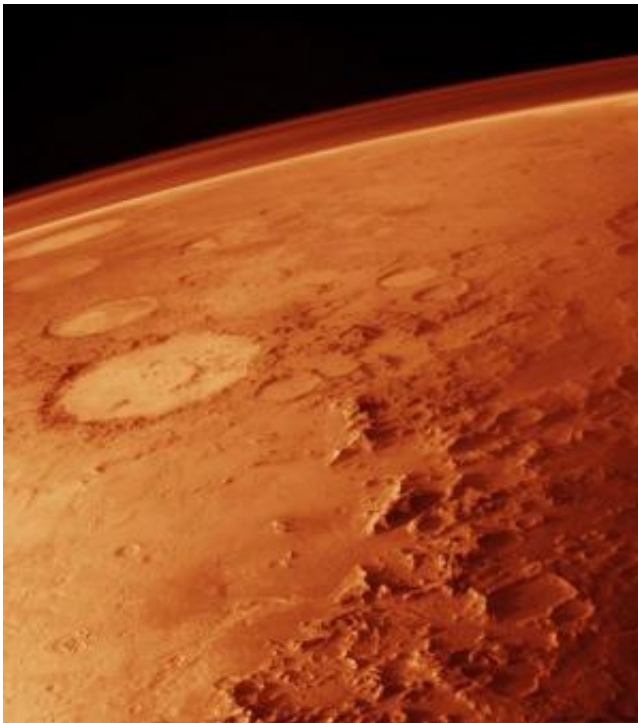


Houston: We have a problem...but no worries, our virtual therapist is on it

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Astronauts feeling depressed or stressed on missions to Mars and other long-duration space flights may soon find computerized solace in the form of a virtual reality-based relaxation system being developed by Dartmouth College researchers and their colleagues. Credit: NASA

Hiking in the mountains or lying on the beach are good ways to relieve stress on Earth, but on spaceflights there's no way to get back to nature. Astronauts feeling stressed on long-duration flights, however, may soon

find computerized solace in the form of a virtual reality-based relaxation system being developed by Dartmouth researchers and their colleagues.

Since 2001, Dartmouth, Harvard, UCLA and The Troupe Modern Media have been developing the "Virtual Space Station", a set of interactive behavioral health training and treatment programs with support from NASA's National Space Biomedical Research Institute (NSBRI). The NSBRI recently gave Dartmouth a \$1.6 million grant to add new [virtual reality](#) and conflict management content to the existing Virtual Space Station programs. The NSBRI is a NASA-funded consortium of institutions developing solutions to health-related problems on long-duration missions.

Dartmouth's Digital Arts Leadership and Innovation lab, better known as [DALI](#), is creating the new technology for the system, including virtual reality content "to help make people feel at ease, at home, happy, comfortable and calm," says Lorie Loeb, a Dartmouth research professor in computer science and executive director of the lab.

DALI will use Oculus Rift, the [virtual reality headset](#) that Oculus VR is developing, plus sounds and smells for mood mitigation "to trick the brain and make people feel as if they are in a variety of beautiful and calm settings, such as with their family at home or strolling on the beach," Loeb says. In such a scenario, an astronaut's virtual reality program could include photos and video of their spouse and children, images of a beach, sounds of waves crashing, odors of saltwater and suntan lotion and a fan to simulate ocean breezes.

"We will use state-of-the-art virtual reality technology to help with the effects of isolation," says Nook Harquail, the lead DALI designer and project manager on the project. "We're building all the new technology for this project and doing the interface and interaction design work from scratch. DALI lab is porting the existing content to a JavaScript game

and creating both the content and framework for the virtual reality component. People have long thought that virtual reality can be therapeutic in addition to being used in gaming and entertainment."

To upgrade the existing content, the Virtual Space Station system has been delivered for testing at the HI-SEAS (Hawaii Space Exploration Analog and Simulation) Mission 3 starting Oct. 15 in Hawaii. A team of six members will spend eight months in simulated Mars habitat – double the length of the previous longest HI-SEAS mission. The Dartmouth team also plans to test the system in Antarctica, which is used as an analog to long-duration spaceflights due to its isolation, length of stay and team composition.

The current Virtual Space Station system includes a suite of multimedia programs, including self-guided training on conflict and stress management. The program also offers a six-session, self-administered depression treatment program guided by psychologist Mark Hegel, Ph.D., a professor at Dartmouth's Geisel School of Medicine and a co-investigator on the project.

Researchers have for years studied the mental challenges of long-duration space flights, but astronauts currently have audio and video access to psychologists only when communication links are available. On longer missions like one to Mars, transmission delays will make real-time therapy problematic. Computer-based treatment offers an autonomous way to address these important problems.

"Our research addresses the NSBRI's emphasis on dealing with depression, stress, anxiety, interpersonal conflict, isolation, fatigue, confinement and other psychological challenges of long-duration space exploration missions," says Jay Buckey, M.D., a former astronaut who is a Geisel professor and the principal investigator on the project. Buckey initiated the initial computer-based work in collaboration with the

Interactive Media Lab at Dartmouth in 2001 and was a co-investigator on the previous NSBRI projects.

The system allows astronauts to seek help confidentially on their laptops and monitors their mental health and conducts therapeutic sessions. The goal is to assess and manage psychosocial problems and to prevent them from becoming serious enough to jeopardize a mission. The multimedia program uses problem-solving and cognitive behavioral therapies and simulates a human presence through the use of virtual therapists – recorded video of Dartmouth and UCLA psychologists—who discuss early signs of depression, stress and conflict and lead the user through the programs. The system provides feedback based upon the information the user provides and helps astronauts develop action plans to address stress or depression.

The program is designed for astronauts but could be adapted to treat people on Earth—a recent Dartmouth study led by Hegel showed that people find the computer-based depression treatment credible and acceptable. The treatment could be used in rural areas where clinical help is limited or nonexistent. Other possible locations include schools, social service offices, places of worship, military bases, prisons, commercial ships, oil rigs and polar and underwater research stations.

The DALI lab, which is supported by Dartmouth's Neukom Institute for Computational Science and the Department of Computer Science, matches undergraduates with real-world projects that focus on communicating complex ideas and data in meaningful ways, using a mix of technology and design.

More information: [www.sciencedirect.com/science/ ...
ii/S0005789414000240](http://www.sciencedirect.com/science/.../S0005789414000240)

Provided by Dartmouth College

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