Fiscal Year:	FY 2016	**Task Last Updated:**	FY 12/16/2015
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 Address 2:	Mail Code: C46		
PI Web Page:			
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:**	06/29/2018
No. of Post Docs:	0	**No. of PhD Degrees:**	1
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: End date changed to 6/29/2018 per E. Connell/M. Whitmore (JSC HRP)--Ed., 1/21/16 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:	December 2015: Shelby Thompson, Ph.D. removed from the project. Ernest Vince Cross, Ph.D. and Maya Greene, Ph.D. added to the project.		
COI Name (Institution):	Sandor, Aniko (Lockheed Martin/NASA Johnson Space Center) Cross, Ernest Vince Ph.D. (Lockheed Martin/NASA Johnson Space Center) Greene, Maya R Ph.D. (Wyle Laboratories/NASA Johnson Space Center)		
Grant/Contract No.:	Directed Research		

Performance Goal No.:	
Performance Goal Text:	
Task Description:	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. The opportunity to systematically collect fine motor performance data throughout a long-duration mission is of great value. It will add to our knowledge base 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. Specific Aims: Aim 1: Determine the effects of long-duration microgravity on fine motor performance. • 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? Aim 2: Determine the effects of different gravitational transitions on fine motor performance. • 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:	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).
Research Impact/Earth Benefits:	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. The handhold developed to keep the iPad stable during task performance could be commercialized for general use with iPads.
Task Progress:	In the Effects of Long-duration Microgravity on Fine Motor Control Skills study, subjects complete a 15 minute set of fine motor tasks on an iPad computer with a stylus and finger. The tasks include: Pointing, Dragging, Shape Tracing, and Pinch-Rotate. Response times and errors for each task are captured and sent to the ISS server for downlink once a week. Subjects perform the task once a week for the first 3 months of the flight, and every two weeks for the remainder of the flight. The study includes two 1-year subjects (U.S. astronaut and Russian cosmonaut), and six standard duration (6-month) astronauts. A ground subject matched to the 1-year U.S. astronaut is also completing the study with the same schedule, lagged by a few weeks. Six ground subjects matched to the standard-duration subjects will be entering the study soon (on schedule with their flight counterparts). The study is progressing very well. We have completed 31 flight sessions to date for the 1-year subjects, and all data have been successfully downlinked for analysis. The first two standard duration (6-month) crew subjects have just joined the crew on ISS and are beginning their early flight sessions. The team is plotting the data as they come in to begin looking at possible trends in performance for response time and errors for each of the four fine motor tasks. A shorter post-flight Fine Motor Skills test battery has been developed, and is currently being tested in preparation for the ISS 1-year mission landing. It was made shorter to address post-flight crew time constraints, and contains a sampling of Fine Motor Skills task variations. The post-flight software will be used on R+0, R+1, and R+3.
Bibliography Type:	Description: (Last Updated: 10/29/2023)