and tasks at work. A software-based solution for application to space ethology (Tafforin and Gerebtzoff, 2010) helps in the data organization and data processing. In confinement situations, we collect data from video recordings every month. **Results:** Ethological observations on crews' non-verbal behavior will be presented from application of these tools to the first 180 days of Mars-500 experiment and the 180-day CELSS experiment (6 months). **Discussion:** Quantitative results correlated to physiological measurements, cognitive evaluations and environmental parameters would contribute to implement the adaptive model as a whole for manned Mars missions.

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