

Fiscal Year:	FY 2023	Task Last Updated:	FY 04/01/2023
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
Contact Monitor:	Whitmire, Alexandra	Contact Phone:	
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Flight Program:	ISS		
Flight Assignment:	<p>NOTE: End date changed to 12/31/2023 per A. Beitman/NASA JSC (Ed., 12/1/22)</p> <p>NOTE: End date changed to 12/31/2022 per HRP and "in progress" information in NSSC (Ed., 3/20/2020)</p> <p>NOTE: Extended to 5/15/2020 per NSSC information (Ed., 6/28/19)</p> <p>NOTE: Extended to 5/15/2019 per NSSC information (Ed., 3/6/18)</p> <p>NOTE: Element change to Human Factors & Behavioral Performance; previously Behavioral Health & Performance (Ed., 1/18/17)</p>		
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 the potential negative effects of anticipatory entrainment in upcoming tasks on present task engagement and effectiveness. We also are in the process of building a theory of optimized task sequencing.</p>
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	<p>Switching from one task to the next is a ubiquitous part of organizational life. As such, scholars have considered what makes workers effective when transitioning between different tasks (Monsell, 2003). However, a more robust understanding of the psychological connections individuals maintain with tasks—both after having performed a transition and anticipating an upcoming transition—are critical to improving and maintaining task motivation and task effectiveness. Understanding these connections could illuminate and optimize task scheduling both for crew members in orbit and individuals on earth. Monsell, S. (2003). Task switching. <i>Trends in cognitive sciences</i>, 7(3), 134-140. http://dx.doi.org/</p>
Task Progress:	<p>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 as well as improve the 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. In short, we consider the effects of crew member entrainment (Ancona & Chong, 1996) as crew members' engagement and motivation spill over between tasks to affect task effectiveness. We completed our participation in the Scientific International Research In a Unique terrestrial Station (SIRIUS)-21 campaign. Following crew member egress, we conducted short debriefings with crew members about their experience staying motivated and transitioning tasks throughout the course of the mission. During the mission, crew members completed two brief surveys three times each week. Specifically, in the course of a workday, following a "task-transition-task" episode, crew members completed 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 that was part of the "task-transition-task" sequence. Additionally, at the end of that same workday, crew members assessed their general engagement and performance that day.</p> <p>Our analyses demonstrate 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 (Newton, LePine, Kim, Wellman, & Bush, 2020). Regarding looking ahead to upcoming tasks, evidence suggests that anticipating upcoming tasks elicits negative emotions in crew members, and these negative emotions reduce subsequent task engagement and effectiveness. In investigating crew members' general motivation flowing from their daily task structure, we found that different task sequences across a given day matter to crew members' overall engagement. Specifically, the decreasing sequence (i.e., starting the day with the most engaging tasks and finishing the day with the least engaging tasks) resulted in the highest overall daily engagement and therefore also daily performance, particularly on Mondays. This decreasing sequence had a stronger effect than the increasing sequence (i.e., starting the day with the least engaging tasks and finishing the day with the most engaging tasks), u-shaped sequence (i.e., starting and finishing the day with the most engaging tasks, and clustering the least engaging tasks in the middle of the day), and inverted u-shaped sequence (i.e., starting and finishing the day with the least engaging tasks, and clustering the most engaging tasks in the middle of the day).</p> <p>These results allow us to gain insight into a potential engagement cascade, in which a positive compounding of engagement is enjoyed as the most engaging tasks are performed earlier in the day and create a positive spillover across later task sequences. However, the heightened engagement experienced from performing meaningful tasks later in the day, or in an unconnected manner at the beginning and the end of the day, has less opportunity to compound and to positively impact engagement in the tasks that follow.</p> <p>In summary, our ongoing research aims to help leverage the benefits of engaging in work across task transitions, while limiting the associated risks of engagement spillover. Understanding 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 CL. (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> <p>Newton DW, LePine JA, Kim JK, Wellman N, Bush JT. (2020) Taking engagement to task: The nature and functioning of task engagement across transitions. <i>J Appl Psychol</i>, 105(1), 1-18. Epub 2019 Jun 17. https://doi.org/10.1037/apl0000428 ; PubMed PMID: 31204829.</p>

Bibliography Type:	Description: (Last Updated: 03/20/2020)
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