Psychosocial Characteristics of Optimum Performance in Isolated and Confined Environments (ICE)

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Objectives
• Review the Behavioral Health and Performance (BHP) Element addressing human health risks in the NASA Human Research Program (HRP), including the Risk of Adverse Behavioral Conditions and the Risk of Psychiatric Disorders. BHP supports and assists in helping to shape characteristics and improve the Behavioral Medicine risk for exploration missions, and in some instances, current Flight Medicine Operations.
• The Behavioral Health and Performance (BHP) Element identified research gaps within the Behavioral Medicine Risk, including: (a) what psychosocial characteristics predict success in an isolated, confined environment (ICE)?
• The review of the literature on isolated and confined environments was modeled after the format used by the Cochrane Collaboration for systematic reviews of the literature (Higgins & Green, 2006). This format includes details on the search strategy, description of selection criteria for studies to review, and review methods.
• Searches of published and unpublished studies were then conducted using the following sources of information: electronic data bases, including the National Library of Medicine's PubMed Central, PsycINFO, Social Sciences Citation Index, and Sociological Abstracts; specialist bibliographies within the Antarctic Bibliography; unpublished technical reports and manuscripts; and library catalogs for books on isolation and confinement in extreme environments. Searches included isolation, confinement, extreme environments, human behavior, and performance. These materials were then reviewed to identify studies that described specific psychosocial characteristics as being associated with one or more measures of behavior and performance.
• Studies that included outcome measures of behavior and performance in isolated and confined environments but did not include psychosocial characteristic as potential predictors of these outcomes (e.g., studies that examined whether duration of exposure to isolation and confinement or changes in cadet performances were related to behavior and performance) were excluded from further review. This left us with a sample of 120 studies for analysis.
• Studies were assigned values based on whether they were anecdotal or review (score = 0) or whether they reflected quasi-experiments (prospective or cross-sectional longitudinal observational designs) (score = 1) or experimental (randomization of participants or longitudinal experimental and confounding) designs (score = 2).
• Psychosocial characteristics identified in the studies reviewed included social-demographic characteristics, personality characteristics, clinical evaluation characteristics, and other characteristics of individuals, as well as characteristics of groups and their leaders.
• Measuring of performance was grouped into five categories: task ability, emotional stability, social compatibility, leadership, and overall.
• When available, data contained in the papers were used to identify correlation coefficients (Pearson's r or Spearman's r), odds ratios, and effect sizes (Cohen's d) for all associations reported to be statistically significant.
• A coding system was developed to prioritize variables based on the fidelity of the study design to long-duration mission in space. A fidelity score was calculated for each study by summing the scores of 4 variables.
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Results
Table 1. Quantity, quality and fidelity of studies reporting associations between psychosocial characteristics and performance

Table 2. Prioritization of predictors by performance category

Conclusions
• Despite the wealth of research on psychosocial characteristics in isolated and confined environments, the evidence supporting any particular characteristic as a predictor of performance is quite limited.
• The number of associations supported by more than one third possessed data that could be used to identify a statistical effect.

Materials and methods
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Table 3. Countermeasures for Performance Enhancement

Literature cited
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For further information