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TESTING, VALIDATION AND VERIFICATION METHODOLOGIES FOR SPACE HABITATS AND ANALOGS – LESSONS FROM THE ARCHITECTURAL PROPERTIES' IMPACT ON STRESS AND COGNITION STUDY

Abstract

The habitats future astronauts will inhabit are a crucial infrastructure of future missions. Their design can significantly impact their health and performance. Thus, it is imperative to develop and utilize methodologies for evaluating the effects of habitats on the astronauts' health. Beyond validation, there emerges a need for design researchers to communicate information in the "language" of space habitat design; technical and quantitative design requirements. To reach this stage, research that investigates if similar effects are observed in-space and on-ground needs to be conducted, along with extensive ground based studies that explore the effects of architecture on its inhabitants. Ground based analogue stations allow for iterative design and improvement to base designs, and, if completed and integrated into the development process early on, they would allow for lower costs of implementation of design changes. This stems from the understanding that design changes early on in a process have a significantly lower cost. These ground based analogue stations evaluations should of course be paired with methodologies that allow for quantitative evaluation of their effectiveness and are paired with Key Performance Indexes (KPI's) that lead the design. This presentation includes initial criteria and directives. which we argue habitat designs should be based upon, i.e. the KPI's, which primarily are: Stress and Stress Recovery, Cognitive Performance and Fatigue. We have used such a protocol in our Architectural Properties' Impact on Stress and Cognition (APISC) study. The potential roadmap of establishing these criteria as core, high level design requirements for future missions and the associated research required is discussed.