Fiscal Year:	FY 2020	**Task Last Updated:**	FY 03/30/2020
PI Name:	Basner, Mathias M.D., Ph.D.		
Project Title:	Temporal Nature of Cognitive and Visuospatial Brain Domain Changes During Long-Duration Low-Earth Orbit Missions		
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) **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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Zip Code:	19104-4209	**Congressional District:**	2
Comments:			
Project Type:	FLIGHT	**Solicitation / Funding Source:**	2017-2018 HERO 80JSC017N0001-BPBA Topics in Biological, Physiological, and Behavioral Adaptations to Spaceflight. Appendix C
Start Date:	06/01/2019	**End Date:**	12/31/2027
No. of Post Docs:	0	**No. of PhD Degrees:**	0
No. of PhD Candidates:	0	**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 12/31/2027 per NSSC information (Ed., 1/27/21)		
Key Personnel Changes/Previous PI:			

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Grant/Contract No.:	80NSSC19K1046
Performance Goal No.:	
Performance Goal Text:	
Task Description:	This is an international proposal consisting of 2 projects with synergistic aims that will be carried out in a joint effort by Deutsches Zentrum für Luft- und Raumfahrt (DLR: German Aerospace Center)/European Space Agency (ESA) and NASA. It addresses the Human Research Program (HRP) Risk of Adverse Cognitive or Behavioral Conditions and Psychiatric Disorders, Human Research Program's requirement to demonstrate the presence or absence of unacceptable deleterious neurocognitive effects beyond the experience base of six-month expeditions, and to permit extrapolation to early interplanetary expeditions. It also addresses several other critical Human Research Program risks and gaps (e.g., BMed1, BMed2, BMed3, BMed5, CNS-1, SM26). More specifically, we will target NASA's particular interest in studying the 'Cognitive-perceptual-visuospatial brain domain changes due to isolation and confinement' as part of the integrated One-Year Mission Project (i1YMP) on the International Space Station (ISS). The data we propose to collect will - for the first time - reliably demonstrate whether prolonging mission duration to one year will have detrimental effects on general cognitive performance (measured with the Cognition test battery), spatial cognition, structural and functional brain changes in general, and hippocampal plasticity more specifically relative to the shorter 6-month and 2-month missions. Using state-of-the-art neuroimaging techniques (that include functional magnetic resonance imaging (fMRI) while performing the Cognition test battery in the scanner), we will determine the biological basis for any changes in cognitive performance, with a focus on hippocampal plasticity. Similar data already gathered on the ISS and in several short- and long-duration space analog environments will be used to generate a normative data base for long-duration missions. Finally, we will derive dose-response relationships between cognitive-visuospatial brain domain changes and mission duration that will allow predicting vulnerability to adverse cognitive or behavioral impairment and psychiatric disorders on interplanetary expeditions such as a mission to Mars. The two 7-yr projects will deliver a highly unique and comprehensive set of integrated neuroimaging and neurocognitive tools for the evaluation and ultimately prevention of adverse effects on brain structure and function that lead to behavioral effects associated with exploration-type missions.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	The two 7-yr projects will deliver a highly unique and comprehensive set of integrated neuroimaging and neurocognitive tools for the evaluation and ultimately prevention of adverse effects on brain structure and function that lead to behavioral effects associated with exploration-type missions. As the Cognition test battery was developed for high-performing subject populations, this work will also translate to high performing populations on Earth (e.g., physicians, submariners).
Task Progress:	The project is currently in its definition phase. The following definition phase objectives were met: Institutional Review Board (IRB) approval was obtained on December 2, 2019. We worked diligently with Research Operations and Integration (ROI) and the other integrated One-Year Mission Project (i1YMP) investigators to integrate our project. We acquired hardware for administering our imaging protocol at the Victory Lakes facility of University of Texas Medical Branch (UTMB). With approval of the element, we postponed setting up our protocol in the scanner as the facility plans software and hardware updates in the near future. Dr. Basner attended all virtual meetings and an investigator meeting at Johnson Space Center (JSC) at the end of January 2020.
Bibliography Type:	Description: (Last Updated: 04/05/2024)