Fiscal Year:	FY 2011	**Task Last Updated:**	FY 09/20/2010
PI Name:	Shea, Steven Ph.D.		
Project Title:	Identification of cardiometabolic vulnerabilities caused by effects of synergistic stressors that are commonly encountered during space missions		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Biomedical countermeasures		
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **HHC**:Human Health Countermeasures		
Human Research Program Risks:	(1) **Cardiovascular**:Risk of Cardiovascular Adaptations Contributing to Adverse Mission Performance and Health Outcomes		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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PI Web Page:			
City:	Boston	**State:**	MA
Zip Code:	02115-5804	**Congressional District:**	8
Comments:	NOTE: PI currently at Oregon Health & Science University as of June 2016.		
Project Type:	GROUND	**Solicitation / Funding Source:**	2009 Crew Health NNJ09ZSA002N
Start Date:	10/01/2010	**End Date:**	09/30/2014
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:	Meck, J@n	**Contact Phone:**	281-244-5405
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Barger, Laura (Brigham And Women's Hospital, Inc.) Lockley, Steven (Brigham And Women's Hospital, Inc.) Scheer, Frank (Brigham And Women's Hospital, Inc.) Wang, Wei (Brigham And Women's Hospital, Inc.)		
Grant/Contract No.:	NNX10AR10G		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	The risk of adverse cardiac events has been listed as Priority 1 in the NASA Bioastronautics Roadmap (Risk Areas 5 and 6; 2005; http://bioastroroadmap.nasa.gov). Under extremely physiological challenging circumstances, i.e. microgravity, astronauts are expected to perform tasks that add additional physical and mental stress to their cardiovascular system such as space walks or robotic operations during EVAs. To date we know little to nothing about the synergetic effects of chronic sleep restriction, circadian misalignment, and physical and mental stressors on cardiovascular functioning. The main goals of this four year NASA project are (1) to characterize the alterations (and potential maladaptations) of cardiovascular and cardiometabolic function (i.e. hemodynamic, haemostatic, autonomous nervous functioning, cardiac vulnerability, energy metabolism) associated with chronic sleep restriction and circadian misalignment occurring during short and long term duration space missions (e.g. Lunar sorti, Lunar outpost, and mission to Mars); (2) to characterize the effects of different types of stressors (postural, exercise, and mental stressors; except microgravity) on cardiovascular and cardiometabolic functioning during short and long term duration space missions; and (3) to identify the synergetic effects of chronic sleep restriction, circadian misalignment, and different stressors, potentially identifying in vulnerable periods with an increased likelihood of adverse cardiac events during short and long term duration space missions. During space missions astronauts are exposed to unusual light-dark cycles (e.g. Martian day length: 24.65 hrs) that leads to circadian misalignment resulting in sleep disturbances, sleep loss, and poor quality sleep. In addition, almost all astronauts report chronic sleep curtailment due to mission requirements such as working ¿slam shifts¿ before EVAs and extended shifts during EVAs. The sleeping conditions on the shuttle or the ISS, e.g. cramped crew quarters, noise, and heat, also add to the reported sleep curtailment. Data from laboratory and epidemiological studies have shown that chronic sleep curtailment and circadian misalignment changes endocrine, inflammatory, and cardiovascular function; changes that potentially result in adverse health events, including cardiac arrhythmias, myocardial and peripheral vascular dysfunction, risk of syncope, hypertension, diabetes, and metabolic syndrome. Moreover, adverse cardiac events show a clear day-night pattern, with a peak in the morning. In addition, it is well know than microgravity itself impacts cardiovascular functioning resulting in decreased circulating blood volume, decreased central venous blood pressure, increased stroke volume and increased cardiac output, potentially leading to cardiac rhythm disturbances that have been documented during spaceflight previously. With the anticipated return of humans to the moon in 2020 and the preparation for human explorations of Mars and other destinations in the solar system it becomes imperative to determine the cardiovascular risks for crew members on these missions, and develop countermeasures to limit or alleviate those risks.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2011.
Bibliography Type:	Description: (Last Updated: 08/14/2018)