Fiscal Year:	FY 2019	**Task Last Updated:**	FY 10/25/2018
PI Name:	Bershad, Eric M. M.D.		
Project Title:	SPACE-CENT: Studying the Physiological and Anatomical Cerebral Effects of CENTrifugation and Head Down Tilt Bed Rest		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Biomedical countermeasures		
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **HHC**:Human Health Countermeasures		
Human Research Program Risks:	(1) **SANS**:Risk of Spaceflight Associated Neuro-ocular Syndrome (SANS) (2) **Sensorimotor**:Risk of Altered Sensorimotor/Vestibular Function Impacting Critical Mission Tasks		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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PI Organization Type:	UNIVERSITY	**Phone:**	713-504-0223
Organization Name:	Baylor College of Medicine		
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PI Web Page:			
City:	Houston	**State:**	TX
Zip Code:	77030-3411	**Congressional District:**	9
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2015-16 HERO NNJ15ZSA001N-AGBR. Appendix G: Physiological & Behavioral Responses in Humans to Intermittent Artificial Gravity during Bed Rest
Start Date:	01/09/2017	**End Date:**	09/30/2020
No. of Post Docs:	1	**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:	Norsk, Peter	**Contact Phone:**	
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Flight Program:			
Flight Assignment:	NOTE: Extended to 9/30/2020 per NSSC information (Ed., 10/18/19)		
Key Personnel Changes/Previous PI:	October 2018 report: Addition of several personnel including Steven Laurie from NASA and his laboratory to assist with in depth optical coherence tomography (OCT) analysis given the positive results from the VaPER study. Addition of Rahul Damani, neurocritical care at Baylor College of Medicine (BCM), and removal of Jose Suarez who changed institutions.		
COI Name (Institution):	Clark, Jonathan M.D. (Baylor College of Medicine) Cohen, Helen Ed.D. (Baylor College of Medicine) Kramer, Larry M.D. (University of Texas, Houston) Marshall-Goebel, Karina Ph.D. (NASA Johnson Space Center) Rittweger, Joern M.D. (Deutsches Zentrum Fuer Luft- Und Raumfahrt E.V.) Sangi-Haghpeykar, Haleh Ph.D. (Baylor College of Medicine) Stern, Claudia M.D. (German Aerospace Cente (DLR)) Strangman, Gary Ph.D. (Massachusetts General Hospital) Venkatasubba Rao, Chethan M.D. (Baylor College of Medicine)		

	Damani, Rahul M.D. (Baylor College of Medicine) Laurie, Steven Ph.D. (NASA Johnson Space Center)
Grant/Contract No.:	NNX17AE04G
Performance Goal No.:	
Performance Goal Text:	
Task Description:	This project will assess the physiological and anatomical effects of two different regimens of intermittent centrifugation induced artificial gravity (AG) with focus on the brain, eye, and vestibular system responses. The specific aims include: 1. Integrative evaluation of the cerebral physiological effects of AG during the 60 day bed rest period using between group and within group comparisons, and 2. Assessment of the acute dynamic changes in the human body systems related to the centrifugation regimen. The methods and techniques used to achieve these objectives include: non-invasive assessment of ICP (intracranial pressure), cerebral blood flow, cerebral blood volume, CSF (cerebrospinal fluid) flow and volumes, ocular anatomy and physiology, and neurovestibular function. This proposal will deliver an integrated view of the physiological, anatomical, and functional effects of intermittent centrifugation (artificial gravity) on the cerebrovascular, ocularm, and vestibular systems. This will provide important insights into the effectiveness of this form of artificial gravity to counteract the headward fluid shifting of head down tilt, which may yield important knowledge about the future utility of this method as a countermeasure for the space-flight induced headward fluid shifts and the Spaceflight Associated Neuro-ocular Syndrome (SANS).
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	This project will implement a wide array of non-invasive monitoring technologies for the brain, vascular system, eye, and sensorimotor system. Some of these technologies are commercially available for Earth based medicine in a variety of health care settings including the intensive care unit, emergency room, and may be implementable in rural and/or remote settings, and could be monitored by clinicians via telemedicine.
Task Progress:	The spaceflight environment is associated with both temporary and some permanent changes to the vision and shape of eye structures in astronauts, which are likely related to the effect of microgravity (i.e., weightlessness) on the eye and brain. This syndrome is named Spaceflight Associated Neuroocular Syndrome (SANS) and is thought to be related to fluid redistribution into the head related to the upward shifting of fluids in microgravity. Development of a ground based analog is essential to understanding the anatomical and physiological processes that may be occurring in the spaceflight environment, and will also allow for the development of countermeasures to reduce the adverse effects of microgravity. Our project is designed to monitor the brain and eye changes occurring in a bed rest analog that combines 6 degree head down tilt with an artificial gravity countermeasure using short-arm centrifugation. In the current phase, the devices and methods for testing have been determined. The devices were selected both for ease of use, non-invasive and safe, and monitoring important physiological parameters of the brain and/or eye. A dry run was successfully completed in Cologne, Germany at the German Aerospace Center in September 2018. The devices were tested on a test subject on the centrifuge and the measurements confirmed fluid redistribution from the head to the legs when the artificial gravity was active. Good quality physiological signals were obtainable, and efficiencies for combining several devices simultaneously were found. This will allow for more efficient testing of the healthy subjects during the study phase, and also allow for better understanding of the physiological changes as assessed by multiple modalities in real time. The tentative start of the 60 day bedrest study is March 2019.
Bibliography Type:	Description: (Last Updated: 11/05/2023)
Abstracts for Journals and Proceedings	Bershad EM, Venkatasubba Rao CV, Lazaridis C, Cohen HS, Clark JB, Sangi-Haghpeykar HS, Suarez, JI, Strangman GE, Marshall-Goebel K, Kramer LA, Hasan KM, Stern C, Rittweger J. "SPACE-CENT: Studying the Physiological and Anatomical Effects of Centrifugation and Head Down Tilt." Presented at the 2018 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 22-25, 2018. 2018 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 22-25, 2018. , Jan-2018