

Fiscal Year:	FY 2022	Task Last Updated:	FY 03/07/2022
PI Name:	Macias, Brandon Ph.D.		
Project Title:	Mitigating Headward Fluid Shifts with Veno-Constrictive Thigh Cuffs During Spaceflight		
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) 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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PI Organization Type:	NASA CENTER	Phone:	281-483-2026
Organization Name:	NASA Johnson Space Center		
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City:	Houston	State:	TX
Zip Code:	77058	Congressional District:	36
Comments:	NOTE: Became civil servant fall 2020; previously KBR/NASA Johnson Space Center. Prior to that until 2016, was at the University of California, San Diego.		
Project Type:	FLIGHT,GROUND	Solicitation / Funding Source:	Directed Research
Start Date:	05/15/2021	End Date:	05/14/2026
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:	Stenger, Michael	Contact Phone:	281-483-1311
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Flight Program:	ISS		
Flight Assignment:			
Key Personnel Changes/Previous PI:	Jessica V. Jasien, Ph.D is no longer a member of the Cardiovascular Lab (CVL).		
COI Name (Institution):	Laurie, Steven Ph.D. (KBR/NASA Johnson Space Center) Marshall-Goebel, Karina Ph.D. (KBR/NASA Johnson Space Center) Lee, Stuart Ph.D. (KBR/NASA Johnson Space Center) Cole, Chris Ph.D. (Clemson University) Foulk, Jonn Ph.D. (Clemson University)		
Grant/Contract No.:	Directed Research		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	This study will determine the ability of venoconstrictive thigh cuff (VTC) application for varying durations to mitigate the weightlessness-induced headward fluid shift during spaceflight for the purpose of evaluating this device as a countermeasure for SANS. The effects of varying durations of continuous VTC usage (~30 minutes, ~3 hours, and ~6 hours) on ocular and cardiovascular variables will be investigated. This proposed study will help determine the potential efficacy of VTC to mitigate the cephalad fluid shift that is hypothesized to be the primary initiating factor to SANS. The VTC countermeasure technique is low-mass, portable, simple to use and may be used for extended durations while working in an operational spaceflight environment. Specific Aim: 1) Determine the efficacy of VTC application to mitigate a spaceflight-induced headward fluid shift. We hypothesize that a VTC countermeasure will temporarily reverse or attenuate spaceflight-induced ocular and cardiovascular changes.
Rationale for HRP Directed Research:	This research is directed because it contains highly constrained research. This study will determine the ability of veno-constrictive thigh cuffs (VTC) application for varying durations to mitigate the weightlessness-induced headward fluid shift during spaceflight for the purpose of evaluating this device as a countermeasure for Spaceflight Associated Neuro-ocular Syndrome (SANS). The effects of varying durations of continuous VTC usage (30 minutes, 3 hours, and 6 hours) on ocular and cardiovascular variables will be investigated. This proposed study will help determine the potential efficacy of VTC to mitigate the cephalad fluid shift that is hypothesized to be the primary initiating factor to SANS. The VTC countermeasure technique is low-mass, portable, simple to use and may be used for extended durations while working in an operational spaceflight environment. The investigator team has the required expertise to conduct this research and has experience from a ground study led by this team in 33 subjects who wore these VTC for up to ~2 hours while supine at rest. An updated VTC and microfiber sleeve have been developed and tested in these ground-based studies.
Research Impact/Earth Benefits:	The Flight Thigh Cuff research study will advance NASA's understanding of use of the VTC as a potential countermeasure for Spaceflight Associated Neuro-ocular Syndrome (SANS), an important human health and performance risk. This goal will be accomplished by quantifying vascular and ocular changes before and during spaceflight. Given the unique environment of the International Space Station, commonly used ophthalmic instruments are being implemented in novel operational environments (e.g., optical coherence tomography (OCT) and pneumotonometry). This work will help NASA to evaluate this spaceflight-associated risk more accurately and to refine its data-driven approach to SANS countermeasure development.
Task Progress:	<ul style="list-style-type: none"> • The Flight Thigh Cuff Principal Investigator (PI) team has worked with the NASA Research Operations and Integration (ROI) Element to provide inputs to the Feasibility Assessment. • The Institutional Review Board (IRB) package was approved by the NASA Johnson Space Center (JSC) IRB on February 17, 2022. • A study overview was presented at the 2022 Human Research Program Investigators' Workshop (virtual).
Bibliography Type:	Description: (Last Updated: 04/04/2024)
Abstracts for Journals and Proceedings	<p>Jasien JV, Laurie SS, Marshall-Goebel K, Lee SMC, Greenwald SH, Pardon LP, Lytle J, Stephenson JL, Cole C, Foulk J, Macias BR. "Mitigating headward fluid shifts with venoconstrictive thigh cuffs during spaceflight." 2022 NASA Human Research Program Investigators' Workshop, Virtual, February 7-10, 2022.</p> <p>Abstracts. 2022 NASA Human Research Program Investigators' Workshop, Virtual, February 7-10, 2022. , Feb-2022</p>