Exploring Evidence for the Use of Immersive Virtual Reality Simulation with Undergraduate Nursing Students

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Objectives

Following this presentation, participants will be able to:

- Distinguish types of virtual reality education strategies for use in nursing education
- Describe immediate and long term outcomes using virtual reality to teach the skill of decontamination
- Apply the NLN Jeffries Simulation Theory to the implementation and evaluation of virtual reality simulation

Review of Literature

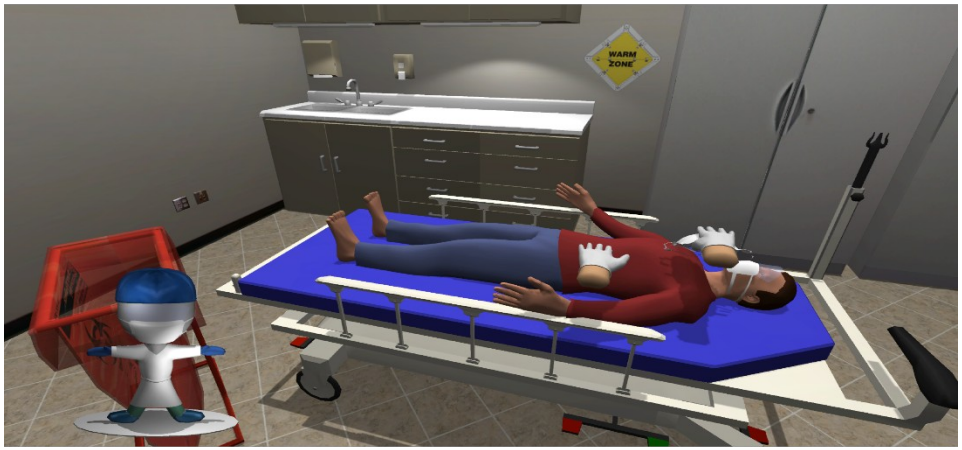
- Virtual Reality Simulation (VRS)
  - Levels of immersiveness
    - Desktop virtual reality (2D)
    - Fully immersive virtual reality (3D)
- VRS and Disaster
  - Positive student outcomes
  - Realistic and enhances learning

Background

- Nurse educators have been called upon to transform nursing education to prepare students for complex healthcare environments
- Disasters can be one of the most complex environments faced in practice
- Virtual reality simulation (VRS) is one strategy for preparing nurses for disaster response
  - Little is known about outcomes based on the varying levels of VRS immersiveness
  - Little is known about the student experience using VRS at various levels of immersion

Trajectory of Current Research

- 2014 Pilot of pre/post test of performance/knowledge/self-efficacy; psychometric evaluation
  - 2 sites (WSU and Miami)
  - Kinect interaction
- 2015 Pre/post test of performance and knowledge. Eliminated self-efficacy measure.
  - 2 sites (WSU and Miami)
  - Hydra Razer interaction
  - Added measure of retention
- 2015-2017 Pre/post test of performance and knowledge
  - 3 sites (WSU, Miami, Cedarville)
  - Maintained measure of retention
  - Added distinguishing between two types of VRS with different levels of immersiveness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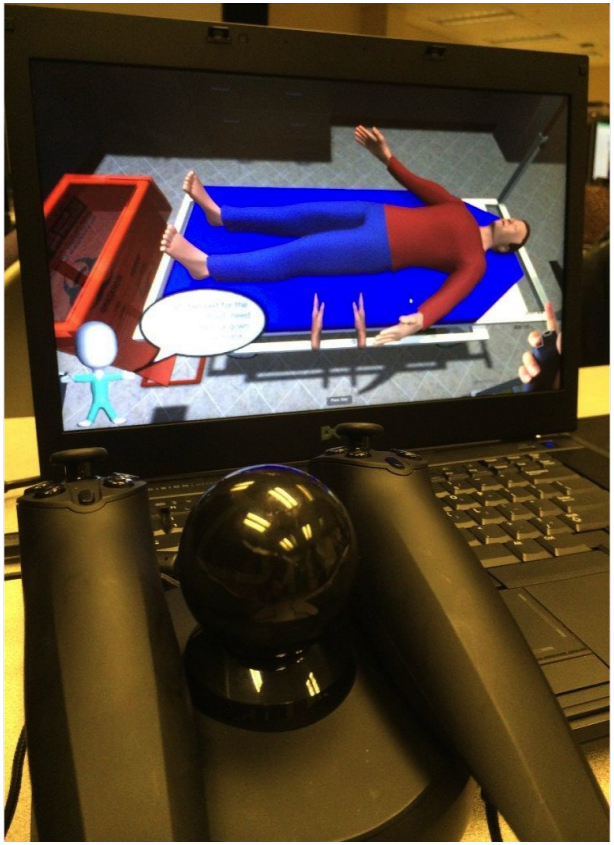

