Mock Mars trek finds down-to-Earth sleep woes

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Astronauts have a down-to-Earth problem that could be even worse on a long trip to Mars: They can't get enough sleep. And over time, the lack of slumber can turn intrepid space travelers into drowsy couch potatoes, a new study shows.

In a novel experiment, six volunteers were confined in a cramped mock spaceship in Moscow to simulate a 17-month voyage. It made most of the would-be spacemen lethargic, much like birds and bears heading into winter, gearing up for hibernation.

The men went into a prolonged funk. Four had considerable trouble sleeping, with one having minor problems and the sixth mostly unaffected. Some had depression issues. Sometimes, a few of the men squirreled themselves away into the most private nooks they could find. They didn't move much. They avoided crucial exercise.

"This looks like something you see in birds in the winter," said lead author David Dinges, a sleep expert at the University of Pennsylvania School of Medicine.

The experiment was run and funded by Russian and European space agencies. A report on the simulation's effect on the men was published online Monday in the journal Proceedings of the National Academy of Sciences.

Dinges said scientists can't tell if the men's lethargy was just lack of sleep or was also caused by other factors: the close quarters, lack of privacy with so many cameras or being away from their families for so long.

It's a problem that has to be fixed - and can be - before astronauts are sent to Mars, as President Barack Obama proposes for the mid-2030s, Dinges said. The trip to Mars, Earth's closest neighbor, would take about six months each way.

The world record for continuous time in space - 14 months - is held by Dr. Valery Polyakov, who was on the Russian space station Mir in 1994 and 1995. American astronaut Scott Kelly and Russian cosmonaut Mikhail Kornienko are scheduled to spend an entire year in space on the International Space Station, starting in 2015.

When leaving confinement in November 2011, the six volunteers - three Russians, a Frenchman, an Italian-Colombian and a Chinese - called their experience successful: "We can go forward and now plan to go to Mars and move confidently," said volunteer Romain Charles of France.

The data scientists collected wasn't as rosy. Devices on the volunteers' wrists measured their movements and showed that when they were asleep and awake they were moving much less than they should have been, an unexpected and disturbing finding, Dinges said.

One of the six volunteers - who were paid $100,000 to live in the mock spaceship with limited and time-delayed contact with the outside world - slept nearly half an hour less each night than he did when he started the mission, affecting how he went about his day, Dinges said.

The loss of sleep matters because astronauts will have to perform intricate tasks on the way to Mars and while on the red planet. And they have to do vigorous exercises daily to fight the toll that near-zero gravity takes on the bones and other parts of the body. And most of the volunteers weren't doing that.

The Moscow study, based on the ground, couldn't take into account the added difficulty of near-zero gravity.

Former astronaut Michael Lopez-Alegria, who holds the American record for longest space mission, said he could relate to the study findings. During his 215 days in orbit on the space station, he sometimes had trouble getting back to sleep because he didn't have a sense of lying down or having his head on a pillow.

The lack of sleep and lots of work caused him to sometimes nod off during the day, and the lack of gravity meant that when he fell asleep accidentally he would float away and awaken elsewhere in the station, he said.

"It happened more than once, but I never thought it was a big deal. I thought it was amusing in a way," Lopez-Alegria said in an interview.

Excerpts from astronaut diaries in a NASA report show prevalent sleep problems, with space station residents talking about nodding off while typing and obsessing over getting too much or too little sleep.

"I just need sleep," one unidentified astronaut wrote.

"The morning started disastrously. I slept through two (wake-up) alarms... My body apparently went on strike for better working conditions," wrote another.

Jerry Linenger, a medical doctor and NASA astronaut who spent more than four months on the Russian space station Mir in 1997, said he watched cosmonauts fall asleep in mid-conversation. And after a couple months, Linenger started having sleep problems despite his best efforts, which included using eye shades and bungee cords to put pressure on his body.

"It's kind of like you're wiped out after New Year's Eve, kind of like a hangover or something," Linenger said. "You are aware you're not performing. So I'd be extra careful if I had to switch some buttons."

Later in 1997, a cosmonaut on Mir who had a sleepless night accidentally disconnected a system that gathered solar power for the aging station, said Charles Czeisler, a sleep professor and space researcher at Harvard Medical School.

Czeisler, who wasn't part of the Dinges study, said the new work was important in demonstrating the challenges of a Mars mission.

Astronauts do use sleeping pills to help them sleep.

And one solution experts like Dinges and Czeisler agree on is lighting. Blue evening light is essential for resetting a body's natural rhythms, Czeisler said, and changing the color and timing of lighting has been shown to help people sleep on Earth.

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