

IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Interactive Presentations - IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (IP)

Author: Mrs. Lucie Ráčková
Masaryk University, Czech Republic

STRESS AND ISOLATION IN SUMMER ANTARCTIC EXPEDITION

Abstract

Antarctic expeditions are natural isolation experiments suitable for studying human behavior and performance. Naturally, these attract the attention of space researchers. So far, winter-over expeditions were favored for their lack of sunlight, limited contact with the outside world, and significantly limited movement outside the station. However, this leaves summer expeditions unfairly neglected. Although performed during light periods, they offer an exceptional opportunity to study the psychological and social reactions of environmental scientists and technicians working in isolated and extreme conditions both at the stations and in the terrain. The way of their conduct is similar to the expected short missions on the moon.

This paper reports the results of the research on the trajectory of stress reaction performed at the summer expedition in 2021/22 at the Johann G. Mendel Czech Antarctic Station on the coast of James Ross Island in Antarctica. 16 individuals (5 women) were subjected to a unique situation of double isolation – first during a 10-day mandatory preventive quarantine against COVID-19 infection in Chile, followed by the second period of 66 days at the polar station. They were isolated from the world with internet access limited to plain text e-mails with considerable time delay. Data on heart rate and energy expenditure were collected continuously. Affective reactions and team cohesion were collected weekly. Cognitive performance (vigilance by 5minute Psychomotor Vigilance Task and risk-taking behavior by Iowa Gambling Task) along with physiological reactions were assessed bi-weekly. The physiological measures coupled with cognitive tests were continuous heart rate variability and stress entropic load (SEL).

The SEL is a novel method for objective and real-time stress measurement based on thermodynamics, developed by the team of prof. Julie Dobrovolná at Masaryk University. The invention led to a spin-off company Entrant s.r.o. with support from ESA BIC. The company's prototype for SEL measurement was previously successfully validated in the laboratory, suggesting higher sensitivity for cognitive decrements in comparison to heart rate or blood pressure. The proposed paper reports on its first trial in the field study conducted in an extreme and isolated environment. The results of this novel method are compared with the state-of-the-art heart rate variability and with results from cognitive tests and psychological assessments.