183 Preliminary Results of Assessing Cognitive Load During Procedure Training

Alshiakh S, Patil R, Rutenberg A, Hood C, Ajabnoor Y, Rebol M, Galavo C, Horan E, Pietroszek K, Sikka N, Ranniger C/George Washington University, Washington, DC

Study Objectives: During simulated teaching of a medical procedural skill, learners must develop, refine, and activate complex mental models for cognitive and psychomotor tasks. These processes may burden the learner and contribute to cognitive load. Augmented reality (AR) systems can expand access to training by facilitating remote interactions. However, the technology itself can impact cognitive workload and affect learning. In advance of deploying an AR training system, we seek to define the workload associated with the simulation environment. This pilot study uses NASA-TLX, a subjective workload rating tool, and SIM-TLX, a derivative designed to evaluate workload in simulated environments, to measure contributions to workload in instructor/learner dyads during in person, Ultrasound Guided Central Venous Catheter training. We postulate that the SIM TLX in the in-person training setting will result in low environment-based workload ratings.

Methods: A prospective observational study was conducted after IRB approval. Five learners with minimal US-CVC experience were paired with 5 physician instructors. Each trainee watched an instructional video prior to hands on, in-person skills practice using a commercially available US CVC simulator. Both the instructor and trainee completed post session NASA TLX and SIM TLX surveys. Workload ratings were compared using paired, 2 tailed t tests to identify individual workload item contributions.

Results: Average results of the overall and workload subscales are presented in Figure 1. Learners reported a non-significantly higher overall workload than instructors. In the NASA TLX, learners rated Mental Workload higher than Temporal Workload, Frustration and Effort; and Performance and Effort higher than Frustration as components of the overall workload (Paired 2 tailed t-test, $p \leq 0.05$), In the SIM TLX, learners rated Mental Workload higher than Temporal Workload, Frustration, Situational Stress, Distraction, and Perceptual Strain; Task Completion higher than Temporal Stress, Situational Stress, Distraction and Perceptual Strain; and Task Control higher than Situational Stress or Temporal Workload. Instructors rated Mental Workload higher than Physical Workload in both surveys, and higher than Distraction and Perceptual Strain in the SIM TLX.

Conclusion: In the in-person training environment, both instructors and trainees identified Mental Workload and Task Complexity as greater contributors to workload than Perceptual Strain and Distraction subscales in the SIM TLX, a finding not reflected in the NASA TLX subscales. We conclude that the simulation environment during in-person training contributed minimally to cognitive load. Further workload evaluation in AR and other training environments will help to delineate the magnitude of environmental contributions to workload during training.