Fiscal Year:	FY 2021	**Task Last Updated:**	FY 08/24/2022
PI Name:	Stankovic, Aleksandra Ph.D.		
Project Title:	Quantification of Response to Virtual Reality-based Sensory Stimulation for Relaxation and Therapeutic Release in ICE		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:			
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 (2) **HSIA**:Risk of Adverse Outcomes Due to Inadequate Human Systems Integration Architecture		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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PI Organization Type:	NON-PROFIT	**Phone:**	908-391-1177
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City:	Charlestown	**State:**	MA
Zip Code:	02129-2020	**Congressional District:**	7
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2017-2018 HERO 80JSC017N0001-HHCHFBP: Human Health Countermeasures, Human Factors, Behavioral Performance. Appendix D
Start Date:	09/09/2020	**End Date:**	09/08/2023
No. of Post Docs:		**No. of PhD Degrees:**	
No. of PhD Candidates:		**No. of Master' Degrees:**	
No. of Master's Candidates:		**No. of Bachelor's Degrees:**	
No. of Bachelor's Candidates:		**Monitoring Center:**	NASA JSC
Contact Monitor:	Whitmire, Alexandra	**Contact Phone:**	
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:	Ed. Note (8/23/22): As per the PI, the following personnel have changed. Dr. Gary Strangman, of Massachusetts General Hospital/Harvard Medical School, has been added to the project as a CoInvestigator. Tristan Endsley, Ph.D. and Kevin Duda, Ph.D., of the Charles Stark Draper Laboratory, are no longer CoInvestigators with the project.		
COI Name (Institution):	Buckey, Jay M.D. (Dartmouth College) Bovard, Pooja Ph.D. (Charles Stark Draper Laboratory Inc) Strangman, Gary Ph.D. (Massachusetts General Hospital/Harvard Medical School)		
Grant/Contract No.:	80NSSC20K1852		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	The environmental conditions of prolonged spaceflight missions pose medical and psychological risks for astronauts. As identified by NASA Human Research Program (HRP), long duration exposure to an isolated, confined, and extreme (ICE) environment contributes to the risk of adverse cognitive or behavioral events which may compromise mission safety and success. Previous work has suggested a link between the reduced sensory stimulation associated with such environments and a loss of pleasure, satisfaction, and engagement ([1], [2], [3]). Effective countermeasures are necessary to promote individual behavioral health and performance by providing increased sensory stimulation, offering novelty, preventing boredom, reducing stress, and increasing attention. Draper Laboratory, in conjunction with collaborators at Dartmouth Geisel School of Medicine, will investigate Virtual Reality (VR) stimulation for relaxation and therapeutic release to mitigate the risk of adverse cognitive and behavioral effects in spaceflight-like isolated, confined environments. This study will expand upon previous work conducted by our Dartmouth collaborators which investigated the feasibility of nature-based sensory stimulation using VR to promote stress management and relaxation ([4]) by (1) adding an interactive component to the VR-based sensory stimulation, to promote engagement and to facilitate therapeutic release; (2) deploying and testing this platform in ICE for feasibility and validation; (3) incorporating non-intrusive physiological monitoring; and (4) examining quantifiable neurophysiological response to stimulation exposure, individual variability in responses, and longitudinal and dose-response characteristics of exposure impacts. References: [1] Kanas N, Sandal G, Boyd JE, Gushin VI, Manzey D, North R, (...), Inoue N. (2009). Psychology and culture during long-duration space missions. Acta Astronautica, 64(7-8), 659-77. [2] Stuster J. (2011). Bold endeavors: Lessons from polar and space exploration. Naval Institute Press. [3] Holland AW. (2000). Psychology of spaceflight. Journal of Human Performance in Extreme Environments, 5(1), 4-20. [4] Brasher KS, Dew AB, Kilminster SG, Bridger RS. (2010). Occupational stress in submariners: the impact of isolated and confined work on psychological well-being. Ergonomics, 53(3), 305-313.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	Year 1 Progress (Ed., 8/24/22) This project aims to optimize and test virtual reality (VR) sensory presentation for behavioral health support in isolated, confined, and extreme (ICE) environments. The work will include psychophysiological monitoring and feedback, and multisensory display presentations (e.g., haptic/tactile stimulation, enhanced audio), and will be tested in laboratory and ICE analog environments. The first phase of this investigation involves the analysis of subjective feedback questionnaires and post-mission interviews collected from participating operational ICE environment volunteers who interacted with a standard VR platform on an informal basis. The purpose of this exploratory, opportunistic research is to assess preference for VR scenarios and to gather contextually-specific experiential data with the goal of optimizing future VR presentation for maximum restorative impact. Currently, we are in the process of deploying a set of VR experiences for winter-over usage at the South Pole Station. These include several different VR scenarios which modulate one or more of four specific attributes of the VR experience: (1) scenario duration (short vs. long); (2) sensory modality (visual only or visual haptic cues and enhanced audio); (3) scene context (city or nature scenes); and (4) scene dynamic presentation (fixed scenes or dynamically explorable scenes with motion). We will be examining both subjective responses (through self-reported mood and preference questionnaires) and objective physiological responses to VR experience interactions, to assess the emotional and psychological impacts of various platform configurations. We anticipate collecting data during the second half of the winter-over 2022 season (approximately July-October). Future work will involve preparations for Aim 3 laboratory testing, which will expand upon our analog work and incorporate an investigation of the impact of various VR experiences (including the introduction of biofeedback) on attributes of cognitive performance.
Bibliography Type:	Description: (Last Updated: 04/19/2024)
Articles in Peer-reviewed Journals	Lyons KD, Slaughenhaupt RM, Mupparaju SH, Lim JS, Anderson AA, Stankovic AS, Cowan DR, Fellows AM, Binsted KA, Buckey JC. "Autonomous psychological support for isolation and confinement. " Aerosp Med Hum Perform. 2020 Nov;91(11):876-85. https://doi.org/10.3357/AMHP.5705.2020 , Nov-2020