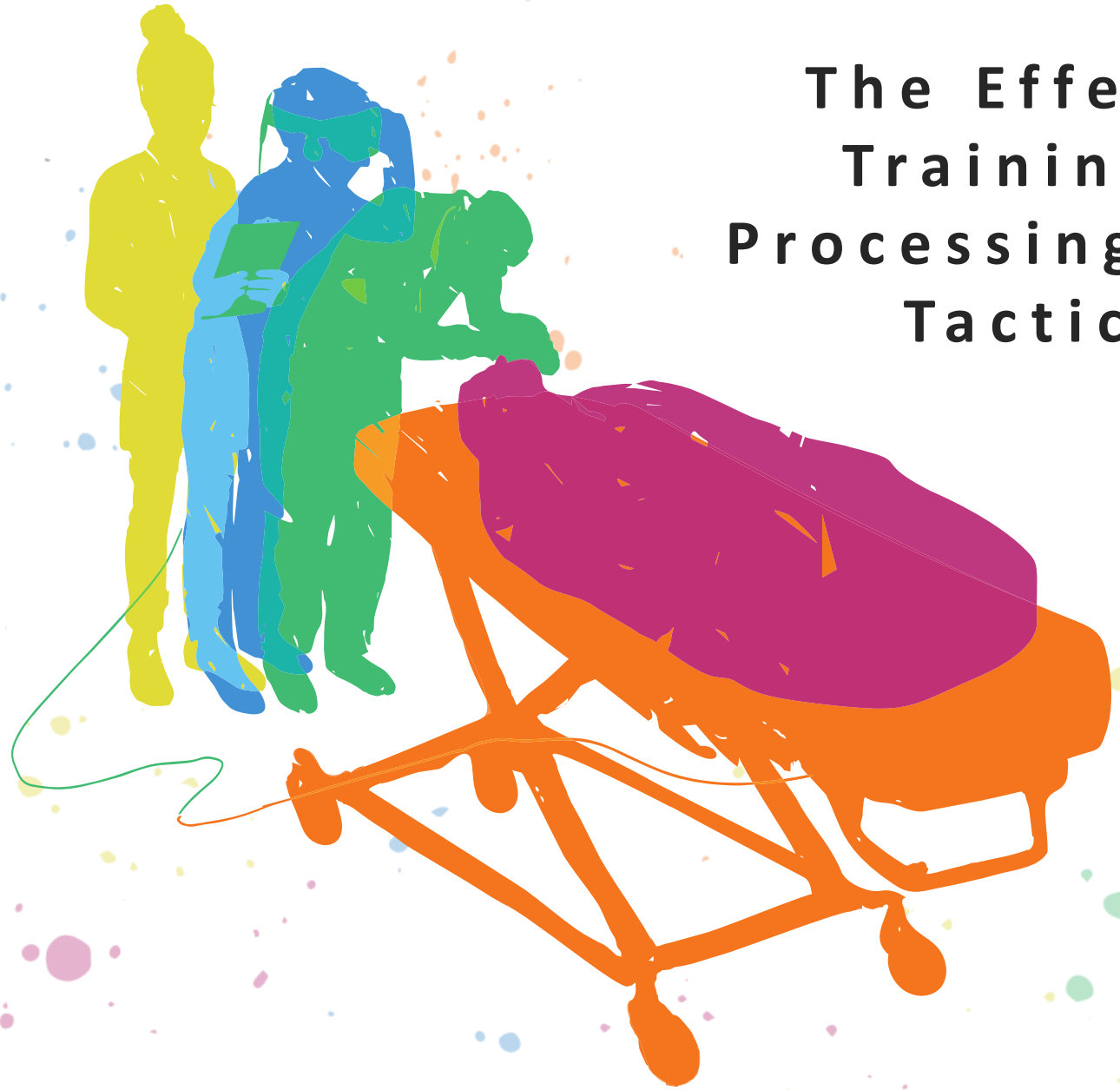

The Effects of Augmented Reality Training Systems on Information Processing and Performance During Tactical Combat Casualty Care

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DESIGN INTERACTIVE

WELCOME

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Problem & Importance

- While some studies have provided evidence of AR benefit to training and operations, others have highlighted potential negative effects associated with application of AR
  - Non-optimal allocation of attention between real-world objects of interest and AR cues
  - Adverse impacts to human information processing (e.g., altered head movements due to restricted FOV, change blindness due to AR overlays acting as distractors) may impact learning and training transfer to real world (RW) tasks
- Critical Questions
  - How do head-worn displays (HWDs) transform perception, cognition, and decision making?
  - Do HWDs alter the relationship between sensation, embodiment, and action?
  - Does attention allocation change in HWDs due to the restricted field-of-view or other display or AR content parameters?

