Fiscal Year:	FY 2018	**Task Last Updated:**	FY 09/11/2017
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 Cognitive or Behavioral Conditions and Psychiatric Disorders		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2013-14 HERO NNJ13ZSA002N-BMED Behavioral Health & Performance
Start Date:	11/13/2014	**End Date:**	11/12/2018
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: End date changed to 11/12/2018 per NSSC information (Ed., 12/13/17) NOTE: Element change to Human Factors & Behavioral Performance; previously Behavioral Health & Performance (Ed., 1/17/17)		
Key Personnel Changes/Previous PI:	None		
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Performance Goal No.:			
Performance Goal Text:			

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:	
Research Impact/Earth Benefits:	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. 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.
Task Progress:	All study objectives have been met during the past year of the project. Specifically: 1) We completed data collection from the 2016 HERA campaign (4 missions). We are cleaning and aggregating these data at present. Findings will be presented at the 2018 NASA Human Research Program (HRP) investigators' workshop in January 2018 and subsequently submitted for publication. 2) Data collection in 2 Antarctic stations is ongoing with support from Dr. Jim McKeith and the Center for Polar Medical Operations. At South Pole, a total of 21 participants have been recruited, and at McMurdo, 88 participants have been recruited. Data collection will be completed in November 2017, after which data will be cleaned and analyzed prior to publication in peer-reviewed journals. 3) Our comprehensive technical report titled, "Long-Duration Space Exploration and Emotional Health: Recommendations for Conceptualizing and Evaluating Risk" received feedback from HRP staff. 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. These findings have also been submitted to a peer-reviewed journal and are currently undergoing revisions prior to publication.
Bibliography Type:	Description: (Last Updated: 12/23/2022)