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PI Name:	Perlman, Greg		
Project Title:	Personality and Biological Predictors of Resiliency to Chronic Stress Among High-Achieving Adults		
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Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Behavior and performance		
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Human Research Program Risks:	(1) BMed :Risk of Adverse Cognitive or Behavioral Conditions and Psychiatric Disorders		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	11794-3365	Congressional District:	1
Comments:			
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No. of Bachelor's Candidates:	0	Monitoring Center:	NASA JSC
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Flight Program:			
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Key Personnel Changes/Previous PI:			
COI Name (Institution):	Kotov, Roman Ph.D. (State University of New York, Stony Brook) Hajcak, Greg (State University of New York, Stony Brook)		
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Task Description:

The objective of this research proposal is to identify the key personality, behavioral, and neurophysiological predictors of resiliency among a population of high-achieving young adults in a high-stress environment. To accomplish this objective, we will recruit 200 adult male and female trainees from nearby highly demanding medical training programs and research labs, a population analogous to astronauts. During the first visit to our laboratory (Wave 1), we will assess trainees with a comprehensive battery of characteristics relevant to resiliency. Self-report predictors include "Big 5" personality, recently-developed subfacets of the Big 5 (i.e., social closeness, melancholia, self-discipline, etc.), IQ, and behavioral-health scales (i.e., mood, anxiety, support, etc.). Neurophysiological predictors will be assessed using a comprehensive battery designed to measure neural reactivity (i.e., electroencephalogram) during experimental tasks relevant to space mission success (i.e., performance monitoring, vigilance). Resiliency will be measured by self-report behavioral health symptoms (i.e., depression, anxiety, sleep, stress) and behavioral performance on tasks (e.g., accuracy, post-error adjustments, reaction time) at Wave 1 (to establish a baseline) and then monthly for 5 months. This prospective, repeated measures design will allow us to track fluctuations in resiliency during the course of their highly demanding medical training program. After completing data collection, we will identify the Wave 1 personality, behavioral, and neurophysiological profile that best predicted successful adaption during intensive training (i.e., better mental health and better performance). We will also use innovative statistical methods to develop validity scales to identify "fake good" personality responses.

This research proposal aims to elucidate the personality, behavioral, and neurophysiological factors that predict successful adaptation to chronic stress among high-achieving young adults in highly demanding contexts. The knowledge gained from this research will aid in the design of a new standardized selection protocol, which could then be streamlined and validated in an astronaut sample in close analogues to space travel.

Rationale for HRP Directed Research:**Research Impact/Earth Benefits:**

This is a first study of stress resilience in high-achieving adults to (1) break down broad personality traits into facets tapping specific contributors to resilience and enhance predictive power of traits, (2) create validity scales specifically for the study questionnaire using a novel and powerful psychometric strategy, and (3) evaluate neural processes underpinning resilience. These methodological advances and substantial sample size will allow us to gain new insight into the nature of stress resilience, understanding specific dispositions to resilience and the neural processes involved. The proposed study also will produce a short, powerful tool to select resilient individuals. It can be useful in selecting personnel for other high stress occupations, such as the military and law enforcement. The resulting validity scale can be applied even beyond personnel selection to where untruthful responding is a risk (e.g., in academic testing, forensic evaluations).

Based on study results, a brief, powerful resilience assessment will be developed. NASA can use this tool to more accurately select for resilience among astronaut candidates, reducing the risk of behavioral health and performance threats during space missions. This tool also can aid personnel selection in occupations associated with high stress, workload, and danger, such as the military and law enforcement. Also, the proposed research will advance behavioral science in understanding stress resilience better and clarifying its component processes.

Task Progress:

We proposed to recruit 200 26-46 year-old participants who are medical residents or postgraduate trainees in Science, Technology, Engineering and Mathematics (STEM) fields for a baseline assessment and 5 1-month follow-up assessments. The proposed timeline for this study was 1-year. These populations are analogous to astronauts—high achieving, comparable on demographics, and exposed to chronic stress and high demands. For each participant, we conduct a thorough baseline assessment of risk factors for poor behavioral health and performance, and then conduct 5 monthly follow-ups to assess outcomes of behavioral health and performance.

An overview of this study was presented as a poster at the 2016 Human Research Program Investigators' Workshop, February 8th-11th 2016, at the Galveston Island Convention Center. Our in person baseline assessment includes a self-report screen for lifetime depression and anxiety disorders; Big 5 traits and facets; cognitive ability, neural activity related to behavioral health and performance (Event-Related Potential), behavioral performance on speeded response tasks, and measures of last month behavioral health functioning (mood symptoms, anxiety symptoms, social functioning, sleep functioning, cognitive function, perceived stress, and objective chronic stress: workload, work-related disruption to relationships, reduction in self-care, strain of caring for dependents, and social isolation). A subtle over-claiming questionnaire is used to obtain information about validity. Online follow-up assessments to track behavioral health and performance are completed once a month for 5 months. This includes reassessment of baseline measures of mood symptoms, anxiety symptoms, social functioning, sleep functioning, cognitive function, perceived stress, and objective chronic stress, as well as behavioral performance on speeded response tasks.

Over the first 10 months, we screened 243 interested candidates for enrollment in our study. This yielded 126 high-achieving adult participants out of the target 200. The most common reason for exclusion after screening is young age (24-25 year-olds) as Ph.D. students in STEM fields seem to be more responsive to recruitment than Postdoc and Medical Residents. At this time, 90% of enrolled participants have completed the 1-month follow-up on time and 94.9% of enrolled participants have completed the final 5 month follow-up on time, slightly higher than our anticipated retention rate. We have applied for and received a no-cost extension to continue enrollment past the proposed time line.

All data collection occurs at Stony Brook University. Dr. Perlman serves as principal investigator and supervises all aspects of the study and staff, including data collection, activities of the study coordinator, and organizes weekly team meeting to ensure data quality and team cohesion. Dr. Perlman supervises the study coordinator, Ms. Ferayorni, who is employed half-time by our study, and oversees baseline assessments, undergraduate research assistants, and schedules follow-up appointments. Undergraduate research assistants help with recruitment and appointment proctoring. Dr. Kotov serves as Co-Investigator due to his expertise in personality, longitudinal data collection, and statistical analysis. Dr. Hajcak serves as Co-Investigator due to his expertise in EEG collection, data processing, and interpretation of EEG data. Dr. Ruggero consults as statistician and recruitment expert. His responsibilities include designing the online data collection protocol, assistance with statistical analyses, and checking integrity of data collected online. Dr. Kuncel consulted on personnel selection, interpretation of findings, and strategies to measure resiliency.

Bibliography Type:

Description: (Last Updated: 06/22/2016)

**Abstracts for Journals and
Proceedings**

Perlman G, Ferayorni F, Ruggero C, Kotov R. "Personality and biological predictors of resiliency to chronic stress among highachieving adults." Presented at the 2016 NASA Human Research Program Investigators' Workshop (Frontiers in Human Space Exploration Research), Galveston, TX, February 8-11, 2016.
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