Study Methods

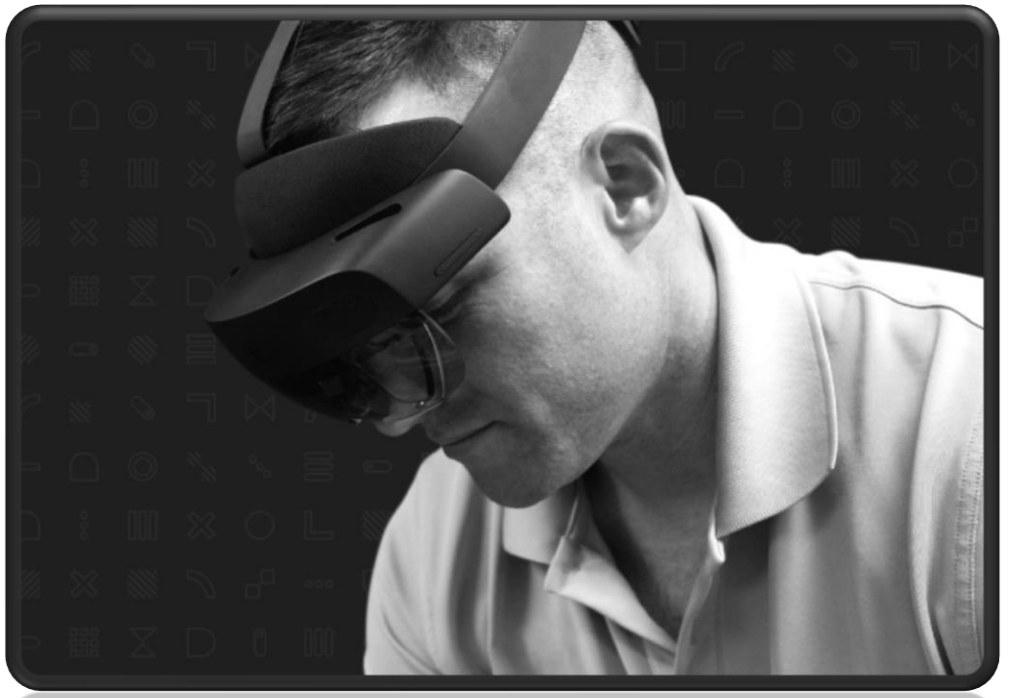
- Experts vs. Novices
  - Total *n = 144*
  - Sample size based on pre-post within group measures, $\alpha = 0.05$, $\beta = 0.90$ and 20% dropout rate

- Device
  - HoloLens 2 (AR)
  - Tobii Pro 2 Glasses (Real-World [RW])

- Exposure
  - 40-min exposure (with or without 5 min breaks) AR
  - 40-min exposure (with or without 5 min breaks) RW
  - 1-hr break between AR and RW

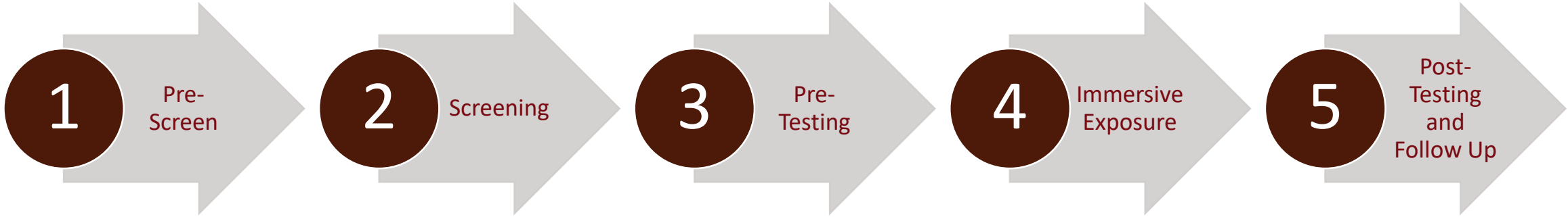
- Dependent Measure
  - Assessment of eye movement data (e.g., fixations, areas of interest, gaze trail) for assessing human information processing and perceptual validity

To realize the full potential of AR applications, it is important to understand the impact of AR on human information processing toward the development of recommendations to reduce negative effects and boost training and performance gains.



HoloLens 2

Experimental Procedure



Exclusion criteria: 1) history of neurological impairments, 2) ongoing musculoskeletal problems of knee, ankle, shoulder, elbow, 3) any known loss in depth perception/ lack of stereoscopic vision or other visual anomalies, 4) any known inner-ear anomalies, 5) history of seizures; Expertise screening

Written informed consent, SSQ (those with scores >12 excluded from study), standard clinical stereo-test (those without stereoscopic vision or other noted visual anomalies other than myopia/hyperopia excluded from study)

Measure height/weight, IPD; fill–out demographics survey; fill-out knowledge pre-test

Counter-balance exposure to RW- and AR-conditions; exposure of experts and novices; randomly assigned to either break or no break conditions; measure eye tracking and process performance throughout exposure

SSQ, human performance outcome measures, debrief, report symptoms 24 hr and 48 hr after departure

Anticipated Results

- Expect significant differences between AR and real-world training outcomes regarding eye tracking, cognitive, behavioral, and task measures
- Experts are expected to exhibit better information processing across AR and real-world scenarios
- Participants with breaks during scenarios are expected to exhibit better performance outcomes than counterparts without breaks
- By using eye tracking and other data to examine effect that expertise level, inclusion of a rest period, and training modality have on human information processing, in the context of military medical training, results from this study will be used to guide development of AR applications that maximize transfer of training

Goals

Provide quantifiable results that describe AR effects on critical components of human information processing in order to provide recommendations for usage of AR in training environments.

