

Fiscal Year:	FY 2014	Task Last Updated:	FY 01/21/2015
PI Name:	Salas, Eduardo Ph.D.		
Project Title:	Using Real-Time Lexical Indicators to Detect Performance Decrements in Spaceflight Teams: A Methodology to Dynamically Monitor Cognitive, Emotional, and Social Mechanisms That Influence Performance		
Division Name:	Human Research		
Program/Discipline:	NSBRI		
Program/Discipline--Element/Subdiscipline:	NSBRI--Neurobehavioral and Psychosocial Factors Team		
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) 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		
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Comments:	NOTE: Previous affiliation was University of Central Florida, until mid-2015		
Project Type:	GROUND	Solicitation / Funding Source:	2012 Crew Health NNJ12ZSA002N
Start Date:	08/01/2013	End Date:	01/31/2017
No. of Post Docs:	0	No. of PhD Degrees:	0
No. of PhD Candidates:	5	No. of Master' Degrees:	0
No. of Master's Candidates:	0	No. of Bachelor's Degrees:	0
No. of Bachelor's Candidates:	0	Monitoring Center:	NSBRI
Contact Monitor:	Contact Phone:		
Contact Email:			
Flight Program:			
Flight Assignment:	NOTE: End date changed to 1/31/2017 per NSBRI (Ed., 8/31/15) NOTE: End date is now 7/31/2016 (previously 11/30/2014) per NSBRI (Ed., 12/8/14) NOTE: End date is now 11/30/2014 per NSBRI (Ed., 7/15/14)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Driskell, James (Florida Maxima Corporation)		
Grant/Contract No.:	NCC 9-58-NBPF03402		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	<p>Future exploratory long-duration missions will incorporate a crew of six on a mission length of approximately 2.5 years. Challenges include the requirement for the crew to function autonomously, under significant communication delays, and with the potential for increased crew and interpersonal friction or tension. The specific aims of this research are to (1) develop a methodology to assess cognitive and emotional state at a distance through analysis of spontaneous verbal output in real-time communications and (2) test the feasibility of a real-time assessment tool, STRESSnet, to detect cognitive performance deficits, stress, fatigue, anxiety, and depression in the spaceflight operational setting. Because the health and well-being of crew members directly affects mission success, it is important to track cognitive/emotional changes that may indicate a deficit. One problem with many existing assessment methods is that most require direct observation of behavior or performance or self-assessment by a pen and paper-type instrument. The requirement to assess individual and team functioning at a distance suggests the potential efficacy of a methodology to assess cognitive and emotional state in real-time from ongoing or spontaneous verbal output. The basic premise of this work is that spontaneous verbal output provides a natural and valid indicator of basic cognitive processes. Natural word use is not prone to the typical limitations of self-report measurements. That is, natural language use is less subject to social desirability bias, and can be derived in real-time without interfering with the cognitive processes being measured, and without interrupting crew performance. Moreover, natural word use is reliable and consistent across time and context, and can be meaningfully measured in individuals and teams.</p> <p>STRESSnet is a lexical analysis tool designed to provide a non-obtrusive means of detecting stress and related deficits in long-duration spaceflight through the assessment of spontaneous verbal output in real-time crew communications. The research builds on existing work on text and sentiment analysis; however, STRESSnet is unique in that (1) it is specifically designed to assess stress and related cognitive/emotional states, (2) we draw on existing astronaut communications and mission logs to develop a lexicon that includes terms unique to this environment, and (3) we developed STRESSnet with the specific goal of application as a tool to assess user state and provide automatic schedule recommendations for crew work/leisure activities to counter identified deficits. STRESSnet provides an unobtrusive means to evaluate ongoing task communications within the crew and between the crew and mission control in order to assess cognitive/emotional states such as workload, negative affect, stress, anxiety, and depression. Individualization of this tool to each crew member can be achieved in the 5-year pre-training period. This tool will be tested in Human Exploration Research Analog (HERA), NASA Extreme Environment Mission Operations (NEEMO), and other analogs, as well as tested in archival analyses using existing mission transcripts.</p>
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	<p>The outcome of this research effort will not only allow for the dynamic and unobtrusive detection of stress and related cognitive deficits during spaceflight, but will also be directly applicable to Earth-based applications. It is expected that a real-time assessment and graphical display of stress effects (such as attentional focus, cognitive load, negative emotion, anxiety, and social impairment), as well as measures of fatigue, mood, and team functioning (i.e., collective orientation, synchronicity) drawn from ongoing verbal or textual communications, can be used in healthcare, military, education, law enforcement, and workplace applications. Furthermore, there is a burgeoning market for sentiment analysis tools in social media and online communications.</p>
Task Progress:	<p>Major Accomplishments: Development of a theoretical model of cognitive performance deficits, stress, fatigue, and anxiety in spaceflight based on existing research on lexical analysis and language usage in astronauts.</p> <p>Development of a lexical analysis tool, STRESSnet, to unobtrusively track and assess stress in individuals and teams. Implementation and test of this approach in HERA1, HERA2, HERA3, HERA4, and NEEMO18.</p> <p>Deliverables: The deliverables resulting from this effort will provide the National Space Biomedical Research Institute-Neurobehavioral and Psychosocial Factors (NSBRI-NBPF) team and NASA an evidence-based, empirically-validated methodology and assessment tool for non-obtrusively detecting and mitigating stress and anxiety in the spaceflight operational setting that is capable of capturing decrements at multiple levels of analysis (i.e., individual and team). The concept of use, developed in coordination with Johnson Space Center (JSC) Operations, is a tool to assess user state and provide automatic schedule recommendations for crew work/leisure activities to counter identified deficits.</p> <p>Milestones: Development of prototype STRESSnet tool HERA1 data collection, 2/14 HERA2 data collection, 4/14 HERA3 data collection, 6/14 HERA4 data collection, 9/14 NEEMO18 data collection.</p> <p>7/14 Archival analysis of JSC oral history transcripts (ongoing).</p>
Bibliography Type:	Description: (Last Updated: 09/04/2023)
Articles in Other Journals or Periodicals	Driskell T, Burke S, Driskell JE, Salas E, Neuberger L. "Steeling the team: Assessing individual and team functioning 'at a distance.' " The Military Psychologist. 2014 Apr;29(1):12-8. , Apr-2014