

## PART 1: The Hazards of travelling to Mars: Isolation and confinement

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As humans, we have an inherent need for connection and social interaction with others. It is no surprise that we are social beings with social needs. Simultaneously, as we look to broaden our horizons, we enter environments that are not well-suited to our needs. For astronauts travelling to space and, in particular, to Mars, isolation and confinement are unavoidable realities. With missions to the Red Planet taking anywhere from six to nine months each way, and potential stays of up to several years on the planet's surface, astronauts will experience unprecedented levels of isolation from their loved ones and the rest of the world. Imagine being that far away from your favourite coffee shop or pet. The psychological effects of this isolation and confinement could have a significant impact on the success of the mission to Mars, and it is important to consider strategies to mitigate these effects. Isolation and confinement have been highlighted by NASA as one of five major risk categories for Mars exploration.

One of the biggest challenges of isolation is the psychological toll it takes on individuals. Being cut off from social contact can lead to a host of mental health issues, including anxiety, depression, and even psychosis. A study by NASA found that astronauts on long-duration missions experienced significant cognitive changes, including decreased memory and attention span, as well as alterations in mood and emotional regulation. The study also found that these effects were more pronounced the longer the mission lasted, indicating that long-duration isolation can have lasting effects on mental health. In addition to psychological effects, there are also physical effects of isolation and confinement. Without access to regular physical activity, astronauts can experience muscle atrophy and bone density loss, which can be dangerous upon their return to Earth. The lack of a regular day-night cycle can also disrupt sleep patterns and lead to circadian rhythm disorders, which can cause fatigue, irritability, and other health issues.

To combat these effects, NASA has developed a number of strategies for maintaining astronaut health and well-being during long-duration missions. One of the most important is maintaining a regular schedule of exercise and physical activity. Astronauts on the International Space Station (ISS) are required to spend at least two hours per day exercising to prevent muscle and bone loss. NASA has also developed a system of virtual reality and other immersive technologies to provide astronauts with simulated experiences of Earth, such as virtual tours of museums and cities.

Another key strategy is maintaining social connections between the astronauts and their loved ones on Earth. NASA has developed a program called “Family and Crew Time” that allows astronauts to communicate with their families regularly through email, video calls, and even Twitter. The agency has also developed a system of virtual support groups for astronauts, where they can connect with one another to share experiences and offer emotional support.

Perhaps the most important strategy for mitigating the effects of isolation and confinement is providing astronauts with meaningful work and a sense of purpose. NASA has found that astronauts who are engaged in meaningful work, such as scientific research or exploration, are more likely to maintain their mental and emotional health during long-duration missions. Providing astronauts with a sense of purpose and meaning can help them stay motivated and focused, and can help them maintain their mental and emotional well-being throughout the mission.

Despite these strategies, isolation and confinement remain significant challenges for astronauts travelling to Mars. It is important for NASA and other space agencies to continue to research and develop new strategies for mitigating the effects of isolation, both for the well-being of the astronauts and for the success of the mission. One potential solution is the development of new propulsion technologies that would allow for faster travel to Mars, reducing the length of the journey and the amount of time astronauts must spend in isolation.

Another potential solution is the development of advanced virtual reality and other immersive technologies that could provide astronauts with more realistic simulations of life on Earth, including the sights, sounds, and smells of home. These technologies could help to combat the sense of isolation that astronauts may feel and provide them with a sense of connection and purpose that would be difficult to achieve otherwise.

It will be interesting to monitor how NASA and broader research groups try to solve many of the hazards astronauts will face. Acknowledging new technologies like virtual reality as a possible solution to isolation also has broader consequences for those of us living on Earth. Many of these findings can be applied to on-world issues like the prison system, where prisoners are forced to spend elongated periods of time in small spaces with limited visiting opportunities. Additionally, this could be applied to soldiers on the front line, who are often separated from their family and friends in very harsh situations.



Will you be taking part in NASA's next isolation study?