Developing a Spherical Video-Based Virtual Reality Program to Facilitate Embodiment for Adults with Chronic Pain

Alexandro Guerrero, OT/s, Robert Edwards, PhD, Nancy Baker, ScD, MPH, OTR/L, FAOTA

Tufts University Department of Occupational Therapy

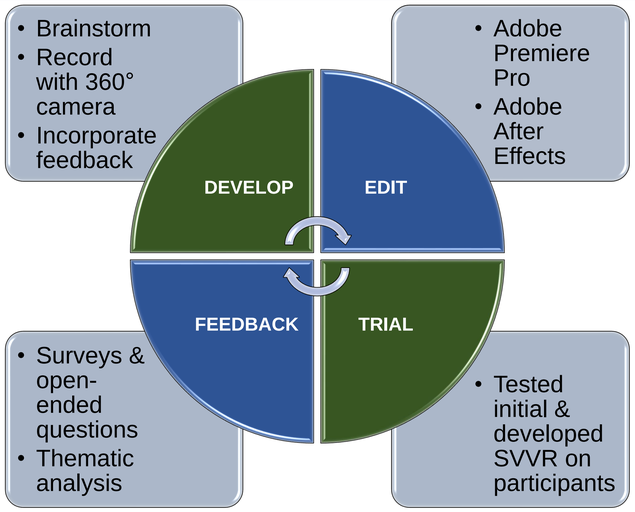
Brigham and Women's Hospital
Founding Member, Mass General Brigham

Introduction

- Immersive virtual reality (IVR) and associated effects have begun to make great strides in health-related contexts.[1-5]
- Embodiment, or the sense of having a body, in IVR may pave way for new pain management strategies & alternative treatments for chronic pain.[6,7]
- Spherical video-based virtual reality (SVVR) is a type of IVR that uses spherical video environments and is highly immersive & effective for embodiment.[8-10]
- However, one challenge of facilitating embodiment in IVR for health-related applications is assessing issues related to design & usability.[11,12]

Purpose: ***To explore the feasibility of developing a therapeutic immersive virtual reality program using 360° videos (SVVR) to facilitate embodiment for adults with chronic pain.***

Methods



Participants

Total n = 10; all graduate student from Tufts OT Department

Phase 1
- n = 6 adults (age: 24.8 ± 1.94; min 22 – max 28)
- Tested initially developed SVVR program

Phase 2
- n = 4 adult (age: 24.8 ± 2.87; min 23 – max 29)
- Tested redeveloped SVVR with Phase 1 participant feedback

Assessments: Simulator Sickness Questionnaire, Embodiment Questionnaire, User Engagement Scale, iGroup Presence Questionnaire, System Usability Scale

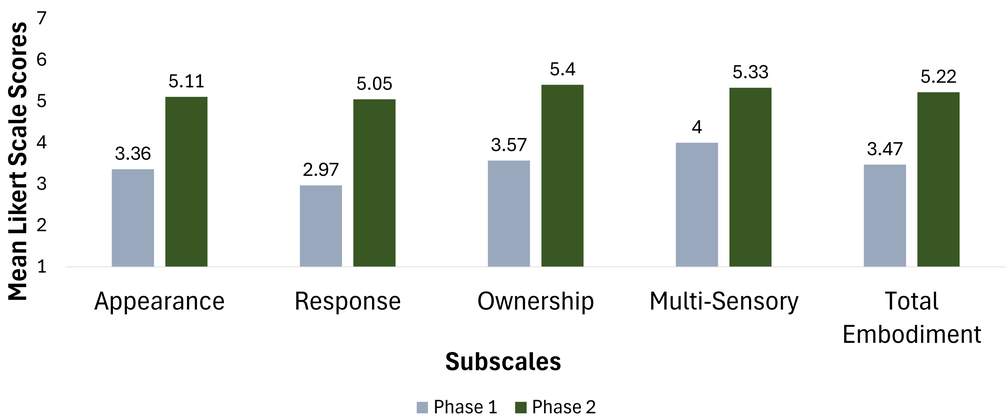
Results

Phase 1 SVVR 360 Video Development
- **3 SVVR Interventions**: (1) Range of Motion, (2) Light Pressure, (3) Deep Pressure
- **3 Occupation-Based Activities**: (1) Drawing on a Whiteboard, (2) Creating a 3D Wooden Figure, (3) Making a PB&J Sandwich

Result

Participant Feedback Incorporated
- Length of videos
- Limb representation
- Interesting/engaging activities
- Comfort & usability of VR headset
- Multimodal stimulation (olfactory, auditory)

Pre/Post Embodiment Data



Discussion

Appearance of virtual avatar, response to external stimuli, ownership of a virtual avatar, and multisensory feelings contribute to virtual embodiment.

Participants reported feeling more embodied with light pressure visuotactile stimulation compared to deep pressure visuotactile stimulation.

Participants reported feeling more engaged with occupation-based activities that incorporated multimodal stimulation.

Participants reported feeling less embodied when the limb of the virtual avatar did not represent their own (i.e., size, shape, skin tone, & other features).

Conclusion

- Findings suggest that engagement, presence, and usability may contribute to immersion, & consequently facilitating embodiment within IVR.
- Multimodal stimulation and participant's response to it seemed to be the driving factor for embodiment.
- Potential for IVR to be implemented as a tool to reduce pain and restore function & occupational performance.
- IVR may provide OTPs with alternative, therapeutic methods to treating chronic pain.

Limitations: limited video creation and editing resources, small sample size & research team, human error during intervention, researcher bias in data analysis and interpretation, variation in participants' interests and preferences

Future Suggestions: dedicated resources for video creation & editing, video scripts for consistency, larger sample size, more variety in occupation-based activities

References: Scan QR Code

Contact: Alexandro Guerrero, OT/s
alexandro.guerrero@tufts.edu

Acknowledgements
Thank you to Marise Cornelius, Akul Srinivasau, Saloni Patel, and all the hand models