Fiscal Year:	FY 2018	**Task Last Updated:**	FY 05/18/2018
PI Name:	Seidler, Rachael D. Ph.D.		
Project Title:	Spaceflight Effects on Neurocognitive Performance: Extent, Longevity, and Neural Bases		
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) **HSIA**:Risk of Adverse Outcomes Due to Inadequate Human Systems Integration Architecture (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		
PI Email:	rachaelseidler@ufl.edu	**Fax:**	FY
PI Organization Type:	UNIVERSITY	**Phone:**	352-294-1722
Organization Name:	University of Florida		
PI Address 1:	Applied Physiology & Kinesiology		
PI Address 2:	FLG 142, P.O. Box 118205		
PI Web Page:			
City:	Gainesville	**State:**	FL
Zip Code:	32611-8205	**Congressional District:**	3
Comments:	NOTE: PI moved to University of Florida in July 2017; previous affiliation was University of Michigan.		
Project Type:	FLIGHT,GROUND	**Solicitation / Funding Source:**	2010 Crew Health NNJ10ZSA003N
Start Date:	07/14/2017	**End Date:**	07/13/2019
No. of Post Docs:	3	**No. of PhD Degrees:**	
No. of PhD Candidates:	2	**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:	Loerch, Linda	**Contact Phone:**	
Contact Email:	linda.loerch-1@nasa.gov		
Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Bloomberg, Jacob Ph.D. (NASA Johnson Space Center) Mulavara, Ajitkumar Ph.D. (Universities Space Research Association)		
Grant/Contract No.:	80NSSC17K0461		
Performance Goal No.:			
Performance Goal Text:			
Task Description:	NOTE: Continuation of "Spaceflight Effects on Neurocognitive Performance: Extent, Longevity, and Neural Bases," grant NNX11AR02G, due to Principal Investigator Seidler's move to University of Florida from University of Michigan. NRA NNJ10ZSA003N requested proposals to assess changes in elemental neurocognitive functions such as perception, motor control, memory, attention, language, executive function, and emotional processing following long duration spaceflight using both behavioral assessments and monitoring technologies such as fMRI. In response to this call, we propose to perform structural and functional MR brain imaging to identify the relationship between changes in crewmember neurocognitive function and neural structural alterations following a six month International Space Station mission. Our central hypothesis is that measures of brain structure, function, and network integrity will change from pre to post flight in crewmembers (Aim 1). Moreover, we predict that these changes will correlate with indices of cognitive,		

	sensory, and motor function in a neuroanatomically selective fashion (Aim 2). Our interdisciplinary approach utilizes cutting edge neuroimaging techniques and a broad ranging battery of sensory, motor, and cognitive assessments that will be conducted pre flight, during flight, and post flight to investigate neuroplastic and maladaptive brain changes in crewmembers following long duration spaceflight. Success in this endeavor would 1) result in identification of the underlying neural mechanisms and operational risks of spaceflight-induced changes in behavior, and 2) identify whether a return to normative behavioral function following re-adaptation to Earth's gravitational environment is associated with a restitution of brain structure and function or instead is supported by substitution with compensatory brain processes.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	The results of this project will have relevance not only to understanding the effects of spaceflight on the human brain and behavior, but also for delineating the capacity of the brain to remodel in response to adaptive stimuli. As such, the results should prove informative for understanding the neural mechanisms associated with adaptive behavioral change and the rehabilitation of these changes during recovery periods.
Task Progress:	We have made substantial progress over the past year; at this point we are halfway through data collection with six crewmembers who have completed all testing timepoints, and several others in various stages of progress. We are also working with a retrospective diffusion weighted MRI data set obtained from the Lifetime Surveillance of Astronaut Health (LSAH) database. In light of the recent reports of microgravity-induced cephalad fluid shift and gray matter atrophy seen in astronauts, we applied a technique to estimate white matter metrics after correcting for free water contamination. This approach enabled the analysis of white matter tissue-specific alterations that are unrelated to fluid shift, occurring from pre- to post- spaceflight as well as regional shifts in free water (FW). These findings are currently under review for publication. Prospective longitudinal studies are required to evaluate the time course of recovery from these changes.
Bibliography Type:	Description: (Last Updated: 01/24/2024)
Articles in Peer-reviewed Journals	Yuan P, Koppelmans V, Reuter-Lorenz P, De Dios Y, Gadd N, Riascos R, Kofman I, Bloomberg J, Mulavara A, Seidler RD. "Change of cortical foot activation following 70 days of head down bed rest." J Neurophysiol. 2018 Jun 1;119(6):2145-52. Epub 2018 Feb 28. https://doi.org/10.1152/jn.00693.2017 ; PubMed PMID: 29488843; PubMed Central PMCID: PMC6032127 , Jun-2018
Articles in Peer-reviewed Journals	Cassady K, Ruitenberg M, Koppelmans V, Reuter-Lorenz P, De Dios Y, Gadd N, Wood S, Riascos Castenada R, Kofman I, Bloomberg J, Mulavara A, Seidler R. "Neural predictors of sensorimotor adaptation rate and savings." Hum Brain Mapp. 2018 Apr;39(4):1516-31. Epub 2017 Dec 23. https://doi.org/10.1002/hbm.23924 ; PubMed PMID: 29274105; PubMed Central PMCID: PMC5847457 , Apr-2018
Articles in Peer-reviewed Journals	Yuan P, Koppelmans V, Reuter-Lorenz P, De Dios Y, Gadd N, Wood S, Riascos R, Kofman I, Bloomberg J, Mulavara A, Seidler R. "Vestibular brain changes within 70 days of head down bed rest." Hum Brain Mapp. 2018 Jul;39(7):2753-63. Epub 2018 Mar 12. https://doi.org/10.1002/hbm.24037 ; PubMed PMID: 29528169 ; PubMed Central PMCID: PMC6033666 , Jul-2018