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PSYCHOLOGY OF ISOLATION AND ARCHITECTURE OF LUNAR HABITATS: LESSONS FROM
SPACE ANALOGS, ANTARCTIC MISSIONS, AND SECURE FACILITIES DESIGN

Abstract

Research shows that for the most common psychological issues faced by astronauts during space missions, the underlying cause is confinement or isolation. Researchers have found that prolonged exposure to ICE (Isolated Confined Environments) leads to a three-fold experience of isolation, including spatial-temporal isolation, social isolation, and sensory isolation, which manifests through symptoms of fatigue, altered circadian rhythm, neurocognitive impairment, and sleep disturbance. Therefore, when planning a long-term mission or potential settlement on the Moon, it is essential to account for the psychological challenges of isolation in the design of lunar habitats. To learn more about this relationship between architectural design and the psychology of isolation we turn to the most readily available examples of ICE on Earth including Space Analogs, Antarctic Missions, and Secure Facilities.

This paper will provide a review of the current research on the psychological effects of the habitation designed for Space Analogs, Antarctic Missions, and Secure Facilities. Possibly the most well-known example of a psychological experiment using a space analog is the MARS 500 project by the Institute of Bio-Medical Problems (IBMP) in Russia, where 6 participants spent 520 days in isolation. Data from this and other more recent experiments including the HI-SEAS, FMARS, and MDRS analog facilities will be discussed. The paper will also review the research from recent Antarctic Missions to consider the impact of 'winter-over syndrome' and other such conditions on the psychological well-being of the participants. Finally, the paper will look at Secure Facilities design and discuss the research on the impact of isolation on inmates of high-security prisons. The paper will further correlate the architectural design of these space analogs, Antarctic habitats, and secure facilities to the psychological issues and provide an analysis of the relationship between spatial design and psychological issues. The design features will be evaluated against the existing frameworks of Trauma Informed Design (TID) to present a set of approaches and guidelines for the design of lunar habitats.

This research is an initial step in identifying the connections between the psychology of isolation and architectural design as it will be relevant for the design of future lunar habitats. However, the learnings from this process will also highlight the importance of environmental psychology in architecture to create environments that foster resilience and mitigate the adverse effects of isolation on occupants' mental health.