Thesis Portfolio

Investigating the Efficacy of Virtual Experiences on Stress Reduction
(Technical Report)

Virtual Reality & the Opioid Crisis
(STS Research Paper)

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Patients are now seeking non-traditional approaches to clinical therapy that are safer, more economical, and more efficient. This demand results from widespread issues such as rising healthcare costs and the ongoing opioid epidemic. One technological approach that is receiving much recognition for its potential within the healthcare industry is virtual reality (VR) therapy. Once only used for entertainment purposes, VR has recently been repurposed into the healthcare space. Interestingly, large companies have made adding more virtual care solutions the top initiative for tackling health care costs in 2019. Furthermore, VR technology serves as a relevant, attractive novel therapy in that it recently emerged in the mass market with the invention of VR headsets, allowing it to be widely accessible at a reasonable cost. Ultimately, the capstone project and STS project seek to explore the emergence and effectiveness of VR as a versatile therapeutic clinical tool. While the capstone project focuses on the application of immersive virtual technology in the emotional health space, the STS research project explores what factors are influencing the development of VR therapy for the treatment of physical health.

My technical research project explores the combination of Attention Restoration Theory and immersive virtual technology as a novel therapy for short-term stress reduction in the workplace. The goal of our team's work was to understand how various immersive technologies impact the effect of both nature and urban environments on acute stress. In order to assess this, study participants were guided through "micro-vacations," or a series of virtual nature or urban images, after being induced with stress. The micro-vacations were presented via three different virtual immersive technologies: a virtual reality (VR) experience using a headset in a booth, a GeoDome experience, or a 2D experience which acted as a control. Biometric, subjective mood and comfort data were gathered from the participants throughout the study in order to measure the changes in stress and mood before, during, and after the microvacation experiences. We

hypothesized that the nature environments are more relaxing than the urban environments, and that both the VR booth and GeoDome will reduce stress levels in participants to a greater degree than the 2D images. Due to restrictions inflicted by COVID-19, however, the team was only able to gather preliminary results. While the results represent only preliminary findings on a limited sample size, such results from our study suggest nature stimuli had a restorative effect on stress and reflect potential for immersive virtual technology applications for stress management and relaxation.

For my STS research project, I wanted to explore how VR is being utilized in the physical pain space in light of the opioid crisis. Specifically, my research seeks to answer the question, "*What factors are shaping virtual reality's development as a pain therapy for alleviating the opioid crisis?"* I propose that rather than again turning to alternative sources of opioids to solve this issue, we should combat the crisis by exploring alternative sources of pain management. My paper first takes a closer look at the opioid epidemic in order to better understand the roots of the problem, then identifies major sources of influence from such background that could shape the development of VR pain therapy. The paper therefore explores three major areas: past VR pain therapy studies, big healthcare industry influencers, and regulation. It was found that researchers, medical physicians, pharmaceutical and insurance industries, and regulation are shaping and will continue to impact the development of alternative pain therapies such as VR. In order for VR pain therapy to move forward, the combined effort of a multi-industry approach is needed.

Overall, my capstone and STS research projects demonstrate the notable emergence of VR as a means of clinical therapy. The goal is ultimately to help advance the knowledge of this innovative therapy in both the emotional and physical healthcare space as it is becoming

increasingly considered for wide-spread adoption in the clinical world. Through my capstone experience, I learned a lot about VR as I personally worked with and became captivated with the technology myself. The year posed many challenges, however, in that restrictions inflicted by COVID-19 caused our capstone team's study to be cut short. Because of this, the team was only able to present preliminary findings. Despite this, however, future researchers will be able to continue where we left off in that the team laid all the groundwork for and documented our processes thus far. For my STS research project, I learned a lot about the opioid epidemic and how intertwined multiple industries can be in the development of novel therapies. Moving forward, I would assess the development of VR pain therapy for the opioid epidemic in context of the current COVID-19 pandemic. As the world becomes ever-increasingly confined to their homes during this time, the adoption of VR therapy for both stress-reduction and the treatment of physical pain doesn't seem too far off.