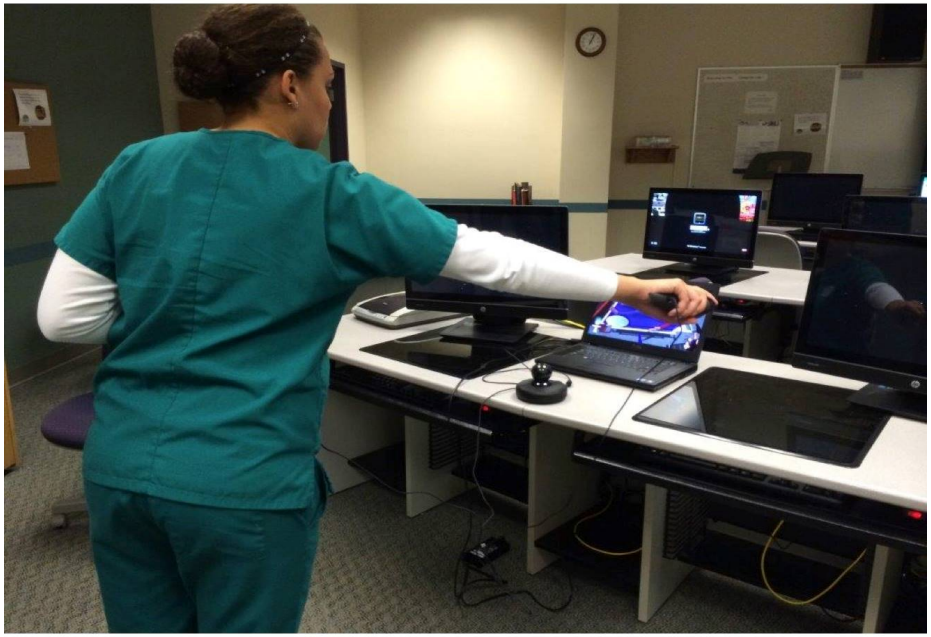


Oculus

Purpose

- Examine the longitudinal effects of two varying levels of immersive virtual reality strategies to teach the disaster skill of decontamination in terms of:
  - Cognitive knowledge
  - Psychomotor Performance
  - Satisfaction

Theoretical Framework

- NLN Jeffries Simulation Framework (Jeffries, 2016)
  - Simulation environment must experiential, interactive, learner centered
  - Incorporates design that includes level of fidelity, roles
  - Outcomes related to system, patient, and/or participant
  - Participant construct currently not well-explored

Methods

- Multi-Methods Design
  - Treatment group A-computer and mouse VRS
  - Treatment group B-VRS
  - Control group-Written directions
- Pre/post-test, 5 month follow-up
- Four campuses from 3 baccalaureate programs in Midwest
- Exempt IRB status at all universities

Sample

Table 1. Demographic Information				
N= 189				
Age	Age 18-25= 138	Age 26-34= 28	Age 35-50= 21	Greater than 50 = 2
Gender	Male= 24	Female= 163	Not Reported= 2	Missing = 2
Ethnicity	Hispanic=7	Non-Hispanic= 150	Other= 31	Missing = 2
Previous Disaster Training	Yes = 73	No = 114	Missing = 2	
Previous Virtual Reality Experience	Yes = 21	No = 166	Missing = 2	
Previous Gaming Experience	Yes = 108	No = 79	Missing = 2	

