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Author: Prof. Gabriel G. De la Torre
University of Cádiz, Spain

Ms. Celia Avila-Rauch
ILEWVG "EuroMoonMars", Germany
Ms. Sara Gonzalez-Torre
University of Cádiz, Spain
Dr. Miguel Angel Ramallo
University of Cádiz, Spain

EXTRAVEHICULAR ACTIVITY (EVA) UNDER PRESSURE. SIMULATED EMERGENCY
SCENARIOS DURING EVA IN SPACE ANALOGS.

Abstract

During space missions, astronauts are exposed to an extreme environment and several health risks and stressors. Space environment may have an effect on the astronaut's performance including neurocognitive, mood and behavioural problems. These effects have been confirmed by a number of recent studies, especially those including long-term inhabitations in space. Extravehicular activity (EVA) is one of the most dangerous activities of human space exploration. To ensure astronaut safety and mission success, it is imperative to identify and mitigate the inherent risks and challenges associated with EVAs. As we continue to explore beyond low earth orbit and embark on missions back to the Moon and onward to Mars, it becomes critical to reassess EVA risks, especially in the context of a planetary surface, where accidents may happen as well as medical and situational emergencies. It is important to analyse the aspects related to these emergency situations that may happen while exploring and establishing a new habitat. The terrestrial 'Golden Period' emergency concept is one that will also be applicable to planetary EVA emergencies, especially when considering the challenges to first-aid emergency treatment and transportation because of the spacesuit, these emergencies require not only basic medical but team-work and psychological skills/ training. Training and practicing in these activities are crucial for mission success in extreme environments. These emergencies may happen as a result of falls, technical malfunctions and other medical circumstances, spacesuit malfunction, environmental danger, etc. Understanding psychological aspects become especially important for long duration missions, especially for a mission to Mars/ Moon missions. The importance of readiness and the positive and effective group dynamic have a direct impact on a crew member's performance, and EVAs represent an important part of this. Using simulated EVA emergency scenarios, we studied different aspects of response to these emergencies by the crew, including psychological, cognitive, problem solving and team dynamics. Although most of the emergencies simulated and studied before were medical related emergencies, we wanted to focus in those emergencies where fast, accurate problem solving, teamwork and calculation may be needed to solve some strategic or vital equipment failure (e.g. oxygen system of spacesuit). This emergency scenario was tested in several space analogs.