Fiscal Year:	FY 2019	**Task Last Updated:**	FY 06/20/2019
PI Name:	Kozlowski, Steve Ph.D.		
Project Title:	Team Cohesion Monitoring Badge: Development of Galvanic Skin Resistance Modality		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Behavior and performance		
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **HFBP**:Human Factors & Behavioral Performance (IRP Rev H)		
Human Research Program Risks:	(1) **Team**:Risk of Performance and Behavioral Health Decrements Due to Inadequate Cooperation, Coordination, Communication, and Psychosocial Adaptation within a Team		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
PI Email:	swjkozlowski@gmail.com	**Fax:**	FY
PI Organization Type:	UNIVERSITY	**Phone:**	813-974-0352
Organization Name:	University of South Florida		
PI Address 1:	4202 East Fowler Avenue PCD 4118G		
PI Address 2:	Department of Psychology		
PI Web Page:			
City:	Tampa	**State:**	FL
Zip Code:	33620	**Congressional District:**	12
Comments:	I moved from Michigan State University to the University of South Florida in August 2020.		
Project Type:	Ground	**Solicitation / Funding Source:**	2015-16 HERO NNJ15ZSA001N-Crew Health (FLAGSHIP, NSBRI, OMNIBUS). Appendix A-Crew Health, Appendix B-NSBRI, Appendix C-Omnibus
Start Date:	08/25/2016	**End Date:**	07/31/2020
No. of Post Docs:	0	**No. of PhD Degrees:**	0
No. of PhD Candidates:	3	**No. of Master' Degrees:**	0
No. of Master's Candidates:	3	**No. of Bachelor's Degrees:**	2
No. of Bachelor's Candidates:	6	**Monitoring Center:**	NASA JSC
Contact Monitor:	Williams, Thomas	**Contact Phone:**	281-483-8773
Contact Email:	thomas.j.will1@nasa.gov		
Flight Program:			
Flight Assignment:	NOTE: Changed end date to 7/31/2020 per D. Risin/JSC (Ed., 5/27/2020) NOTE: New end date is 5/15/2020 per L. Juliette/HRP (Ed., 2/19/2020) NOTE: New end date is 12/31/2019 per NSSC information (Ed., 5/29/19) NOTE: New end date is 12/31/2018 per NSSC information (Ed., 3/14/18) NOTE: Element change to Human Factors & Behavioral Performance; previously Behavioral Health & Performance (Ed., 1/18/17)		
Key Personnel Changes/Previous PI:	June 2017 report: Co-Investigator Chu-Hsiang (Daisy) Chang's leave assignment to serve as NSF Science of Organizations Program Officer has been extended an additional year. August 2016 report: Co-Investigator Chu-Hsiang (Daisy) Chang started a one-year leave in July 2016 to assume the role of NSF (National Science Foundation) Science of Organizations Program Officer.		

COI Name (Institution):	Biswas, Subir Ph.D. (Michigan State University) Chang, Chu-Hsiang Ph.D. (Michigan State University)
Grant/Contract No.:	NNX16AR52G
Performance Goal No.:	
Performance Goal Text:	
Task Description:	This proposal is for ground-based, technology development research designed to address: PRD (Program Requirements Document) Risk: Risk of Performance Decrements Due to Inadequate Cooperation, Coordination, Communication, and Psychosocial Adaptation within a Team. IRP (Integrated Research Program) Gap – Team2: We need to identify a set of validated measures, based on the key indicators of team function, to effectively monitor and measure team health and performance fluctuations during autonomous, long duration, and/or distance exploration missions. Research Plan: Our current research (NNX13AM77G) [Ed. note: grant NNX13AM77G ended in August 2018; was current at the time grant NNX16AR52G was awarded in 2016] is developing a technology system that is designed to unobtrusively measure and support team collaboration and cohesion. One key component of the system is a monitoring badge – a wearable body sensor array – that is designed to assess the frequency, duration, and quality of collaborative interactions between team members as they work together to accomplish team tasks, as well as physiological metrics (i.e., heart rate [HR]; heart rate variability [HRV]). In prior research, we have evaluated the high frequency interaction data streamed by the badges, which are highly reliable and valid. In addition, we have promising experimental evidence indicating that positive and negative affective reactions to specific team member interactions can be predicted from the HR and HRV data streams. Although promising, we believe it is critical to add an additional sensor – galvanic skin response (GSR) – to the current sensor array to improve reliable detection of crew anomalies using badge data streams. Specific Aims and Deliverables: The purpose of this proposal is to extend technology development of the monitoring sensor system. The proposed work has been developed in consultation with the Element Senior Scientist responsible for our current NASA research. Specifically, the proposed research will (1) extend technology development of the sensor platform to integrate a GSR sensor, develop relevant software, and redesign the badge casework, and (2) validate the utility of the GSR sensor to improve discrimination of positive and negative affective states.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	Team cohesion is not just a critical factor for astronaut teams and ground crews; cohesion is important to the effectiveness of all teams and especially those that operate in critical, high reliability setting. Of the many team process factors that support team effectiveness, team cohesion is the most studied with over a half century of research. Yet, remarkably, very little is known about the characteristics that promote its development and maintenance. For example, we know that experience working together is associated with cohesion formation and maintenance, but what are the mechanisms? Teams that do not cohere replace problematic members or disintegrate so experience reveals only those teams that survive, but that does not tell us why or how. This research, which will create technologies to monitor team cohesion and guide interventions to restore it, has the potential for wide utility in aviation, military, medical, industrial, and other environments where society depends on the effective performance of high reliability teams.
Task Progress:	Aim 1: Development of a Bluetooth Low Energy (BLE) based Galvanic Skin Sensor (GSR) • Development of the BLE-GSR sensor was reported and concluded in the prior reporting period. Aim 2: Validate the Utility of GSR Sensor Data • Validation data were collected during Fall semester 2018 and Spring semester 2019; data collection is concluded. • Data were collected from a total of 71 teams of 3-members each (N = 213) involved in 2592 dyadic interactions across the experiment. • Team members wore technology packages that included BLE-GSR, heart rate (HR), and interaction (proximity) sensors while performing a structured resource exchange task; specific interactions were stressed via a cognitive load manipulation; participants self-reported affect (i.e., valence and arousal) following each dyadic interaction. • Data are in the process of being compiled; that is, data from the sensors and interaction self-reports are in the process of being cleaned and aligned for statistical analyses; it is likely that the final sample for analyses will be somewhat attenuated due to technology or measurement issues. • Analyses are anticipated to be accomplished during the Fall semester 2019. o Prior research using just the HR sensor indicated that positive and negative affective reactions could be predicted using HR data. o Analyses for this validation will assess the extent to which the GSR sensor improves the prediction of affective reactions beyond that of the HR sensor alone.
Bibliography Type:	Description: (Last Updated: 07/05/2023)