Fiscal Year:	FY 2021	**Task Last Updated:**	FY 08/30/2021
PI Name:	McGregor, Heather Ph.D.		
Project Title:	Investigating Plantar Somatosensory Noise as a Countermeasure for Balance and Locomotion Impairments in Simulated Lunar and Martian Gravity		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:	TRISH--TRISH		
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	None		
Human Research Program Risks:	None		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
PI Email:	heathermcgregor@ufl.edu	**Fax:**	FY
PI Organization Type:	UNIVERSITY	**Phone:**	
Organization Name:	University of Florida, Gainesville		
PI Address 1:	Department of 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:			
Project Type:	Ground	**Solicitation / Funding Source:**	2021 TRISH-RFA-2101-PD: Translational Research Institute for Space Health (TRISH) Postdoctoral Fellowships
Start Date:	09/01/2021	**End Date:**	08/31/2022
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:**	TRISH
Contact Monitor:		**Contact Phone:**	
Contact Email:			
Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Seidler, Rachael Ph.D. (MENTOR: University of Florida, Gainesville)		
Grant/Contract No.:	NNX16AO69A-P0602		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	POSTDOCTORAL FELLOWSHIP The vestibular system in our inner ear is key to our sense of orientation and balance. However, in space, the vestibular system does not function normally and the brain cannot interpret its signals. The brain gradually reinterprets vestibular signals to adapt to microgravity, but when astronauts re-encounter gravity post-flight, they have difficulty maintaining their balance while standing and walking. This is because the brain needs time to readjust to normal vestibular signals in gravity. Astronauts require days or even weeks to regain their full sense of balance in gravity. This is problematic for missions to the Moon and Mars as poor balance may impair spacecraft evacuation or result in falls during extravehicular activities. While their vestibular system is dysfunctional, astronauts can use other sources of sensory information for maintaining balance in gravity. Indeed, research suggests that astronauts rely on somatosensory cues – derived from their sense of touch and body position – for maintaining stable upright stance following spaceflight. For example, the brain can use somatosensory information such as the angle of the ankle joint and the sensation of pressure between the foot sole and the ground to help maintain balance. If astronauts rely on somatosensory signals from the feet for maintaining balance after spaceflight, could enhancing those somatosensory signals improve their balance? The primary goal of my proposed study is to address this question. In this ground-based study, I will use a body weight support system to mimic gravity on the Moon and Mars. Participants will perform balance and walking tests in Earth's gravity, in simulated Moon gravity, and in simulated Mars gravity. During a subset of the tests, I will enhance somatosensory inputs from the feet using vibrating shoe insoles. I will test if insole vibration can improve stability while standing and walking in simulated partial gravity. The secondary goal of my proposed study is to characterize how reduced gravity and insole vibration change how the brain processes sensory inputs from the feet. I will measure the brain's response to foot sensory inputs using electroencephalography (EEG). The brain's response to sensory inputs will be measured in Earth gravity, simulated Moon gravity, and simulated Mars gravity, both with and without insole vibration. I will test if reductions in gravity alter how the brain processes sensory inputs from the feet. Moreover, I will assess if insole vibration augments the brain's response to sensory inputs from the feet. If insole vibration indeed enhances balance, locomotion, and the brain's sensory processing in simulated Moon and Martian gravity, this method of sensory enhancement will warrant further investigation. In addition to contributing to our fundamental understanding of the contribution of somatosensory inputs to human balance and locomotion, the findings of this research will test if insole vibration could be an effective countermeasure for post-flight balance and locomotor impairments for future deep space exploration missions.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2021.
Bibliography Type:	Description: (Last Updated: 01/12/2023)