Task Book Report Generated on: 04/17/2024

Plane Revery Makins MD, Ph.D. Project Title; Advanced Algorithms for the Prediction of Adverse Cognitive and Hebavioral Conditions in Space	Fiscal Year:	FY 2019	Task Last Updated:	FY 02/04/2019
Project Title: Advanced Algorithms for the Prediction of Adverse Cognitive and Behavioral Conditions in Space Program/Discipline: Runan Research Program Elasis: None Space Biology Special Category: None Space Biology Element: None Space Biology Element: None Space Biology Special Category: None Space Biology Special Category: None Ple Email: None Space Biology Special Category: None Ple Email: Programization Type: University of Pennsylvania Ple Address 1: Ple Address 2: Programization Name: University of Pennsylvania Ple Address 3: Programization Name: Cris: Cris			rask East Opuateu.	11 02/04/2017
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Space Biology Cross-Element Discipline: None PI Email: basner@pennmedicine.upenn.edu Fax: FY PI Organization Type: UNIVERSITY Phone: 215-573-5866 Organization Type: University of Pennsylvania PI Address 1: Department of Psychiatry, Division of Sleep and Chronobiology PI Address 2: 423 Service Dr, 1013 Blockley IIall PI Web Page: City: Philadelphia State: PA Zip Code: 1910-4-209 Congressional District: 2 Comments: Branch Branch Branch Fanding Research Advances for Space Health (RISII) Biomedical Research Advances for S	Human Research Program Risks:	None		
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Task Description:

This proposal addresses the Human Research Program (HRP) Risk of Adverse Cognitive or Behavioral Conditions and Psychiatric Disorders and several other critical HRP risks and gaps. This study utilizes Reaction Self-Test (RST) data collected by the Principal Investigator (PI) and his team in n=24 astronauts on 6-month International Space Station missions, arguably the largest cognitive dataset ever collected in spaceflight. RST consists of a survey module and a 3-minute version of the Psychomotor Vigilance Test (PVT). Our main objective is to additionally obtain data on key environmental stressors (i.e., carbon dioxide levels, temperature, noise, and radiation) and combine them with RST data and other operational data collected by the PI and his team (Specific Aim 1). All data will be integrated in one carefully annotated database, which will be delivered to NASA at the end of the project and could be later amended and mined by other researchers (Deliverable 1). We will then develop an individualized dynamic prediction model that informs future PVT performance based on environmental data, survey data, prior PVT administrations, and person-specific characteristics using state-of-the-art machine learning techniques such as functional concurrent regressions and neural networks for time series forecasting (Specific Aim 2). We will perform model selection and identify those variables that have the highest predictive value for PVT performance (Deliverable 2) and could preferentially be collected on future spaceflight missions to inform relevant changes in cognition and behavioral health. At the end of the study, we will deliver an algorithm to NASA that, for the first time, can predict adverse cognitive conditions in astronauts early and with an unprecedented precision (Deliverable 3). The predictive algorithms can be translated to several settings on Earth where high performing individuals have to sustain high levels of cognitive performance while facing several environmental or other challenges (e.g., US Navy personnel on submarines).

Rationale for HRP Directed Research:

Research Impact/Earth Benefits:

Task Progress:

New project for FY2019.

Bibliography Type:

Description: (Last Updated: 04/05/2024)