Fiscal Year:	FY 2021	**Task Last Updated:**	FY 02/19/2021
PI Name:	Wood, Scott J. Ph.D.		
Project Title:	Optimizing the Combination of Intranasal Scopolamine and Sensory Augmentation to Mitigate G-Transition Induced Motion Sickness and Enhance Sensorimotor Performance		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:			
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **HHC**:Human Health Countermeasures		
Human Research Program Risks:	(1) **Sensorimotor**:Risk of Altered Sensorimotor/Vestibular Function Impacting Critical Mission Tasks (Revised as of IRP Rev M)		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Comments:	NOTE: PI returned to NASA JSC in January 2017. PI was at Azusa Pacific University from August 2013 – January 2017; prior to August 2013, PI was at NASA JSC.		
Project Type:	GROUND	**Solicitation / Funding Source:**	2019-2020 HERO 80JSC019N0001-HHCBPSR, OMNIBUS2: Human Health Countermeasures, Behavioral Performance, and Space Radiation-Appendix C; Omnibus2-Appendix D
Start Date:	01/01/2021	**End Date:**	03/01/2024
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
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Daniels, Vernie M.S. (KBR/NASA Johnson Space Center) Reschke, Millard Ph.D. (NASA Johnson Space Center)		
Grant/Contract No.:	Internal Project		
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Performance Goal Text:			

Task Description:	Our primary aim is to evaluate a combination of intranasal scopolamine and sensory augmentation to both mitigate motion sickness and enhance crew performance. The current approach is to administer anti-motion sickness medications prior to landing. However, it is operationally challenging to optimize dosage levels. The intranasal form of scopolamine has several properties that should improve efficacy. It has increased bioavailability (i.e., plasma concentration) soon after administering the drug with minimal side effects. This formulation allows crewmembers to self-medicate in the operational environment even after the onset of symptoms. Water landings are expected to exacerbate reentry motion sickness severity. In addition to the unstable support surface, crewmembers will be deprived of a stable Earth visual reference inside the crew capsule. Sensory augmentation, e.g., vibrotactile feedback of an Earth vertical reference, has been effective as a spatial awareness and balance aid with vestibular impairment. We hypothesize that the combination of intranasal scopolamine and sensory augmentation of Earth vertical will be more effective to mitigate motion sickness and improve task performance than when administered separately. During this ground-based study, we will evaluate combining intranasal scopolamine and sensory augmentation as an integrated countermeasure on a multi-degree of freedom platform simulating capsule motion during water landings. We hypothesize that exposure to simulated capsule wave motion will induce motion sickness and impair performance on functional tasks. We also hypothesize that the combination of intranasal scopolamine and sensory augmentation of Earth vertical will be more effective to mitigate motion sickness and improve task performance than when administered separately. We will compare motion sickness symptom onset, severity, and recovery across four conditions: intranasal scopolamine (0.4 mg) and placebo control with and without sensory augmentation. Performance on a series of functional tasks (dual-task tracking, eye-head-hand target acquisition, sit-to-stand) will be performed pre, during, immediately post and following 15 min of recovery of each test. The bioavailability of scopolamine for each session will be estimated from plasma concentrations. Cognition and alertness assessments and subjective reports of drug side effects will be obtained. Two additional specific aims are also proposed to further evaluate the efficacy of intranasal scopolamine to provide treatment (“rescue”) of symptoms following motion sickness onset. For specific aim 2, a laboratory-based study will be used to compare motion sickness symptom severity and recovery for intranasal scopolamine (0.4 mg) and placebo control that subjects self-administer during the simulated capsule wave motion following symptom onset. Finally, specific aim 3 will involve an operational clinical field study in which flight surgeons will administer intranasal scopolamine to astronauts and/or recovery operations personnel during SpaceX landings or Orion splashdown recovery simulations. The significance of treating motion sickness with intranasal scopolamine is the ability to self-administer real-time dosage adjustments during crew landing and recovery operations. The combination of non-pharmaceutical sensory augmentation approach with intranasal scopolamine has the benefit to not only mitigate motion sickness but enhance crew performance of landing and egress tasks.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2021.
Bibliography Type:	Description: (Last Updated: 02/03/2022)