

Fiscal Year:	FY 2015	Task Last Updated:	FY 10/29/2014
PI Name:	Holden, Kritina Ph.D.		
Project Title:	Effects of Long-duration Microgravity on Fine Motor Control Skills		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline-- Element/Subdiscipline:			
Joint Agency Name:	TechPort:	No	
Human Research Program Elements:	(1) HFBP :Human Factors & Behavioral Performance (IRP Rev H)		
Human Research Program Risks:	(1) BMed :Risk of Adverse Cognitive or Behavioral Conditions and Psychiatric Disorders (2) HSIA :Risk of Adverse Outcomes Due to Inadequate Human Systems Integration Architecture (3) Sensorimotor :Risk of Altered Sensorimotor/Vestibular Function Impacting Critical Mission Tasks		
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:	281-483-8829
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City:	Houston	State:	TX
Zip Code:	77058-3607	Congressional District:	22
Comments:			
Project Type:	FLIGHT	Solicitation / Funding Source:	Directed Research
Start Date:	10/01/2013	End Date:	12/30/2016
No. of Post Docs:	0	No. of PhD Degrees:	0
No. of PhD Candidates:	0	No. of Master' Degrees:	0
No. of Master's Candidates:	0	No. of Bachelor's Degrees:	0
No. of Bachelor's Candidates:	0	Monitoring Center:	NASA JSC
Contact Monitor:	Whitmore, Mihriban	Contact Phone:	281-244-1004
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Flight Program:	ISS		
Flight Assignment:	ISS NOTE: Change in title to "Effects of Long-duration Microgravity on Fine Motor Control Skills" from "Effects of Long-duration Microgravity on Fine Motor Skills: 1-year ISS Investigation" per E. Connell/SHFH HRP (Ed., 8/19/15) NOTE: Risk/Gaps per E. Connell/HRP (Ed., 3/20/14) NOTE: Start date changed to 10/1/13 (from 6/25/13) per M. Whitmore/JSC (Ed., 2/24/14)		
Key Personnel Changes/Previous PI:	None		
COI Name (Institution):	Thompson, Shelby (NASA JSC/Lockheed Martin) Sandor, Aniko (NASA JSC/Lockheed Martin)		
Grant/Contract No.:	Directed Research		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	<p>Fine motor skills will be critical during long-duration space missions, particularly those skills needed to interact with new technologies required for autonomous operations in next-generation space vehicles, spacesuits, and habitats. Few, arguably no, studies have been completed to investigate this type of functional fine motor performance in microgravity. There has also not been a complete, systematic study of fine motor performance to include different phases of microgravity adaptation, long-term microgravity, and the sensorimotor recovery period after transition to Earth gravity (post landing). In addition, the studies conducted to date have not been conclusive regarding the effects of microgravity on fine motor control.</p> <p>The opportunity to systematically collect fine motor performance data throughout a long-duration mission is of great value. It will add to our knowledgebase and provide a vastly improved capability to judge the risk of performance decrements due to long-duration microgravity. The proposed investigation will also supplement two other sensorimotor 1-yr investigations by providing an additional measure of functional performance post-flight, and a new sensorimotor functional test in-flight. These data will contribute to closure of several research gaps and may drive in-flight mitigations and/or design decisions for future vehicles/habitats.</p> <p>Specific Aims:</p> <p>Aim 1: Determine the effects of long-duration microgravity on fine motor performance.</p> <ul style="list-style-type: none"> • How does fine motor performance in microgravity trend/vary over the duration of a six-month, and year-long space mission? • How does fine motor performance on orbit compare with that of a closely matched subject on Earth? <p>Aim 2: Determine the effects of different gravitational transitions on fine motor performance.</p> <ul style="list-style-type: none"> • How does performance trend/vary before and after gravitational transitions, including the periods of early flight adaptation, and very early/near immediate post-flight periods?
Rationale for HRP Directed Research:	<p>This research is directed due to a time constraint. This proposal focuses on the research opportunity afforded by the 2015 year-long mission of two crewmembers aboard the International Space Station (ISS).</p>
Research Impact/Earth Benefits:	<p>The Fine Motor Skills computer-based tasks could be used to measure fine motor decrements in elderly or diseased populations. The tasks may also prove beneficial in rehabilitation of fine motor skills in elderly patients, people with motor disorders, and patients with brain injuries.</p> <p>The handheld developed to keep the iPad stable during task performance could be commercialized for general use with iPads.</p>
Task Progress:	<p>The Fine Motor Skills study is planned to launch in March, 2015 as part of the first ISS one-year mission. Standard duration subjects on subsequent missions will participate as well, for a total of 6 standard duration and 2 one-year mission subjects. The study will be conducted on an iPad, using the finger and a stylus to complete 4 types of fine motor tasks. The past year (FY14) has been spent preparing the hardware, software, and documentation required for the study to fly on ISS.</p> <p>A custom handheld for the iPad was designed, prototyped, tested, and manufactured for use with the study. A commercial stylus was selected and purchased.</p> <p>The custom task software was completed, and it includes four fine motor tasks: pointing, dragging, tracing, and pinch-rotate. The software quality certification paperwork was developed and approved, usability and functionality tests were completed successfully, and the final software was delivered for installation on the ISS iPads.</p> <p>Experiment documentation was developed, and Informed Consent Briefings (ICBs) were completed for the 2 one-year crewmembers, and 4 standard-duration crew. ICBs will continue until the full set of subjects has been run. Familiarization and baseline data collection sessions will be held in the coming months for the one-year and standard duration crew who have agreed to participate in the study.</p>
Bibliography Type:	<p>Description: (Last Updated: 10/29/2023)</p>
Abstracts for Journals and Proceedings	<p>Thaxton, S, Holden K, Barshi I. "Space Human Factors Engineering (SHFE) ISS One-Year Mission Investigations." Presented at the 2014 NASA Human Research Program Investigators' Workshop, Galveston, TX, February 12-13, 2014.</p> <p>2014 NASA Human Research Program Investigators' Workshop, Galveston, TX, February 12-13, 2014.</p> <p>http://www.hou.usra.edu/meetings/hrp2014/pdf/3292.pdf, Feb-2014</p>