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Behaviour, Performance and Psychosocial Issues in Space (1)

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TEAMS THAT SIRIUSLY GO THE DISTANCE: EFFECT OF ISOLATION AND CONFINEMENT ON TEAM PERFORMANCE

Abstract

While facing extreme isolation and confinement, long distance space crews will need to sustain high levels of crew performance for an extended period of time. In order to understand the effects of isolation and confinement on crew performance over time, we compared the SIRIUS-19 and SIRIUS-21 crew to two non-isolated control teams performing the same tasks at the same intervals. The SIRIUS crews each began with 6 members. SIRIUS-19 lasted 4 months, and SIRIUS-21 lasted 8 months. We recruited two control teams, matched on diversity at the team level with SIRIUS-21 crew, and administered the same team tasks as in SIRIUS. The SIRIUS-21 crew began with 6 members, but an off-nominal event occurred on mission day 32: a crew member was injured, and needed to leave the mission. The two control crews were reconfigured so our data includes three teams of 5 members each. We assessed team performance on two tasks, creativity and problem-solving. Creativity was assessed using the Alternative Uses Task, which asks the crew to brainstorm as many non-traditional uses for a common object as they can in a limited amount of time. Creative performance was operationalized for each crew at each time as the average of fluency (how many ideas), flexibility (distinct categories of ideas), and novelty (statistical rarity of ideas). Problem-solving was assessed using survival tasks which present the crew with a life-threatening situation and a list of objects that could be useful to their survival. The crew must accurately rank the items in order of importance to survival. Problem-solving performance was operationalized as minimizing the sum of the deviation of the crew's item rankings from those provided by expert rankings. A total of five sets of parallel tasks, one creative and one problem-solving were administered to each of the four crews. We compared the levels of performance observed in each of the crews over time, finding statistically significant differences in the performance trajectories of isolated and non-isolated crews over time. Isolated crews showed greater performance declines than non-isolated crews, and this was particularly so for creative tasks. Further, we examine the effect of significant mission milestones, communication delays, and off-nominal events on team creative and problem-solving performance. Given that crews will need to maintain uniformly high levels of performance over time during interplanetary space travel, these findings have important implications both for studying and ultimately supporting space crews.