Fiscal Year:	FY 2008	**Task Last Updated:**	FY 06/02/2008
PI Name:	Klerman, Elizabeth B. M.D., Ph.D.		
Project Title:	Designing Individual Countermeasures to Reduce Sleep Disruption and Improve Performance and Alertness in Space		
Division Name:	Human Research		
Program/Discipline:	NSBRI		
Program/Discipline--Element/Subdiscipline:	NSBRI--Human Factors and Performance Team		
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **BHP**:Behavioral Health & Performance (archival in 2017)		
Human Research Program Risks:	(1) **Sleep**:Risk of Performance Decrements and Adverse Health Outcomes Resulting from Sleep Loss, Circadian Desynchronization, and Work Overload (IRP Rev F)		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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PI Organization Type:	UNIVERSITY	**Phone:**	617-732-8145
Organization Name:	Brigham and Women's Hospital/Harvard Medical Center		
PI Address 1:	Department of Medicine		
PI Address 2:	Division of Sleep Medicine		
PI Web Page:			
City:	Boston	**State:**	MA
Zip Code:	02115-5804	**Congressional District:**	8
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2007 Crew Health NNJ07ZSA002N
Start Date:	06/01/2008	**End Date:**	05/31/2012
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:**	NSBRI
Contact Monitor:		**Contact Phone:**	
Contact Email:			
Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):			
Grant/Contract No.:	NCC 9-58-HFP01603		
Performance Goal No.:			
Performance Goal Text:			
	Objective neurobehavioral performance, subjective alertness and sleep are critically important to astronaut and ground-based crew health and to ensure the success of space missions. Neurobehavioral performance and alertness are affected by changes in circadian rhythms, homeostatic sleep/wake regulation and sleep inertia, and the interactions of these processes. During space missions, circadian rhythms and sleep are disrupted, both for those working in space and for those on Earth. Astronaut problems with sleep, circadian rhythms and performance have been reported, and NASA data indicate that sleeping pills are among the most commonly used drugs in space. Therefore, it is imperative that schedules and countermeasures are designed to optimize individual performance, alertness and quality sleep relative to operational requirements.		

Task Description:	We have developed and validated a mathematical model of the human circadian pacemaker, performance and alertness that includes the key processes of circadian rhythms, sleep/wake homeostasis and sleep inertia. The software implementing this model has been used by NASA to design light countermeasures for astronaut pre-launch schedules. In our previous NSBRI project, we developed a mathematical method for optimal design of countermeasures and schedules after a change in timing of sleep, light or critical tasks. Specific Aims 1. Replace the current assumption that an individual sleeps when scheduled to sleep, with probabilities of sleep and wake during those times; 2. Improve daily assessment of sleep and sleep disruption using actigraphy data; 3. Add statistical features including confidence limits to the predictions; and 4. Update the software per astronaut and ground crew requests for specific features and reports. The basic mathematical work will focus on individual, rather than group, predictions and will use novel, non-linear mathematical and statistical measures. This project addresses NASA's objectives to improve the design of individual countermeasures to reduce sleep disruption and improve performance and alertness in space and on Earth.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	0
Task Progress:	New project for FY2008.
Bibliography Type:	Description: (Last Updated: 02/16/2021)