

Fiscal Year:	FY 2017	Task Last Updated:	FY 08/26/2016
PI Name:	Alfano, Candice Ph.D.		
Project Title:	Characterization of Psychological Risk, Overlap with Physical Health, and Associated Performance in Isolated, Confined, Extreme (ICE) Environments		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Behavior and performance		
Joint Agency Name:	TechPort:	No	
Human Research Program Elements:	(1) HFBP: Human Factors & Behavioral Performance (IRP Rev H)		
Human Research Program Risks:	(1) Bmed: Risk of Adverse Behavioral Conditions and Psychiatric Disorders (2) Sleep: Risk of Performance Decrements and Adverse Health Outcomes Resulting from Sleep Loss, Circadian Desynchronization, and Work Overload (IRP Rev F)		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Comments:			
Project Type:	GROUND	Solicitation:	2013-14 HERO NNJ13ZSA002N-BMED Behavioral Health & Performance
Start Date:	11/13/2014	End Date:	11/12/2017
No. of Post Docs:	1	No. of PhD Degrees:	0
No. of PhD Candidates:	3	No. of Master' Degrees:	0
No. of Master's Candidates:	0	No. of Bachelor's Degrees:	0
No. of Bachelor's Candidates:	0	Monitoring Center:	NASA JSC
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Flight Program:			
Flight Assignment:	NOTE: Element change to Human Factors & Behavioral Performance; previously Behavioral Health & Performance (Ed., 1/17/17)		
Key Personnel Changes/Previous PI:	None		
COI Name (Institution):	Connaboy, Christopher (University of Pittsburgh) Laughlin, Mitzi Ph.D. (University of Houston) Simpson, Richard Ph.D. (University of Houston) Deng, Zhigang Ph.D. (University of Houston) Zolensky, Michael Ph.D. (NASA Johnson Space Center)		
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Task Description:

Anecdotal and empirical findings collected in space and other extreme environments continue to highlight the potential for psychological symptoms and conditions to degrade crew performance, increase conflict, and jeopardize mission success. Indeed, 'negative reactions' during periods of isolation, confinement, demanding work schedules, stimulus reduction, separation from loved ones, sleep deprivation, and a host of other stressors are more appropriately viewed as normative rather than pathogenic. Selection methods and countermeasures serve to mitigate some degree of psychological risk, but long-duration space flight will substantially extend exposure to these and other stressors. Previous research documenting psychological symptoms experienced during space flight and in other isolated and confined environments (ICE) provides evidence of a wide range of psychological and behavioral reactions. Unfortunately however, these collective data ultimately serve to raise more questions than answers. Differences in collection methods, types of symptoms/reactions assessed, psychological constructs examined, and timing and duration of measurements limit conclusions that can be drawn from this research. As a result, understanding of the discrete symptoms and conditions most likely to occur during space flight and thus, ability to quantify the magnitude, probability, or consequences of such risk remains inadequate. The current project proposes to address these notable gaps in knowledge via three specific Aims. First, we will conduct extensive scientific literature reviews and interviews with subject matter experts in order to synthesize existing knowledge of the psychological and behavioral symptoms experienced in space and other extreme environments (Aim 1). Our review will directly inform the development of a comprehensive checklist of symptoms to be monitored among 6 separate cohorts (i.e., 2 Antarctic and 4 Human Exploration Research Analog (HERA) cohorts) as part of a longitudinal investigation (Aim 2). Symptoms will be examined based on their point/period prevalence, severity, and duration. The checklist will also be administered (repeatedly) in conjunction with a physical symptoms checklist in order to examine concurrent and sequential overlap between psychological and physical health symptoms as means of clarifying potential etiologies. Finally, our study will extend previous research by exploring relationships among psychological health, sleep loss/dysregulation, biomarkers of stress, and performance-based outcomes (Aim 3). A comprehensive battery of cognitive and performance measures (including a perception-action coupling task) will be administered repeatedly as part of our longitudinal study. These outcomes will inform a final list of psychological/ behavioral symptoms to be examined during an extended International Space Station (ISS) mission.

Rationale for HRP Directed Research:

Anecdotal and empirical findings collected in space and other extreme environments continue to highlight the potential for psychological symptoms and conditions to degrade crew performance, increase conflict, and jeopardize mission success. Indeed, 'negative reactions' during periods of isolation, confinement, demanding work schedules, stimulus reduction, separation from loved ones, sleep deprivation, and a host of other stressors are more appropriately viewed as normative rather than pathogenic. Selection methods and countermeasures serve to mitigate some degree of psychological risk, but long-duration space flight will substantially extend exposure to these and other stressors. Previous research documenting psychological symptoms experienced during space flight and in other isolated and confined environments (ICE) provides evidence of a wide range of psychological and behavioral reactions. Unfortunately however, these collective data ultimately serve to raise more questions than answers. Differences in collection methods, types of symptoms/reactions assessed, psychological constructs examined, and timing and duration of measurements limit conclusions that can be drawn from this research. As a result, understanding of the discrete symptoms and conditions most likely to occur during space flight and thus, ability to quantify the magnitude, probability, or consequences of such risk remains inadequate. Thus, there is a need to: (1) identify the psychological/behavioral symptoms that pose the greatest threat to performance; (2) provide accurate and acceptable risk thresholds; (3) inform screening and selection processes; (4) guide further development of suitable working practices (standard operating procedures); and (5) develop interventions and counter measures to mitigate these risks.

