Fiscal Year:	FY 2020	**Task Last Updated:**	FY 10/18/2020
PI Name:	Tavakkoli, Alireza Ph.D.		
Project Title:	A Non-intrusive Ocular Monitoring Framework to Model Ocular Structure and Functional Changes due to Long-term Spaceflight		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:			
Joint Agency Name:		**TechPort:**	Yes
Human Research Program Elements:	(1) **HHC**:Human Health Countermeasures		
Human Research Program Risks:	(1) **SANS**:Risk of Spaceflight Associated Neuro-ocular Syndrome (SANS)		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	89557-0001	**Congressional District:**	2
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2019 HERO 80JSC019N0001-FLAGSHIP & OMNIBUS: Human Research Program Crew Health. Appendix A&B
Start Date:	08/27/2020	**End Date:**	08/26/2021
No. of Post Docs:		**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:	Grant-Technical-Officer, JSC-SA	**Contact Phone:**	281.244.8942
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Webster, Michael Ph.D. (University of Nevada, Reno)		
Grant/Contract No.:	80NSSC20K1831		
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Performance Goal Text:			

Task Description:	Unique neuro-ocular structural and functional changes affect a subset of astronauts who have completed prolonged spaceflight missions and due to its unique pathology, a new case definition was proposed and the condition was renamed Spaceflight Associated Neuro-ocular Syndrome (SANS). In this project we investigate two interconnected computational frameworks to develop a diagnostic system as well as a mapping mechanism to assist NASA scientists and clinical experts to more comprehensively study the SANS phenomenon and predict the risk of its development in prolonged spaceflight. Therefore, the first aim (Aim 1) of this project is to develop novel computational tools to establish mappings between the observed ocular structure and visual function, pre-, in-, and post-flight, in order to provide NASA scientists and clinicians with better means to investigate SANS etiology and its progression. The second aim (Aim 2) of this project is to integrate Contrast Sensitivity (CS), Visual Fields (VF), and our novel distortion assessment mechanism into a validated and compact diagnostic tool to better measure ocular function (SANS 301 : Laboratory development of mechanical countermeasures). We will focus our efforts in each aim on a sub-set of functionalities that allow for the establishment of the interconnected computational framework enabling the pursuit of long-term research to predict the risk of development of SANS and monitor its progression. Omnibus Aim 1: Structure-Function Mapping Research Task-1.1: Design a novel mapping between Optical Coherence Tomography (OCT), Magnetic Resonance Imaging (MRI), Contrast Sensitivity (CS), and Visual Fields (VF) perimetry. Research Task-1.2: Conduct studies on retrospective data from NASA Lifetime Surveillance of Astronaut Health (LSAH) and Life Sciences Data Archive (LSDA) on the three populations (astronauts, head-down-tilt bed rest, and idiopathic intracranial hypertension (IIH)) patient. These findings will be significant in two ways: (1) They will allow us to predict measures within a smaller sample set, if a larger analog sample set has known structure-function maps. (2) They will enable us to design predictive mechanisms to study disease progression both in astronauts and in terrestrial analogs terrestrial analogs. Expected Outcomes: (1.i) understanding how OCT/MRI correlates with VF, (1.ii) translational parametrization of mappings across cohorts, and (1.iii) ability to predict the risk of development of SANS and monitor its progression by utilizing the proposed mappings. Omnibus Aim 2: Address SANS 301 Knowledge Gap Research Task-2.1: Integrate VF and CS assessments into a VR-mediated framework. Research Task-2.2: Validate VR-based VF/CS on the terrestrial analog populations. Expected Outcomes: (2.i) a novel Virtual Reality (VR)-based VF/CS assessment and (2.ii) a compact diagnostic tool.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2020.
Bibliography Type:	Description: (Last Updated: 11/09/2023)