

23rd IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM (A5)  
Human Exploration of the Moon and Cislunar Space (1)

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EXTIMACY - EXPRESSIVE BIOFEEDBACK FOR PERSONAL WELLBEING AND  
INTERCULTURAL COLLABORATION IN HUMAN SPACE FLIGHT

**Abstract**

Human space flight has experienced challenges ranging from isolation to intercultural communication. This study investigated the effect of extimacy, through bioresponsive emotive wearables, for personal wellbeing and collaboration in extreme environments like space travel. Extimacy is a term defined as externalized intimacy, showing how one feels on the inside to the outside world. By employing biosensors to read body systems, physiological states are translated to visual, auditory, or tactile displays. This real-time tangible interaction gives the body a voice that offers biofeedback for the wearer as well as acts as a body based form of communication with others. The non-verbal interface aims to self-manage wellbeing, and also increase prosocial behavior and group flow.

The fourth EuroMoonMars - IMA - HI-SEAS (EMMIHS) mission took place between February 1st - 15th 2020 at the Hawaii - Space Exploration Analog and Simulation (HI-SEAS) habitat in Hawai'i, USA. It was part of the EMMIHS campaign, which is a collaboration between the EuroMoonMars initiative by ILWEG, the International Moonbase Alliance (IMA) and HI-SEAS. Extimacy was performed with the EMMIHS IV mission crew of 6 (4 females and 2 males) with the Mood Sweater design that translates Galvanic Skin Response (GSR) to a palette of five colors with LED lights in a collar. Three conditions were measured with GSR recorded; no lights mode, "True Mood" mapped the GSR data to the five colors, and a random light sequence. Over a period of 15 days the conditions were separated into 3 day segments. First, no lights was measured to gather a baseline. Then, the True Mood lights was introduced blindly to find how the team interpreted them. Finally, random light mode was added to compare. The three conditions were tested with workshops in journaling, collaborative and team building improvisation games, gratitude exercises, and reflection times like EVA debriefing. The results concluded that compared to the baseline of the no light emitting GSR, the True Mood was found to synchronize biorhythms and to offer insight and self awareness. Surprisingly, the random mode created a sort of rhythm with the lights that also synchronized biorhythms and entrained the collective mood to instigate group cohesion quickly. Therefore, extimacy provides potential to fine tune moods with self awareness, enhance interpersonal synchronization, and group cohesion for more optimal states. This will be particularly important for long duration space missions, during which crew cohesion will be vital for the success of the mission.