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EFFECTS OF USING A VIRTUAL ASSISTANT ON HUMAN TRUST IN AUTOMATION DURING SPACECRAFT ANOMALY RESOLUTION

Abstract

Long Duration Exploration Missions (LDEMs) may result in delayed communications between on-orbit crew and earth based mission control. This can be detrimental to mission safety and success during in-flight and on-surface emergencies. Hence, crew autonomy is critical and essential in establishing safe and efficient operations when the Earth-based mission support is not readily available. Virtual Assistants (VAs) have potential to improve crew performance in safety- and time-critical operational environments that require prompt intervention to avoid mishaps. We developed a VA, Daphne, to assist the crew in detecting, diagnosing, and resolving such in-flight anomalies in a spacecrafts' Environment Control and Life Support Systems. The VA was first tested in a laboratory environment (n=12), and then deployed inside a NASA flight analog HERA (Human Exploration and Research Analog) for a yearlong campaign of 4 different 45-day missions (n=16). Participants were selected from astronaut-like population. Participants' trust in using VA was evaluated using Jian's Trust in Automation survey. During laboratory study, the participants worked individually to resolve anomalies, and overall trust was measured to be 30.67 +/- 2.83 (Mean +/- SE). During analog study, each participant worked both individually and in a group of 4 crewmembers. The overall trust was measured to be 25.95 +/- 3.03 (Mean +/- SE) for individual sessions, and 30.60 +/- 3.14 (Mean +/- SE) for group sessions. Furthermore, the effect of individual differences such as sex, previous experience, and age is also evaluated on human trust in an AI (artificial intelligent) agent. The impact of training and expertise between laboratory (novice) and analog (expert) participants is also evaluated. The implications of these results are discussed to understand how humans interact with AI agents in the context of anomaly resolution. The findings will contribute to generating recommendations and guidelines for use of such VAs in future LDEMs.