

## S&T Campaign: Human Sciences Human Capability Enhancement Training

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### Research Objective

- How do individual difference traits interact with immersive characteristics of virtual training environments (VTE) to affect learning outcomes?
  - Does simulator sickness (SS) and presence mediate relationship among immersive characteristics (ICs), individual trait differences, and training outcomes?
- Goal of VTE designers and developers is often to develop VTEs with greatest level of ICs to achieve maximal presence based on *accepted assumption* this will achieve optimal learning outcomes via VTEs.
- However, supporting empirical evidence is lacking to support such a strong and accepted assumption.
  - VTEs with > ICs (e.g., head-mounted displays (HMDs)) often produce similar outcomes compared to VTEs (e.g, desktop PCs) with < ICs.
  - VTEs with > ICs often result in such detrimental effects as greater experience of SS and user trepidation compared to VTEs with < ICs.
  - Research *directly* examining relationship between ICs and individual differences (e.g., experience of SS, presence) on learning outcomes is lacking.

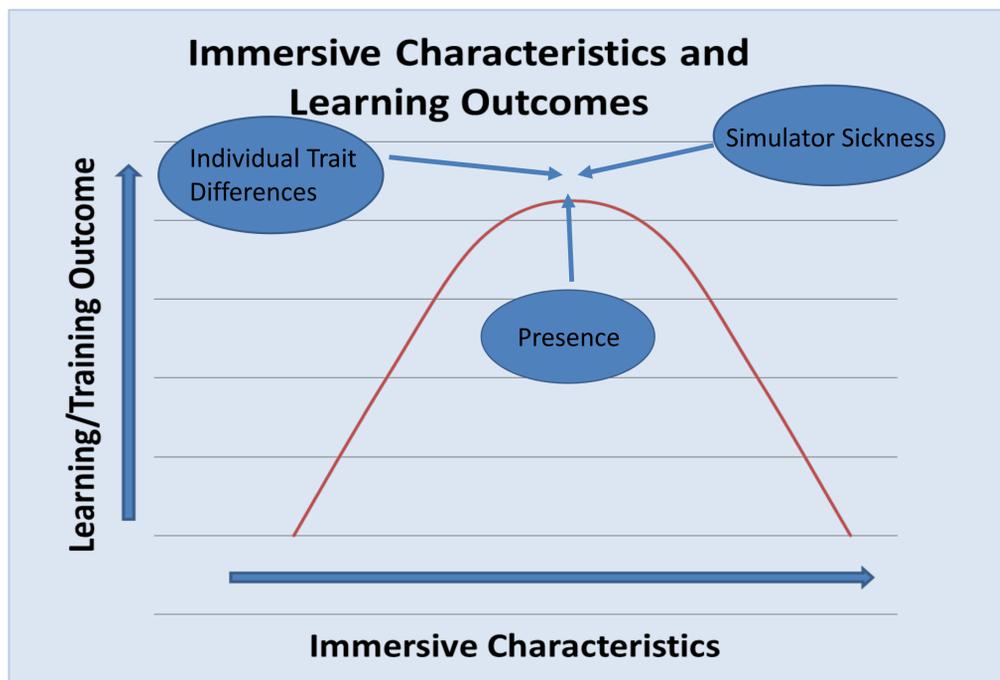


Figure 1. Potential relationship between learning outcomes and ICs. Are learning outcomes mediated by simulator sickness &/or other individual trait differences that are associated with > ICs, resulting in less than optimal, assumed learning outcomes via VTEs with > ICs?

### Challenges

- Appropriate, operationally defining immersion, fidelity, presence, and immersive characteristics, and how to distinguish among each.
  - Research and researchers often used these terms interchangeably without clear, agreed to distinctions.
- Experimental design challenges.
  - Preventing adaptation to simulator sickness.
  - Preventing participant attrition.
  - Achieving high participant compliance (e.g., no alcohol, caffeine, etc.) and completion/return rate (3 experimental conditions taking place on 3 separate dates).
- Designing virtual environments and obtaining hardware (i.e., HMDs) that appropriately manipulate immersive characteristics.

### ARL Facilities and Capabilities Available to Support Collaborative Research

- Experimental laboratory facilities located at ARL West (Los Angeles) and University of California at Santa Barbara.
- Laboratory at Santa Barbara affords accessibility to participants and more convenient for participants to return to future experimental sessions.
- ARL expertise includes 8 researchers across several Human Research and Engineering Division (HRED).
  - Expertise in training, learning, cognitive psychology, training effectiveness, virtual environments, human factors of virtual environments, simulator/motion sickness, neuroscience, and auditory perception.
- Equipment to be used in experiment to provide 3 conditions of varying levels of immersive characteristics:
  - Desktop PC VTE.
  - HMD without peripheral vision occlusion (eMagin Z800 or ProView XL).
  - Oculus Rift HMD that provides full visual occlusion.



Figure 2. Virtual training environments representing the 3 conditions of immersive characteristics in experiment: high (top left), mid (top right), and low (bottom).

### Complementary Expertise / Facilities / Capabilities Sought in Collaboration

- Virtual reality/environment designers/programmers are sought.
- Individuals/organizations with access to old and new head mounted displays in order to manipulate different levels of immersive characteristics.
  - We are having difficulty in finding appropriate HMD for our mid-level condition and appropriate software to run ProView and eMagin HMDs (these HMDs are no longer in production).

### Acknowledgements & Notes

- Dr. Kimberly Pollard is the Principal Investigator of this basic experimental research effort.
- Dr. Jason Moss developed and presented the poster.
- Other members of our research team are Drs. Peter Khooshabeh, Anne Sinatra, Antony Passaro, Ben Files, Mr. Mark Ericson, Ms. Debbie Patton, Mr. Jerald Thomas, and Ms. Ashley Oiknine.
- This research is possible by submitting the winning proposal in response to the FY17 HRED 6.1 Basic Research Forum Competition in the category of Training Effectiveness and Immersion.