

HABITABILITY IN MARS MISSION SIMULATION: SOUNDS AS STRESS COUNTERMEASURES

Abstract: A series of campaigns in an extreme environment has been conducted at the Mars Desert Research Station (MDRS), an analogue of the Moon-Martian habitat for human exploration, where crews of six people work and live together in a closed-system environment simulating a space mission designed to carry out specific field research and experiments. The station is located in Utah in the San Rafael Swell desert, a place considered analogues to the Mars environment. Our research focused on social aspects and pleasant sounds as stress mitigation within the context of these campaigns.

Background

On the basis of previous crews' debriefing investigations (by Extreme-Design in 2010-2012), the importance of music exposure against stress was identified. Our hypothesis was that music and/or nature sounds (*i.e.* streaming water and occasional bird call) will have a positive effect on stress reduction. Crew 125, which included members from Canada, Germany, Japan, Hungary, and the Netherlands, was asked to focus on how the effects of music and pleasant sounds enhanced their mood during the mission. Preliminary results are here reported.

Methods

Unlike prior participants, Crew 125 was asked to bring their favorite music and personal belongings for entertainment. The analysis was performed using direct observations, interviews, and debriefings of each crew. The debriefings were done two days prior to the completion of the mission. Each participant was asked to write down a list of relevant stress related problems and identify the three main stressors. Following the debriefings, each highlighted problem was discussed jointly by the experiment coordinator and the crew in an attempt to identify possible solutions.

Result

Music took an important role to change a mood and to offer a topic. Crew 100A reported sad mood after one crew member quit because of his job, and listening to music and singing were proposed as a part of possible solutions. Crew 125 played science fiction movie related music almost every morning, and it frequently was a topic of discussion during meal-time. The science fiction movie related music was one of the crew's favorite soundtrack played prior to Extra Vehicular Activities and helped encourage crew members' mood. The crew also listened to *nature sounds* as the "morning music" following commander's suggestion. Some members of the crew were surprised that nature sounds could have strong relaxation effects within a short time exposure (*e.g.* less than 5 minutes). One opinion was that listening to Nature Sounds may be good for the time in the evening when we don't need to work hard, because the feeling to work hard is changed after the relaxation. Another person's experience was that slight stress with thinking about tasks had changed after the relaxation, like needless for working harder. A few crew members imagined that this kind of change could be helpful when difficult or serious problems occurred in space, because the stress will be reduced and thought will accept the fact.

Discussion

The debriefing investigation performed in 2010-2013 showed that miscommunication was the most common topic identified as a problem, but it is a well-documented during previous spaceflight missions. However, there are not many studies using music as a stress reducer for an international crew in confined environments. Our study found the strategic use of music and nature sounds were effective for crews in the MDRS analog studies.



MDRS 2013

Common key words / topics approached	Crew Numbers
Communication	100, 113, 124, 125
Layout	91, 113, 124
Toilet	91, 100, 124
Music	91, 100
Gymnastics	91, 100
Storage	91, 113

All the different fields have been approached (Operational, psychological, socio-cultural, physiological, and environmental factors)

Habitability debriefing mission 2010-2013



Crew 125 performing music in MDRS in March 2013

Majority of Crew 125 enjoyed playing music instead of watching a movie, and it was effective for group dynamics to use shorter time than movie.

Regarding the issues of communication, different approaches are needed because music and nature sounds may not always be effective.

Conclusion

Music and *nature sounds* had positive effects on group dynamics at MDRS. Not only passive music, but also active music would help crew's well-being. Consideration of habitability with soundscape design and variation of pleasant sounds may be more important for long-duration space missions.