Compare results based on breaks and expertise level, providing necessary information toward AR application and usage guidance, and driving training guidelines that specify how best to optimize AR training applications for optimal learning and training transfer.

By better understanding dynamic relationships between visual attention allocation, attention switching, situation awareness behaviors, decision making, task outcomes, and toll AR can have on human information processing, development of more responsive and effective AR applications, suitable to wide range of users and their needs, will be more readily achievable.

QUESTIONS?

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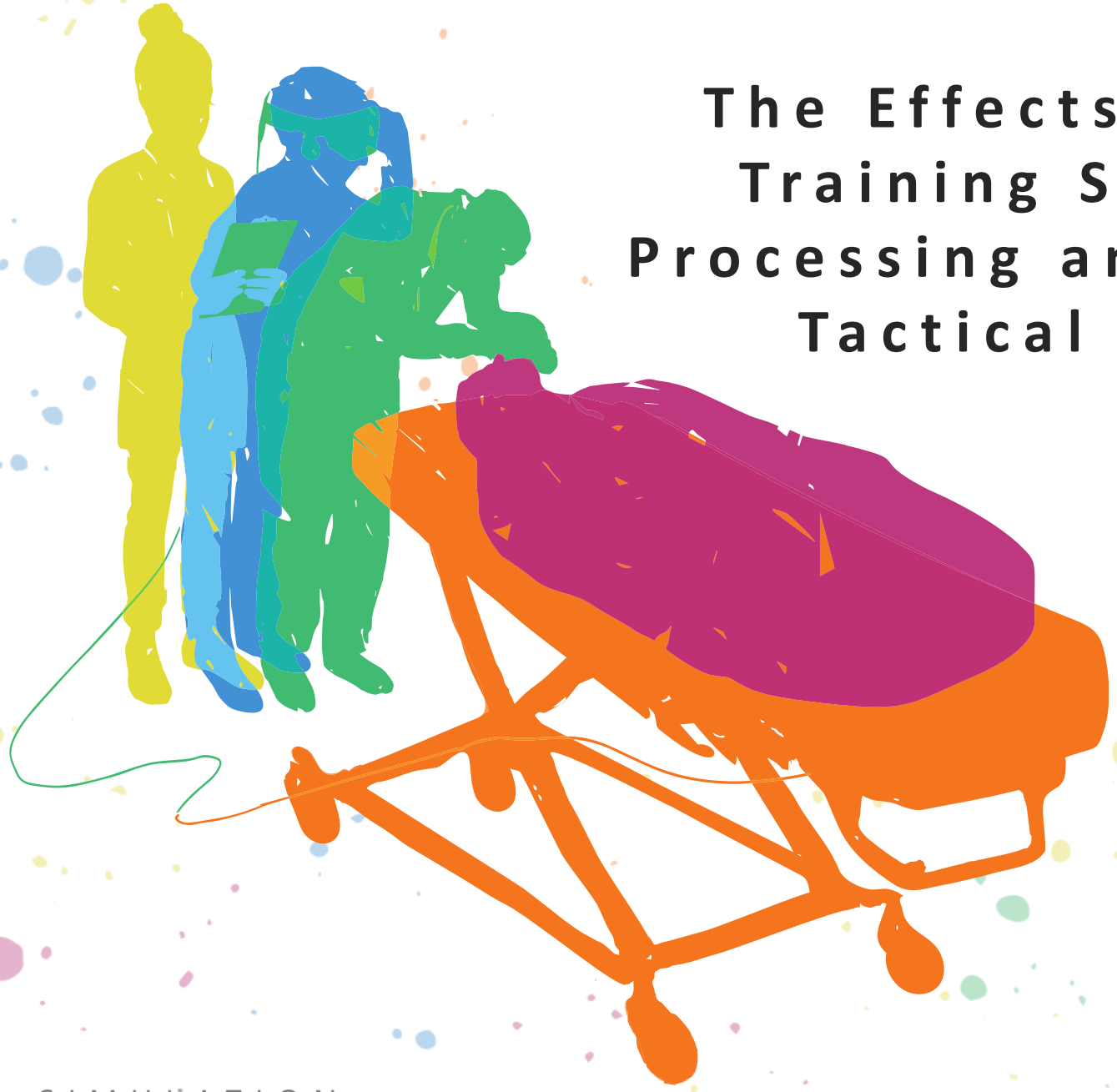

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THANK YOU!