

Fiscal Year:	FY 2011	Task Last Updated:	FY 05/27/2011
PI Name:	Dinges, David F. Ph.D.		
Project Title:	Psychomotor Vigilance Test (PVT) on ISS		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Behavior and performance		
Joint Agency Name:		TechPort:	Yes
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) Sleep :Risk of Performance Decrements and Adverse Health Outcomes Resulting from Sleep Loss, Circadian Desynchronization, and Work Overload		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	19104-4209	Congressional District:	2
Comments:			
Project Type:	FLIGHT	Solicitation / Funding Source:	Directed Research
Start Date:	08/01/2008	End Date:	07/31/2013
No. of Post Docs:		No. of PhD Degrees:	1
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:	Leveton, Lauren	Contact Phone:	
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Flight Program:	ISS		
Flight Assignment:	ISS NOTE: start/end dates changed per J. Dardano/JSC --previously 4/30/2008-8/31/2013 (4/16/2009)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Basner, Mathias (University of Pennsylvania School of Medicine)		
Grant/Contract No.:	NNX08AY09G		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	<p>The Psychomotor Vigilance (PVT) Self Test (operational name on ISS is Reaction Self Test) is intended to provide astronauts with objective feedback on neurobehavioral changes in vigilant attention, psychomotor speed, state stability, and impulsivity while on ISS missions. The PVT Self Test is ideal for repeated use in spaceflight because unlike other cognitive tests, it is very brief (3-minute) while being free of learning effects and aptitude differences that make interpretation of other cognitive measures difficult. The ultimate goal of the Reaction Self Test project is to validate the sensitivity of the PVT Self Test on astronauts on ISS so they can use it to objectively identify when their performance capability is degraded by various fatigue-related conditions that can occur as a result of ISS operations and time in space. The following are the objectives (specific aims) of the project: 1) To evaluate the extent to which PVT Self Test performance of astronauts is sensitive to fatigue from sleep loss and circadian disruption during ISS missions. This will include the following conditions evaluated individually and in aggregate: i) extended wake duration above 16 hours; ii) sleep restriction defined as total sleep time >0 and <6 hours per 24-hour period; and iii) circadian perturbation associated with night work and slam shifting. 2) To evaluate the extent to which PVT Self Test performance of astronauts is sensitive to fatigue from work intensity during ISS missions. This will include the following conditions evaluated individually and in aggregate: i) extend work durations up to 16 hours per day; ii) more than 6 consecutive work days without a day off for rest; and iii) work requiring extravehicular activity (EVA). 3) To evaluate the extent to which PVT Self Test performance of astronauts declines with time in mission. 4) To explore the extent to which PVT Self Test performance of astronauts will be sensitive to the carry-over effects of medications for sleep on ISS. 5) To evaluate the extent to which PVT Self Test performance feedback (via a graphical interface) is perceived by ISS astronauts as a useful tool for assessing performance capability.</p>
Rationale for HRP Directed Research:	<p>The PI developed the original 10-minute Psychomotor Vigilance Test (PVT), which the Reaction Self Test was derived from, to measure changes in psychomotor speed, lapses of attention, wake state instability, and impulsivity induced by fatigue and other performance-degrading factors commonly found in operational environments. Based on research supported by federal and non-US federal agencies, as well as the pharmaceutical industry, the 10-minute PVT has been extensively validated in laboratory studies, simulators and operational environments to be sensitive to a variety of performance-degrading fatigue-related factors. There are currently 180 published peer-review papers on the sensitivity of the 10-min. PVT to fatigue-related factors. The Reaction Self Test is a 3-minute PVT Self Test that contains special timing and algorithm characteristics and that has been validated against the 10-minute PVT. The 3-minute Reaction Self Test will have utility in a wide array of safety-sensitive environments on Earth. Potentially any occupation in which alertness and fatigue management are essential to prevent errors on critical tasks will benefit from adaptations of the PVT SelfTest technology (e.g., certain military personnel, airport security screeners, physicians on night shifts and prolonged call, etc.).</p>
Task Progress:	<p>Data acquisition began in September 2009 with Expedition 21-22. As of July 31, 2011, N=21 astronauts have given informed consent for the project (10 during the past year). Baseline data collection has been completed in N=10 astronauts and is underway on N=3 astronauts. N=9 astronauts have completed (5 during the past year) and N=2 astronauts have started in-flight data acquisition. N=6 astronauts have completed and N=2 astronauts have started post-flight data acquisition. On the date of the last data download from ISS (April 25, 2011), 142 Reaction Self Tests were performed pre-flight, 715 Reaction Self Tests were performed in-flight, and 101 Reaction Self Tests were performed post-flight. Adherence rates (i.e., percentage of scheduled Reaction Self Tests completed) averaged 38%-54% pre-flight, 85%-91% in-flight, and 52%-68% post-flight, respectively (adherence rate estimates vary as the data of some scheduled tests have not been collected yet). We have de-briefed 7 astronauts post-flight and gained important insights on astronauts' perception of the Reaction Self Test.</p>
Bibliography Type:	Description: (Last Updated: 03/24/2024)
Abstracts for Journals and Proceedings	<p>Basner M, Mollicone DJ, Mott CG, Dinges DF. "Objective measurement of fatigue-related decrements in vigilant attention and psychomotor speed in space flight: PVT Self Test on ISS." Poster at the 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. 18th IAA Humans in Space Symposium, Houston, TX, April 11-15, 2011. , Apr-2011</p>
Abstracts for Journals and Proceedings	<p>Basner M, Mollicone DJ, Dinges DF. "Validation of a modified brief version of the psychomotor vigilance test (PVT)." Talk at the 25th Annual Meeting of the Associated Professional Sleep Societies, LLC 2011, Minneapolis, MN, June 11-15, 2011. Sleep 2011;34 Suppl:A110. , May-2011</p>
Articles in Peer-reviewed Journals	<p>Basner M, Mollicone DJ, Dinges DF. "Validity and Sensitivity of a Brief Psychomotor Vigilance Test (PVT-B) to Total and Partial Sleep Deprivation." Acta Astronaut, in revision, May 2011. , May-2011</p>
Articles in Peer-reviewed Journals	<p>Basner M, Rubinstein J. "Fitness for duty: A 3 minute version of the Psychomotor Vigilance Test predicts fatigue related declines in luggage screening performance." Journal of Occupational & Environmental Medicine, in press, May 2011. , May-2011</p>
Articles in Peer-reviewed Journals	<p>Basner M, Dinges DF. "Maximizing sensitivity of the psychomotor vigilance test (PVT) to sleep loss." Sleep. 2011 May 1;34(5):581-91. PMID: 21532951 , May-2011</p>