

Thesis Project Portfolio

How wearable sensing can be used to monitor patient recovery following ACL reconstruction

(Technical Report)

Exploring the Relationship between Clinicians, Patients, and Wearable Health Sensors

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

Over the last decade, wearable sensors have become increasingly common for both general consumers and patients in the medical setting. Sensors have fundamentally altered the way patients can monitor their health and have facilitated certain tasks for clinicians. Despite improvements in technology, understanding how to properly integrate wearable sensors so that they improve the experiences of both patients and clinicians remains a difficult task. The following technical and STS theses identify how patients interact with wearable sensors and how sensors can positively affect a patient's health and recovery monitoring.

The technical project that I pursued sought to explore if wearable sensors could be used to assist patients in ACL recovery following a torn ACL and surgery. We set out to understand how the data from a wearable sensor could be used to identify whether a patient had a healthy ACL or not, and if not, how close they were to full recovery. In order to conduct this study, both healthy subjects and patients who had recently torn their ACL were analyzed. They performed a variety of physical tests with a wearable sensor on each leg and upon data collection my team and I extracted different metrics to perform statistical tests on between the healthy and ACL patients. We found several statistically significant features, indicating that wearable sensors can be a viable solution to tracking an ACL patient's recovery status.

The STS project explored the relationship between patients, clinicians, and wearable sensors using actor-network theory. The project aimed to understand how patients perceive and interact with wearables, how clinicians perceive the sensors and interpret their data, and how a patient's and clinician's relationship changes through the wearables. Past research was collected that provided examples of patients' and clinicians' experiences with sensors along with various

frameworks for how sensors have integrated themselves into the medical field. Patients were found to have strong feelings towards the size, ease of use, and simplicity of the sensors, whereas clinicians are focused on the accuracy of the sensor data.

The technical and STS projects both laid the groundwork for future projects. Researchers could expand on the technical project by gathering more subjects to validate the statistical findings and generate new features from other physical tests. The STS work could be further explored by finding new evidence of wearable sensors in the medical field. For the technical project I'd like to thank my fellow team members for all the hard work that they put in. For my STS project, I'd like to thank Professor Ferguson for guiding me through my findings and teaching me how to observe the anthropological side of technology.