



## PARO Therapeutic Robots and EmbracePlus used to investigate mental health benefits of Robotic Pet Therapy in space missions



Mars Desert Research Station (MDRS) in Utah, US  
(The picture is from the Facebook of "MDRS-Mars Desert Research Station")

Analog Space missions are analogous to real Space missions and have been used for decades by NASA, academics and private industry as well as individuals to test equipment, conduct scientific research and investigate human factors. Preparing on Earth for Space!

The Mars Desert Research Station (MDRS), which is owned and operated by the Mars Society, is located in the Mars-like terrain of southern Utah. An all-female crew of 6 will carry out an analog mission at the MDRS facility involving isolation and human factor studies for two weeks in the second half of November.

<http://mdrs.marssociety.org/>

One of the toughest challenges that analog crews face are behavioral issues related to mental health due to the isolation in a closed, confined space. The crew will use the PARO therapeutic robot to investigate whether it can improve feelings of stress and loneliness. The crew's digital biomarkers will be monitored using Empatica's EmbracePlus wearable device. The results will be correlated with the interaction with PARO and the crew's daily journals.

NASA pointed out what hazards Analog Missions could test, and one of them was "Isolation/Confinement". *Behavioral issues among groups of people occupying a small space over a long time, no matter how well trained they are, are inevitable. The "possible hazards" are that a decline in mood, cognition, morale, or interpersonal interaction, sleep disorder, depression, fatigue, boredom. The more confined and isolated humans are, the more likely they are to develop*

behavioral or cognitive conditions.

<https://www.nasa.gov/analog/what-are-analog-missions>



PARO Robot, a biofeedback medical device (AIST)



PARO for Ukrainian Refugees in Poland (Medical University of Warsaw, Poland)



EmbracePlus (Empatica)



**Ms. Jas Purewal, Scientific Officer of Crew 268**, said *"We will be testing for Quality Improvement for future research the PARO medical device and take measurement of stress response using the Empatica EmbracePlus wearable in analog missions in Poland and the South Pacific."*

### **PARO Therapeutic Robot for Biofeedback Therapy**

PARO is a baby seal robot inspired by "animal pet therapy", and has been a neurological biofeedback medical device in Class 2 by the FDA, the US since 2009. PARO is also a psycho-physiological biofeedback medical device in Europe, Australia and some other countries, except Japan.

In the US, PARO can be prescribed, as a non-pharmacological biofeedback therapy for various kinds of patients from children to elderly, who are diagnosed with symptoms such as anxiety, pain, depression, insomnia and/or agitation such as violent behaviors and abusive speech. Reimbursement for licensed treatment of "biofeedback therapy with PARO" can be accepted by the Medicare, Medicaid and private medical insurance companies.

Because PARO is recognized as a psycho-physiological biofeedback medical device in Europe,

it is being used for improving mood, anxiety, depression, stress, and other symptoms of PTSD among Ukrainian refugees in psychiatric hospitals and other facilities in Poland since June of 2022.

From 2006 to 2007, at the Showa Station in the Antarctica, PARO had been used for Japanese Crew to improve their moods and to encourage communication for bonding.

PARO has been developed by the National Institute of Advanced Industrial Science and Technology (AIST) in Japan since 1993. Intellectual properties on PARO were licensed to Intelligent System Co., Ltd. and PARO was commercialized in 2005 in Japan. Then, after further enhancements, research, and regulatory review it is now distributed in more than 30 countries.

PARO Robots (Intelligent System Co., Ltd. in Japan): <http://parorobots.com>

AIST: [https://www.aist.go.jp/index\\_en.html](https://www.aist.go.jp/index_en.html)

Medical University of Warsaw: <https://www.wum.edu.pl/en/node/17161>

### **EmbracePlus by Empatica**

EmbracePlus is an award-winning medical-grade smartwatch that offers continuous clinical-quality health measurements from the wrist. EmbracePlus, is CE-marked in Europe, and developed with key US partners including HHS, USAMRDC, and the NASA-funded Translational Research Institute for Space Health.

It is the only wrist-worn wearable of its kind that can provide continuous measurements from a wide array of sensors: a custom-made PPG (Photoplethysmography) sensor, an EDA (Electrodermal Activity) sensor, a high-precision 3D microelectromechanical accelerometer and gyroscope, and a digital thermometer.

These enable the simultaneous monitoring of Pulse Rate, Pulse Rate Variability, IBI (Inter-beat Interval), skin temperature, respiration rate, oxygen saturation, movement, rest, stress, and other digital biomarkers.

EmbracePlus is made by Empatica, a full-stack digital healthcare company and a pioneer in digital biomarker development and continuous patient monitoring driven by AI.

Empatica's platform consists of medical-grade smartwatches, software, and physiological and behavioral digital biomarkers. Together they enable the continuous remote monitoring of human health across a range of conditions, through clinical-quality digital measurements.

Empatica's solutions are currently being used by thousands of research partners, institutions, and patients, to run decentralized clinical trials, develop novel digital biomarkers, conduct academic research with real-world data, and monitor neurological conditions.

Empatica: <https://www.empatica.com/>

**List of Crew 268 is attached.**

**Online Press Briefing: 19:00-20:00 (EST), Nov. 11<sup>th</sup>, 2022**

Zoom: <https://us06web.zoom.us/j/5359818246?pwd=RTNiUjVIUW9sU2lBdzYwOWgzSm5nQT09>

Meeting ID: 535 981 8246

Password: 008022

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