

Thesis Portfolio

Development of a Novel Cardiovascular Vessel Health Monitor

(Technical Report)

Investigation of the Role of Poker on Poker Players Mental and Physical Health

(STS Research Paper)

An Undergraduate Thesis

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Bachelor of Science, School of Engineering

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Thesis Prospectus

Sociotechnical Synthesis

This thesis portfolio encompasses the work of two largely unrelated projects; a technical Capstone report and an STS Research Paper. The technical topic was a continuation of a summer research project in the UVa Biomedical Engineering department and the STS topic was chosen due to personal interests in poker and health. The technical deliverable describes a novel non-invasive device created to measure cardiovascular health indicators. While there is not a clear connection with the STS Research Paper, which analyzes how the game of poker effects the mental and physical health of the players, there are some loose connections tying the two projects together. Mainly, many of the effects of poker, such as stress, smoking, and alcohol consumption, have been previously identified as potential risk factors for various cardiovascular diseases. Therefore, the population of poker players could be a potential demographic that the device is looking to address, when evaluating heart health.

The goal of the technical Capstone project is to create a device that can monitor patient heart health inexpensively and noninvasively through the use of pulse wave velocity (PWV) analysis and metabolic equivalents of task (METs) calculations to gauge a patient's health fitness for cardiac surgery. Measurements of PWV can predict early-onset factors of heart disease. In addition, the device provides users with an objective method of calculating METs. Calculating METs in this manner allows decreases the element of human error in the estimation of one's health and allows healthcare professionals to make a more informed decision when sending a patient into surgery. Finally, in order to validate the efficacy of the device, an Institutional Review Board for Health Sciences Research (IRB-HSR) clinical trial commenced. The trial was designed to test the device on both healthy and sick patients in a clinical setting, in order to gain insight into necessary changes in future iterations.

Poker is a gambling card game that contributes to the larger pathological gambling issue in the United States today. Pathological gambling, a recognized mental health disorder, is one of many effects that poker has on players; as additional mental and physical health disorders have been connected to poker and gambling. These effects are often exacerbated by the environment cultivated by casinos and cardrooms, both land-based and online. Therefore, this paper attempts to answer the question of how this environment contributes to the mental and physical health of poker players. In order to frame the problem and structure an answer to this research question, Ulrich Beck's theory of risk analysis is utilized. This framework is supported by evidence gathered through ethnography, discourse analysis, and documentary research methods. The goal of this research is to shed light upon and provide sufficient supporting evidence for an important and relevant current issue. In addition, the research contributes to the field of STS as a case study of risk analysis and risk management. This can also be applicable to many engineering disciplines but, specifically, systems engineering as risk analysis is most often associated with the field. As poker and gambling as a whole begin to become legalized throughout the United States, the hope is that this paper will lead to additional comprehensive research on the topic, in order to better understand the causes and effects of the mental and physical health concerns caused by poker and other forms of gambling.

Both projects provided value, individually. Specifically, the technical project created a novel device that could help to transform clinical care of cardiovascular disease and inform clinical decisions. Hopefully, after additional validation and iterations, this device will help to improve outcomes in one of the largest health fields in the world. On the other hand, the STS topic provided valuable information to poker players, their friends and families, casinos, among others about the risks of playing. Ideally, this information will help these groups identify potential health risks and

help them to mitigate these risks in their daily lives. The advantage of working on these two projects is that it allowed for the research and creation of a novel medical device while also evaluating a potential target demographic, simultaneously. Obviously, the STS topic could have been changed to evaluate a more relevant demographic, however, this project also allowed for research into a topic of interest, making it more engaging. Finally, as a result of working on these projects, I was able to gain a better understanding for the role of engineers in the biomedical field and how these engineers identify and solve serious problems.