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OVERVIEW OF MULTILAYERED DATA MONITORING IN THE APICES SPACE ANALOGUE MISSION

Abstract

This study presents an overview of research conducted during a 6-day long APICES Space Analogue Mission organized by the ICEE.Space at the cave-based Ares station managed by the Astroland Interplanetary Agency. The study involved six analogue astronauts highly selected for their physical health, motivation, experience and astronaut-likeness by a panel of experts, including former NASA astronaut or an ISS flight operator. One analog astronaut was an ESA's reserve astronaut, providing high-fidelity sample and valuable opportunity for comparison with future potential spaceflight.

The mission communication was constrained to text messages with simulated two-way 10 minute delay. The mission day was elongated to simulate Martian day. The workload and type of tasks in the mission were selected to mimic what astronauts will do on Mars, such as sampling biological and environmental data, usage of drones and rovers, exercise schedules, eating lyophilized food, etc. Two emergency scenarios were deployed, one for the individual and team performance assessment, other for individual performance in human-machine interaction context.

For each astronaut, heart rate, blood protein markers of inflammation and adaptive immunity, blood metabolite markers of nutrition/microbiota and the microbiota composition of stool, skin, oral and nasal swabs were measured pre and post mission. Also, dust and clothing samples were taken for analysis of he habitat microbiome, with one experiment examining the effectiveness of UV treatment as a detergent replacement and used results of microbiome analysis on 3 treatment and 3 control individuals. This work was carried out supported by RECETOX Research Infrastructure(ID LM2023069).

Subjective data collection encompassed standardized questionnaires on personality and social desirability were measured at the beginning of the mission. Analogue astronauts' mood, sleep quality and vigilance were measured daily in the morning. In the evening, questions on workload, adaptation, and team dynamics were administered. Changes in the perception of natural and urbanistic landscapes were measured at the beginning and end of the mission, as well as changes in perceived team roles. Another study in the field of human-robot interaction explored differences in spatial attention and visual working memory after manual search, drone assisted search and an emergency scenario with drone assistance. Finally, at the end of the mission, qualitative interviews reconstructing individual stories were recorded for reflexive thematic and interpretative phenomenological analysis.

By gathering these extensive data on various parameters, the mission contributes to advancing our understanding of human adaptation in extreme environments and lays the groundwork for future space exploration endeavors.