

<b>Fiscal Year:</b>	FY 2016	<b>Task Last Updated:</b>	FY 05/17/2016
<b>PI Name:</b>	Basner, Mathias M.D., Ph.D.		
<b>Project Title:</b>	Hybrid Training - A Sensory Stimulation Countermeasure for Long Duration Space Exploration Missions		
<b>Division Name:</b>	Human Research		
<b>Program/Discipline:</b>			
<b>Program/Discipline--Element/Subdiscipline:</b>	HUMAN RESEARCH--Behavior and performance		
<b>Joint Agency Name:</b>		<b>TechPort:</b>	No
<b>Human Research Program Elements:</b>	(1) <b>HFBP</b> :Human Factors & Behavioral Performance (IRP Rev H)		
<b>Human Research Program Risks:</b>	(1) <b>Bmed</b> :Risk of Adverse Behavioral Conditions and Psychiatric Disorders		
<b>Space Biology Element:</b>	None		
<b>Space Biology Cross-Element Discipline:</b>	None		
<b>Space Biology Special Category:</b>	None		
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<b>Zip Code:</b>	19104-4209	<b>Congressional District:</b>	2
<b>Comments:</b>			
<b>Project Type:</b>	GROUND	<b>Solicitation / Funding Source:</b>	2014-15 HERO NNJ14ZSA001N-MIXEDTOPICS. Appendix E: Behavioral Health & Human Health Countermeasures Topics
<b>Start Date:</b>	04/19/2016	<b>End Date:</b>	04/18/2019
<b>No. of Post Docs:</b>		<b>No. of PhD Degrees:</b>	
<b>No. of PhD Candidates:</b>		<b>No. of Master' Degrees:</b>	
<b>No. of Master's Candidates:</b>		<b>No. of Bachelor's Degrees:</b>	
<b>No. of Bachelor's Candidates:</b>		<b>Monitoring Center:</b>	NASA JSC
<b>Contact Monitor:</b>		<b>Contact Phone:</b>	
<b>Contact Email:</b>			
<b>Flight Program:</b>			
<b>Flight Assignment:</b>	NOTE: Element change to Human Factors & Behavioral Performance; previously Behavioral Health & Performance (Ed., 1/17/17)		
<b>Key Personnel Changes/Previous PI:</b>			
<b>COI Name (Institution):</b>	Dinges, David Ph.D. ( University of Pennsylvania ) Gur, Ruben Ph.D. ( University of Pennsylvania ) MGuire, Sarah Ph.D. ( University of Pennsylvania ) Stahn, Alexander Ph.D. ( University of Pennsylvania )		
<b>Grant/Contract No.:</b>	NNX16AI53G		
<b>Performance Goal No.:</b>			

<b>Performance Goal Text:</b>	
<b>Task Description:</b>	<p>This proposal addresses the risk of Adverse Behavioral Conditions and Psychiatric Disorders, and the need to identify and validate countermeasures and effective methods for modifying the habitat/vehicle environment that promote individual behavioral health and performance during exploration class missions (BMed1, BMed7). We propose to investigate the efficacy of physical exercise (using a cycle ergometer) combined with an interactive virtual environment, i.e., Hybrid Training, as a countermeasure for augmenting sensory stimulation during long-duration space missions. This countermeasure will combine validated tools and VR (virtual reality) technologies in a new way to reveal the full potential of Hybrid Training, and take into account (a) key needs that fulfill sensory stimulation, (b) “hedonic adaptation”, i.e., a reduced affective response to stimuli with continued or repeated exposure, (c) delivery schedule, and (d) size, mass, and volume requirements. We plan to investigate a crew of N=9 during two 12-14 month Antarctic winter-over missions in Neumayer station (total N=18). We will investigate both immediate and long-term benefits of Hybrid Training. Our primary outcomes are neurostructural and neurofunctional changes assessed with fMRI, and cognitive performance assessed with the Cognition test battery and a virtual maze. We will also assess biochemical markers of stress and neuroplasticity, objective measures of sleep-wake rhythmicity and sleep structure, subjective symptom reports, and group cohesion with unobtrusive proximity measurements as additional outcomes that will provide insights into mechanisms and consequences of the observed structural and functional brain changes, and their reversibility by Hybrid Training. These data will be compared to historic controls from Neumayer station and other Antarctic stations (Concordia, Halley), space analog environments (e.g., Mars500) and the International Space Station (ISS). At the end of the project, we will have a much clearer understanding whether and to what extent the detrimental effects of ICE environments on neuroplasticity and behavioral health can be mitigated by Hybrid Training.</p>
<b>Rationale for HRP Directed Research:</b>	
<b>Research Impact/Earth Benefits:</b>	
<b>Task Progress:</b>	New project for FY2016.
<b>Bibliography Type:</b>	Description: (Last Updated: 12/22/2021)