

Thesis Project Portfolio

Redesigning the Loop Connector for Patients of Size

(Technical Report)

Wearable Technology: The Rise of Personalized Technology in Obesity Care

(STS Research Paper)

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Ryan Ramey

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Executive Summary

Over the course of the 21st century, the most prominent causes of death have shifted from what they were throughout the world before. In the 20th century and prior, most people died of infectious diseases and other bacterial-related illnesses, the advent of vaccination and the abundance of healthcare in the developed world have reduced these to virtual nonexistence. Now, the primary causes of death are heart disease, cancer, and several other chronic illnesses that can for the most part be tracked to one root cause: obesity. This chronic disease, commonly characterized as being overweight, is on the rise in much of the world with no signs of slowing down. In the United States alone, 40.3% of the population is labeled as obese. While not necessarily guaranteed to cause its associated comorbidities, it remains a fact that the obesity epidemic is here to stay. This epidemic inspired my work, both on my technical research project and my STS research project, through the question of “how is the medical industry meeting the growing needs of the obese population, both for curbing the epidemic and accommodating those of larger size?” Though vast in scope, the two research projects each took their own direction in answering this question, with the technical side seeking to correct the flaws of one device impacting obese people and the STS side addressing and identifying the motivations of all involved in a relevant technological sector.

My technical research project originated from a problem facing certain obese patients in physical therapy and medical care across the country. The Loop Connector faces the key design flaw of only accommodating patients up to a certain weight. Those used at the University of Virginia can only accommodate 330 pounds themselves, with patients above that limit needing upwards of 8 or even 10 nurses to lift them physically for any purpose when they cannot do so themselves. This, as both I and my project advisor agreed, was dehumanizing and in desperate

need of correction. Throughout the course of my project I scoured the internet for different alternative textiles that could replace the weaker polyester of the current product design. I modeled different plastic replicas to identify its points of weakness, reached out to the textile engineering department of another university to inquire towards fabrication, but the project itself seemed out of my depth as a solo team member at a university without dedicated textile fabrication facilities. Thanks to my advisor's connection with a corporate textile engineer, we were able to determine several pre-fabricated textiles that could serve the same purpose as the loop connector while seemingly accommodating several times the weight of the current model. After thorough testing, we selected one of these textiles to potentially use on patients. This design process yielded a clear message that the weight of a patient is no excuse for the inadequacy of current devices to accommodate them, when working alternatives exist just a few clicks away.

As for my STS research, I chose to identify the motivations of the myriad groups involved in the rise of wearable devices, such as smart watches, in weight loss across the world. This sharp turn from my technical research served to answer the question of how the modern world is attempting to curb the obesity epidemic alongside the popularization of technology. This research primarily involved pouring through the three primary actors relevant to the network of wearable devices in weight loss, the manufacturers, the caregivers, and the consumers. For the manufacturers, this involved looking through earnings reports and identifying motivators based on common business practice. For the caregivers, separated into the physicians and the weight loss program creators, I looked through medical studies and reviews to verify the efficacy of these practices and how that impacts their popularity. Finally, for the consumers, I looked at anonymous reports from individuals who owned them for the purpose of weight loss and what

their experiences led them to believe. Though often disconnected in ideology, I found that each of these groups played a key part in the popularization of wearable devices in weight loss, and key indicators that showed this technology only becoming more prominent as time progresses because of it. Both the technical and STS sides of my research yielded promising results, though not quite as conclusive as I had hoped. On the technical side, the lack of communication from some of the companies I reached out to for textiles was disheartening, but I was glad to acquire and test successfully at least one product that could serve as a viable alternative to the current product. The STS side, while fairly complete, was vast enough that each individual actor in the network could garner their own research project if given the proper time. I did not feel as though I fully understood the motivations of each, opting for a broader view for the sake of understanding. All that said, I feel as though my projects were both successful in what I set out to do. It is now up to my peers, my future readers, and my professors to determine whether or not they agree with that.