Task Book Report Generated on: 04/25/2024

PI Name: Wood, Scort J. Ph.D. Project Title: Optimizing the Combination of Intrinasal Scopolimine and Sensory Augmentation to Mitigate G-Trunsition Induced Michael Sciences and Enhance Sensorimotor Performance Division Name: Human Research Program/Discipline: Pergram/Discipline: Pergram/Discipline: Pergram/Discipline: Identify Agency Name: TechPort: No Human Research Program History Identify Agency Name: TechPort: No Human Research Program History None Space Biology Flament: None None Space Biology Flament: None Space Biology Special Category: None PI Email: Sent Augmentify None PI Email: Sent Augmentify None PI Email: Sent Augmentify None PI Address 1: PI Organization Type: NASA CENTER NASA Enhance Space Center PI Address 2: Mail code SD2 PI Address 3: Augmentify None Project Type: Organization None NOTE: PI eturned to NASA ISC In January 2017, PI was at Augus Pacific University from August 2013 – January 2017, prior to August 2013, PI was at NASA JSC. Comments: O101/2021 End End CONNER Schwarze Health Counted Research No. of Post Dace: No. of Master's Candidates: No. of Master's C				
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Division Name: Human Research	PI Name:	Wood, Scott J. Ph.D.		
Program/Discipline: Program/Discipline- Element/Subdiscipline- Eleme	Project Title:			Augmentation to Mitigate G-Transition Induced
Program Discipline	Division Name:	Human Research		
Elements Suddiscipline: Joint Agency Name: (I) HC:Human Restarch Program Elements: (I) Sensorimotor/Risk of Altered Sensorimotor/Vestibular Function Impacting Critical Mission Tasks Space Biology Element: None Space Biology Cross-Element Space Biology Special Category: None Pl Email: Secti i swood@mass.eov Fax: Pl Organization Type: NASA CENTER NASA CENTER Phone: Q810 VASA-Parkway Pl Address 1: 2101 NASA Parkway Pl Address 2: Mail code SD2 Pl Web Page: City: Houston NOTE: Pl returned to NASA JSC in January 2017. Pl was at Azuss Pacific University from August 2013 - January 2017; prior to August 2013, pl was at NASA SC. Project Type: GROUND Salication F and Behavior. Square: No. of Past Decs: No. of Past Decs: No. of Past Decs: No. of Backelor's Candidates: No. of Bac	Program/Discipline:			
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Human Research Program Risks: (I) Sensorimotor-Risk of Altered Sensorimotor-Vestibular Function Impacting Critical Mission Tasks Space Biology Cross-Element None Space Biology Cross-Element Space Biology Special Category: None PI Email: scott.j.wood@nass.gov Fax: FY PI Organization Type: NASA CENTER Phone: (281) 483-6329 Organization Name: NASA Johnson Space Center PI Address 1: 2101 NASA Parkway PI Address 2: Mail code SD2 PI Web Page: City: Houston State: TX 77058 Comments: NOTE: PI returned to NASA JSC in January 2017; PI was at Azusa Pacific University from August 2013 - January 2017; PI was at Azusa Pacific University from August 2013 - January 2017; PI was at Azusa Pacific University from August 2013 - January 2017; PI was at NASA JSC. Project Type: GROUND Solicitation Funding ONNIBUS2: Human Health Countermeasures, Source: 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 Candidates: No. of Master' Semetical Space Radiation-Appendix C; Omnibus2-Appendix D Source: Radiation-Appendix C; Omnibus2-Appendix D Start Date: No. of Master' Semetical Space Radiation-Appendix C; Omnibus2-Appendix D Start Date: No. of Master' Semetical Space Radiation-Appendix C; Omnibus2-Appendix D Start Date: No. of Bachelor's Candidates: No. of Bachelor's Candidates: No. of Bachelor's Candidates: No. of Master' Semetical Space Radiation-Appendix C; Omnibus2-Appendix D Start Date: No. of Master's Candidates: No. of Master' Degrees: No. of Master' Pegrees: No. of Master' Pegrees: No. of Master' Pegrees: No. of Master's Candidates: No. of Master's Candidates: No. of Master' Pegrees: No. of Master's Candidates: No. of Master' Pegrees:	Joint Agency Name:		TechPort:	No
Space Biology Cross-Element Discipline: None Space Biology Cross-Element Discipline: None Pt Email: Scott iwood@mass_gov Fax: FY Pt Organization Type: NASA CENTER Phone: (281) 483-6329 Organization Name: NASA Johnson Space Center Pt Address 1: 2101 NASA Parkway Pt Address 2: Mail code SD2 Pt Web Page: City: Houston State: TX Zjo Code: 77058 Congressional District: 36 Comments: NOTE: Pt returned to NASA JSC in January 2017, Pt was at Azusa Pacific University from August 2013 – January 2017, prior to August 2013, Pt was at NASA JSC. Source: GROUND Solicitation Funding OMNBUS2: Human Health Countermeasures, Behavioral Performance, and Space Relation-Appendix C; Omnibus2-Appendix D Start Date: No. of Post Does: No. of PhD Degrees: No. of Master's Candidates: No. of Master's Candidates: No. of Master's Candidates: No. of Bachelor's Candidates: No. of Bachelor's Candidates: Mointed Stenger, Michael Contact Contact Michael Contact Change: Program: Flight Assignment: Key Personnel Changes/Previous Pt: COI Name (Institution): Resolve, Williard Ph.D. (NASA Johnson Space Center) Recontract Contract No.: Internal Project	Human Research Program Elements:	(1) HHC :Human Health Countermeasure	es	
Space Biology Cross-Element Discipline: Space Biology Special Category: None PI Email: scott j.wood/@nasa.gov Fax: FY Pl Organization Type: NASA CENTER Phone: (281) 483-6329 Organization Name: NASA Johnson Space Center PI Address 1: 2101 NASA Parkway PI Address 2: Mail code SD2 PI Web Page: City: Houston State: TX Zip Code: 77058 Congressional District: 36 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. 2019-2020 HERO 80JSC019N0001-HHCBPSR, OMNIBUS2-Human Health Countermeasures, Behaviori Permance, and Space Radiation-Appendix C; Omnibus2-Appendix D Start Date: 01/01/2021 Fad Date: 03-01/2024 No. of PhD Candidates: No. of Master' Degrees: No. of Master' Degrees: No. of Bachelor's Degrees: No. of Bachelor's Candidates: No. of Master' Degrees: No. of Master'	Human Research Program Risks:	(1) Sensorimotor:Risk of Altered Sensor	rimotor/Vestibular Function	Impacting Critical Mission Tasks
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Performance Goal No.:	COI Name (Institution):			
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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 Description:

Task Progress: New project for FY2021.

Bibliography Type: Description: (Last Updated: 03/08/2024)