Fiscal Year:	FY 2023	**Task Last Updated:**	FY 08/25/2023
PI Name:	Blackwell, Ashley Ph.D.		
Project Title:	Feasibility Study: Use of Neural Networks to Predict Adaptability and Multiday Performance Saving in Dual Motor-Cognitive Tasks After Exposure to Space Flight Stressors		
Division Name:	Space Biology		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:			
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	None		
Human Research Program Risks:	None		
Space Biology Element:	(1) Animal Biology: Vertebrate		
Space Biology Cross-Element Discipline:	(1) Neurobiology		
Space Biology Special Category:	None		
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Comments:	PI moved to University of Nevada, Las Vegas		
Project Type:	GROUND	**Solicitation / Funding Source:**	2021 Space Biology NNH21ZDA001N-SBAS E.11: Animal Studies
Start Date:	08/01/2023	**End Date:**	07/31/2024
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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 ARC
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Britten, Richard Ph.D. (Eastern Virginia Medical School)		
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Performance Goal No.:			
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Task Description:	This proposal will use a rodent model of space flight stressors (SFS), including space radiation (SR) and sleep disruptions (SD), which are known to impair mission-relevant performance that is dependent on cognitive and sensorimotor systems. Astronauts must engage in complex tasks that rely on the integration of information from these multiple systems simultaneously, both independently and cooperatively in team cohesion, while on deep space missions. Engagement in multiple tasks at once, or dual tasks, is very common, such as navigating (i.e., walking or floating in space) through the environment while operating a device (i.e., tablet or radio). Independent, or individual, dual task performance has been shown to be disrupted in astronauts on both short and long duration space missions; that was attributed to microgravity. Yet it is not known how SR and SD will impact performance during complex tasks, including adaptations to new stimuli and re-adaptations to old stimuli, nor whether these deficits will extend to team cohesion beyond the individual, which is critical for performance and mission success. Surprisingly, no work to-date has examined dual task performance in a rodent model of SFS. Dual tasks involve performance in multiple systems simultaneously and provide the opportunity to evaluate adaptations, re-adaptations, and multiday performance savings in rodents and humans. Savings refers to faster relearning, or gains in performance that come from repetition on a task. Both savings and adaptations are imperative to mission success with exposure to SFS and varying task demands. Therefore, the main objectives of this proposal are two-fold: 1) to evaluate the impact of SFS, alone and combined, on neural activity during dual tasks, periods of inactivity, and sleep, and 2) to assess the feasibility of using neural activity to predict subsequent adaptations and multiday performance savings. To accomplish these research objectives, neural recording techniques will be used to establish system-wide SFS effects on independent and cooperative (team cohesion) dual task performance and to characterize the neural mechanisms underlying adaptations and savings, as well as the feasibility of predicting future performance. Our state-of-the-art established wireless neural recording techniques will be conducted while rats perform versions of the behavioral assessments that vary in complexity and during offline periods of inactivity (i.e., neural replay) to examine cognitive, sensorimotor, and vestibular function. Sleep disruptions are commonly reported among astronauts, which have deleterious effects on performance, including reaction time. Therefore, we will also investigate the initial effects of SR exposure on neural activity during sleep, as well as the effect of SD on sleep characteristics (spindles, stage duration). In addition, we will assess the feasibility of predicting neural network function, adaptation, and savings, from sleep characteristics (including sleep stage durations and sleep spindles that are critical to memory). Despite the fact that both independent and cooperative (team cohesion) performance depends on varying demands (single versus dual) in many of the tasks that astronauts must perform in space, the impact that SR and SD have on such performance is unknown. Thus, our proposed studies will determine the relative sensitivity of independent and cooperative (team cohesion) performance on single and dual tasks to these SFS, compared to mono-dimensional tasks that have been the mainstay of rodent-based research to-date. This work also has the potential to identify underlying neurobiological mechanisms of adaptations in a rodent SFS model and to provide a basis to identify resilient and susceptible factors. This work may lead to an understanding of how to promote adaptations and performance savings across time in individuals that are especially susceptible to the effects of SFS.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2023.
Bibliography Type:	Description: (Last Updated:)