

Fiscal Year:	FY 2022	Task Last Updated:	FY 04/22/2022
PI Name:	LePine, Jeffrey Ph.D.		
Project Title:	Understanding and Preventing Crew Member Task Entrainment		
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) HSIA :Risk of Adverse Outcomes Due to Inadequate Human Systems Integration Architecture (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:			
Project Type:	Flight,Ground	Solicitation / Funding Source:	2013-14 HERO NNJ13ZSA002N-ILSRA. International Life Sciences Research Announcement
Start Date:	06/01/2015	End Date:	12/31/2023
No. of Post Docs:		No. of PhD Degrees:	3
No. of PhD Candidates:	2	No. of Master' Degrees:	
No. of Master's Candidates:		No. of Bachelor's Degrees:	
No. of Bachelor's Candidates:		Monitoring Center:	NASA JSC
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Flight Program:	ISS		
Flight Assignment:	NOTE: End date changed to 12/31/2023 per A. Beitman/NASA JSC (Ed., 12/1/22) NOTE: End date changed to 12/31/2022 per HRP and "in progress" information in NSSC (Ed., 3/20/2020) NOTE: Extended to 5/15/2020 per NSSC information (Ed., 6/28/19) NOTE: Extended to 5/15/2019 per NSSC information (Ed., 3/6/18) NOTE: Element change to Human Factors & Behavioral Performance; previously Behavioral Health & Performance (Ed., 1/18/17)		
Key Personnel Changes/Previous PI:	March 2020 report: Daniel Newton, Ph.D., is now CoInvestigator on the project.		
COI Name (Institution):	Wellman, Edward Ph.D. (Arizona State University) Newton, Daniel Ph.D. (University of Iowa)		
Grant/Contract No.:	NNX15AK77G		
Performance Goal No.:			

Performance Goal Text:	
Task Description:	<p>The proposal responds to the request for research exploring task switching in crews in isolated habitats such as the International Space Station (ISS), Human Exploration Research Analog (HERA), and Nezemnyy Eksperimental'nyy Kompleks (NEK). We propose ground- and flight-based experiments to understand and mitigate the performance deficits caused as crew members switch between tasks. Drawing on our own research, as well as research conducted by other scholars, we explain how crew member entrainment is produced by deep levels of cognitive, physical, and affective engagement or immersion in tasks, which immersion makes it difficult for members to disengage from those tasks – even after they have switched to a different task. We have shown that, as a result of this immersion/engagement, entrainment causes subsequent task engagement and effectiveness to suffer, particularly when prior tasks are perceived to be incomplete. We currently investigate potential negative effects of anticipatory entrainment in upcoming tasks on present task engagement and effectiveness.</p>
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	<p>Scholars have conducted research on task transitions (Monsell, 2003) and considered what makes workers effective when transitioning. However, we do not fully understand how individuals' psychological connections to tasks fluctuate when they transition between tasks as well as what the impact is on subsequent task effectiveness. A more robust understanding of the psychological connections individuals maintain with tasks—after having previously transitioned and anticipating an upcoming transition—are critical to improving and maintaining the effectiveness of crew members as well as individuals on earth. Furthermore, understanding these connections could illuminate and optimize task scheduling for both crew members in orbit and individuals on earth.</p> <p>Monsell, S. (2003). Task switching. <i>Trends in cognitive sciences</i>, 7(3), 134-140. http://dx.doi.org/</p>
Task Progress:	<p>Aims of Proposal: The proposed research addresses the performance effects of entrainment during an operational space flight context. We explore what can be done to mitigate the negative effects of entrainment and improve individual and team capabilities to engage in effective task switching. We seek to address the following needs: understanding threats to teams during long duration missions; identifying countermeasures to support team function for all phases of autonomous, long duration missions; identifying psychosocial and psychological factors, measures, and combinations thereof that can be used to compose effective crews for autonomous, long duration missions.</p> <p>We consider the effects of crew member entrainment (Ancona & Chong, 1996) as crew members' engagement and motivation spills over between tasks to affect task effectiveness. Due to the COVID-19 pandemic, our data collection efforts were delayed until the end of 2021 when in-person experimental activities could be safely conducted. Therefore, in the fall of 2021, we began data collection in the Nezemnyy Eksperimental'nyy Kompleks (NEK), Russia's IBMP Ground-based Experimental Complex, and also conducted pilot studies in our university lab. [Ed. Note: The IBMP is Russia's Institute of Biomedical Problems.]</p> <p>NEK Campaign: We examined the challenges in anticipating upcoming tasks as part of the 2021 NEK campaign. As with our previous investigations – as part of the NASA Human Exploration Research Analog (HERA) campaigns – we coordinated with NASA subject matter experts to select a finalized series of “task-transition-task” episodes to examine the spillover of engagement across tasks. Three times each week, after the completion of the second task of a “task-transition-task” episode, crew members complete a brief survey about their engagement and attention residue in past tasks and their anticipatory engagement in upcoming tasks – and whether this anticipation distracted or motivated them on the initial task in a “task-transition-task” sequence. Thus far, we have seen confirming evidence that ruminating on prior tasks – which is referred to as attention residue (Leroy, 2009) – impairs crew members' engagement and effectiveness on subsequent tasks. Additionally, evidence from the NEK environment in 2021 shows that anticipating upcoming tasks elicits negative emotions in crew members, and these negative emotions reduce crew members' subsequent task engagement and effectiveness.</p> <p>In addition to investigating “task-transition-task” episodes, we are also in the process of assessing crew members' general motivation flowing from their daily task structure. Therefore, on the same days of the task-transition-task episodes, crew members reflect – at the end of the day – on their general engagement and motivation that day. Although we have limited data thus far on this perspective, the data will eventually allow us to investigate whether one's daily structure affects one's motivational flow. We plan to leverage this data to inform a theory of task transitions and scheduling. Specifically, we reason that the sequencing of tasks – with respect to the general meaningfulness of the underlying tasks – could produce positive or negative compounding effects on engagement due to internal processes and feedback loops responsible for the spillover of engagement. By directly leveraging the positive and negative mechanisms involved in these loops, as determined by agent-based modelling, we aim to gain further theoretical insight into the nature of task sequencing effects and when they might be strengthened or weakened.</p> <p>In summary, our ongoing research aims to help NASA leverage the benefits of engaging in work across task transitions, while limiting the associated risks of engagement spillover in the forms of attention residue and anticipatory engagement. Understanding this phenomenon of engagement spillover has significant bearing on multifaceted work and the structure and order of individuals' workdays in a variety of organizational contexts, including exploration missions.</p> <p>References:</p> <p>Ancona, D., & Chong, C. L. (1996). Entrainment: Pace, cycle, and rhythm in organizational behavior. <i>Research in Organizational Behavior</i>, 18, 251-284.</p> <p>Leroy, S. (2009). Why is it so hard to do my work? The challenge of attention residue when switching between work tasks. <i>Organizational Behavior and Human Decision Processes</i>, 109(2), 168-181. doi: 10.1006/obhd.2001.2974</p>
Bibliography Type:	Description: (Last Updated: 03/20/2020)