

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

**A Care Ethics Analysis of the Duke Research Team's Published Article: "Genomic
signatures to guide the use of chemotherapeutics" in the *Nature Medicine* journal**
(STS Research Paper)

An Undergraduate Thesis Portfolio

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Bachelor of Science in Systems Engineering

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Socio-technical Synthesis: Health Technology Research and Ethics

My technical work and my STS research are primarily connected through a shared focus on health technology. According to the World Health Organization, health technology is “the application of organized knowledge and skills in the form of devices, medicines, vaccines, procedures and systems developed to solve a health problem and improve quality of lives” (World Health Organization, 2015). While my technical work and STS research share this common ground, health technology is a very diverse field, and the specific subjects of these two works vary to a significant degree. My technical work is focused on improving health technology resources by testing the effectiveness of new digital technology on reducing stress and anxiety. However, my STS research is focused on exploring the potential ethical pitfalls during the testing of new health technology and methods. Although my technical work and my STS research examine two different aspects of health technology, the theme is consistent across both projects.

My technical work 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 this work is to understand how various immersive technologies impact the effect of both nature and urban environments on acute stress. In order to assess this, my capstone team designed a study in which 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 micro-vacation experiences.

My STS research explores a specific case of health technology research and testing. My research focuses on the use of the care ethics framework to analyze the actions of a Duke University research team that introduced an innovative way to treat cancer. Its method consisted of analyzing patients' genomic data and using this information to personalize treatments. The team advertised positive results, but its methods and analyses were fundamentally flawed (Carlson, 2012). Using these incorrect results, the team initiated multiple clinical trials. My claim is that the team did not successfully provide proper care to the cancer patients involved in the testing of the team's methodology. This is based on the team's repeated actions against the best interest of these individuals throughout both the initial study and the resulting clinical trials. The goal of my research is to promote a greater understanding of what constitutes ethical research practices, especially in the healthcare industry.

Working on the two of these projects simultaneously added value to both. My technical work introduced me to health technology research, and gave me a much greater understanding of the experimental processes involved testing and analyzing the effects of this type of technology on patients. My STS research complimented this new knowledge well by giving me a much greater awareness of the ethical concerns that can arise during this type of research. This improved my understanding of what it means to be an ethical and moral researcher. In conclusion, working on these two projects together has given me a significantly more well-rounded view of the health technology field than I could have achieved otherwise.

References:

Carlson, B. (2012). Putting oncology patients at risk. *National Center for Biotechnology*

Information, 9(3), 17–21. Retrieved from

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3474449/>

World Health Organization. (2015, May 26). *What is a health technology?*. Retrieved from

<https://www.who.int/health-technology-assessment/about/healthtechnology/en/>