Research Impact/Earth Benefits:

This project specifically addresses several knowledge gaps related to Risks of Adverse Behavioral Conditions and Psychiatric Disorders including; Gaps 1 (Need to identify and quantify the key threats to and promoters of mission relevant behavioral health and performance during exploration class missions) and Gap 3 (Need to identify and validate measures to monitor behavioral health and performance and determine acceptable thresholds for these measures during exploration missions). Our primary goal is to identify the psychological and behavioral health symptoms with the greatest likelihood of occurrence during extended human space flight/habitation to space and to estimate associated levels of threat imposed to mission-based performance. As a final deliverable, a checklist of symptoms will be developed for implementation during an ISS mission (>6 months) in order to determine its feasibility, reliability, and facilitation of evidence-based decision making with regard to crew health, safety, and mission success.

As a first step, we will conduct extensive scientific literature reviews and interviews with subject matter experts in order to synthesize existing knowledge of the psychological and behavioral symptoms experienced in space and other extreme environments (Aim 1). Our review will directly inform the development of a comprehensive checklist of symptoms to be monitored among 8 separate cohorts (i.e., 4 Antarctic and 4 HERA cohorts) as part of a longitudinal investigation (Aim 2). Symptoms will be examined based on their point/period prevalence, severity, and duration. The checklist will also be administered (repeatedly) in conjunction with the Space Medicine Exploration Medical Condition List (SMEMCL) in order to examine concurrent and sequential overlap between psychological and physical health symptoms as means of clarifying potential etiologies. Finally, our study will extend previous research by exploring relationships among psychological health, sleep loss/dysregulation, biomarkers of stress, and performance-based outcomes (Aim 3). A comprehensive battery of cognitive and performance measures (including a perception-action coupling task) will be administered repeatedly as part of our longitudinal study. These outcomes will inform a final list of psychological/ behavioral symptoms to be examined during an extended ISS mission.

During year 2 of the project all objectives have been met. Specifically, we completed and submitted to NASA a comprehensive technical report titled, "Long-Duration Space Exploration and Emotional Health: Recommendations for Conceptualizing and Evaluating Risk." The overarching goals of this report were to provide an integrative summary of emotion-based outcomes from previous studies in isolated, confined, extreme (ICE) environments and to provide specific recommendations for future research. We are currently awaiting feedback from Behavioral Health & Performance (BHP) element scientific staff regarding our report. During the next year of the project we will seek to publish our findings in a peer-reviewed journal.

At the time of this report, we have completed data collection in 3 of 4 HERA cohorts during the 2016 campaign. Few problems have been encountered and very few missing data have occurred. We are currently preparing for the 4th and

Task Progress:	<p>final 2016 HERA mission and have begun cleaning data for analysis.</p> <p>After receiving approval from the National Science Foundation (NSF) to implement our protocol in two Antarctic stations during the 2017 winterover season, we are currently working Neal Scheibe and the Antarctic Support Team at Lockheed Martin (contracted by NSF) to finalize logistics and implement our project in two Antarctic cohorts. We are in the process of purchasing and organizing all materials for the study which will be shipped to the two Antarctic stations in October 2016. We are also working with Dr. Jim McKeith, the Antarctic Support Contractor at University of Texas Medical Branch (UTMB), who will lead the research support team that will oversee our project on the ice.</p>
Bibliography Type:	Description: (Last Updated: 04/30/2020)
Abstracts for Journals and Proceedings	<p>Alfano CA, Simpson R, Connaboy C, Laughlin M, Zvolensky M, Deng Z. "Characterization of Psychological Risk, Overlap with Physical Health, and Associated Performance in Isolated, Confined, Extreme (ICE) Environments." Research poster at 2016 NASA Human Research Program Investigators' Workshop, Galveston TX, Feb 8-11, 2016. 2016 NASA Human Research Program Investigators' Workshop, Galveston TX, Feb 8-11, 2016. , Feb-2016</p>
NASA Technical Documents	<p>Alfano CA, Bower J, Cowie J, Lau S, Simpson R. "Long-Duration Space Exploration and Emotional Health: Recommendations for Conceptualizing and Evaluating Emotional Risk." Technical Report submitted to NASA-Johnson Space Center, Houston, TX, May 2016. , May-2016</p>