Instruments

- Cognitive knowledge
  - 20-point multiple choice exam
- Performance
  - Researcher developed rubric—score based on 17 items
  - Time to complete procedure
- Satisfaction
  - Researcher developed focus group questions
- Demographic questionnaire
  - Age range, gender, previous disaster, gaming, and VRS experience

Procedures

- Senior baccalaureate students recruited electronically and in person at all campuses
- Students complete cognitive pre-test and demographic questionnaire
- Students view educational module decontamination as a group
- Students randomly assigned to mouse/keyboard VRS, immersive VRS or control (written instructions) group
- Repeat Cognitive post-test
- Students demonstrated skill of decontamination on mannequin
- Repeat cognitive and performance test 5-6 month post-training

Data Analysis

- Quantitative Analysis
  - Multilevel linear modeling with repeated measures
- Qualitative Analysis
  - -Focus group data

Cognitive Test Results by Treatment Group and Time

Treatment Group	Pre-Test Score	Post-Test Score	6 months Post-test Score	Pre-Post p value	Post-6 months p value	Pre-Final p value
Group A: Immersive VRS	8.78 ± 0.29	16.25 ± 0.29	14.19 ±0.33	<0.0001*	<0.0001*	<0.0001*
Group B: Computer/ Mouse VRS	9.47 ± 0.29	16.19 ± 0.29	14.07 ± 0.34	<0.0001*	<0.0001*	<0.0001*
Group C: Written Instructions	9.38 ± 0.29	16.07 ± 0.30	14.25 ± 0.33	<0.0001*	0.0006*	<0.0001*
p value	0.77 (A vs. B) 0.88 (A vs. C) 1.00 (B vs.	1.00 (A vs. B, A vs. C, B vs. C)	1.00 (A vs. B, A vs. C, B vs. C)			

Performance Rubric Scores by Treatment Grou

Treatment Group	Performance Post Score/S.D.	Performance 6 months post Score/S.D.	Post-6 months p value
Immersive VRS	14.24 ± 0.29	12.61 ±0.33	0.0017*
Computer / Mouse VRS	14.93 ± 0.29)	12.03 ± 0.33	<0.0001*
Written Instructions	13.48 ± 0.30	12.14 ± 0.34	0.0226*
p value	0.5450 (A vs. B) 0.4429 (A vs. C) 0.0084* (B vs.	0.8269 (A vs. B) 0.9200 (B vs. C) 0.999 (B vs.	

Performance Time to Completion by Treatment Group and Time

Treatment Group	Time post (seconds)	Time 6 months post (seconds)	Post-6 months P value
Immersive VRS	530.11 ± 18.62	514.51 ± 20.62	0.9638
Computer / Mouse VRS	543.92 ± 18.67	472.34 ± 20.84	0.0038*
Written Instructions	574.91 ± 19.29	499.04 ± 21.01	0.0020*
p value	0.9951 (A vs. B)	0.7036 (A vs. B)	

*p<0.05

Analysis Based on Demographic Characteristics

- Generally no demographic characteristics were associated with outcomes
  - Gaming experience mattered between computer/mouse group and control group in terms of performance
  - Females were faster than males in the computer/mouse group

Results: Qualitative

- Simulation Experience/facilitator educational strategies
  - Scaffolding, game-like, active learning
- Simulation Design
  - Fidelity, extension, barriers, skills training
- Participant Outcomes
  - Satisfaction, memory retention, self-confidence
- Simulation Experience/Participant
  - Participant attributes, learning styles

Future Research

- Identify appropriate ‘dosing’ between training
- Solicit more diverse and larger sample sizes
- Repeat with this skill and others
- Repeat with RNs, other healthcare providers

Nursing Education Implications

- Multi-site studies require time and coordination
- Busy students are difficult to recruit
- Need for evidence to best practice approaches for acquisition and retention of complex skills
- Advantages of VRS/Disadvantages of VRS
- Effect of repetition, current events

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Questions?????