

Fiscal Year:	FY 2020	Task Last Updated:	FY 04/24/2020
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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Zip Code:	77204-5022	Congressional District:	18
Comments:			
Project Type:	GROUND	Solicitation:	2013-14 HERO NNJ13ZSA002N-BMED Behavioral Health & Performance
Start Date:	11/13/2014	End Date:	09/30/2021
No. of Post Docs:	0	No. of PhD Degrees:	0
No. of PhD Candidates:	1	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
Contact Monitor:	Williams, Thomas	Contact Phone:	281-483-8773
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Flight Program:			
Flight Assignment:	NOTE: End date changed to 9/30/2021 per NSSC information (Ed., 4/22/2020) NOTE: End date changed to 3/31/2020 per NSSC information (Ed., 1/29/2020) NOTE: End date changed to 12/31/2019 per NSSC information (Ed., 7/17/19) NOTE: End date changed to 5/31/2019 per NSSC information (Ed., 2/12/19) NOTE: End date changed to 1/31/2019 per NSSC information (Ed., 12/28/18) 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:	April 2020: None		

COI Name (Institution):	Connaboy, Christopher Ph.D. (University of Pittsburgh) Laughlin, Mitzi Ph.D. (University of Houston) Simpson, Richard Ph.D. (University of Houston)
Grant/Contract No.:	NNX15AC13G
Performance Goal No.:	
Performance Goal Text:	
Task Description:	<p>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.</p>
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	<p>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: Gap 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.</p> <p>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.</p>

Task Progress:	All major project objectives have been met. Main outcomes regarding our Mental Health Checklist (MHCL) measure in the Antarctic study, including participants who were stationed at the South Pole station or the McMurdo station, are currently under peer review. Secondary outcomes including sleep and cognitive testing are currently being prepared for submission. Main outcomes were presented at the Johnson Space Center in June 2019. During the approved no cost extension period we are seeking to further validate our MHCL measure in several additional populations including an additional Antarctic sample, elite athletes, and special forces soldiers.
Bibliography Type:	Description: (Last Updated: 04/30/2020)
Abstracts for Journals and Proceedings	Alfano CA. "Psychological Risk, Sleep Patterns and Physical Health in the Antarctic during Winterover." Presented at the Johnson Space Center, Houston, TX, June 2019. National Aeronautics and Space Administration (NASA) Johnson Space Center, 2019. , Jun-2019
Abstracts for Journals and Proceedings	Alfano CA, Bower JL, McLaughlin M, Connaboy C, Simpson R. "Somatic Complaints and Biomarkers of Stress as Predictors of Mental Health in the Antarctic." Paper presented at the 2020 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 27-30, 2020. Abstracts. 2020 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 27-30, 2020. , Jan-2020
Abstracts for Journals and Proceedings	Alfano CA, Bower J, McLaughlin M, Connaboy C, Simpson RJ. "Prevalence, Severity and Course of Mental Health Symptoms during Antarctic Winterover." Paper presented at the 2019 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 22-25, 2019. Abstracts. 2019 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 22-25, 2019. , Jan-2019
Articles in Peer-reviewed Journals	Bower JL, Laughlin MS, Connaboy C, Simpson RJ, Alfano CA. "Factor structure and validation of the mental health checklist (MHCL) for use in isolated, confined and extreme environments." Acta Astronaut. 2019 Aug;161:405-14. https:// , Aug-2019
Articles in Peer-reviewed Journals	Connaboy C, Johnson CD, LaGoy AD, Pepping GJ, Simpson RJ, Deng Z, Ma L, Bower JL, Eagle SR, Flanagan SD, Alfano CA. "Intersession reliability and within-session stability of a novel perception-action coupling task." Aerosp Med Hum Perform. 2019 Feb 1;90(2):77-83. https:// ; PubMed PMID: 30670116 , Feb-2019
Articles in Peer-reviewed Journals	Johnson CD, LaGoy AD, Pepping GJ, Eagle SR, Beethe AZ, Bower JL, Alfano CA, Simpson RJ, Connaboy C. "Action boundary proximity effects on perceptual-motor judgments." Aerosp Med Hum Perform. 2019 Dec 1;90(12):1000-8. https:// ; PubMed PMID: 31747996 , Dec-2019
Articles in Peer-reviewed Journals	Connaboy C, LaGoy AD, Johnson CD, Sinnott AM, Eagle SR, Bower JL, Pepping G-J, Simpson RJ, Alfano CA. "Sleep deprivation impairs affordance perception behavior during an action boundary accuracy assessment." Acta Astronaut. 2020 Jan;166:270-6. Epub 2019 Oct 22. https:// , Jan-2020