Thesis Project Portfolio

Delivering Effective Physical Therapy Remotely via a Wearable Sleeve and Mobile Application

(Technical Report)

The Innovation of Gamified Physical Therapy

(STS Research Paper)

An Undergraduate Thesis

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Table of Contents

Sociotechnical Synthesis

Within the past couple of years, and especially during the COVID-19 pandemic, monitoring patient's health remotely has become the new norm. With the transition to telehealth, new technologies have been emerging to help doctors and therapists collect data from their patients while they are at home. This also has become increasingly prevalent in the physical therapy space, where therapists prescribe home exercise programs but have had no way of tracking their patient's progress. Also, patients do not have many incentives to complete their at-home exercise programs, which are key to their recovery process, and because so they may never fully recover from their injury. That is where our product comes in as a complete system to help track a patient's recovery, solve the communication barrier between patients and therapists, and provide incentives for patients to complete exercises through gamification.

Our product consists of three separate modules that work together to create a complete system. First, we have a lightweight motion capture wearable that is used to track the patient's motion in real-time. This motion capture data is displayed on a mobile application which serves as the patient portal, and the second module. Here, patients can view their exercises, communicate with their therapists, and track their progress using the motion capture wearable. Using the motion capture data with machine learning, the application will also alert the patient about how accurately they are completing each exercise, and provide tips for improving. Next, the therapists will have a web portal, the third module, where they can view all of their patients and communicate with them, schedule appointments with our built-in calendar feature, and prescribe their patients with

at-home exercises, and track the progress they are completing. Finally, with all the data being collected, and a patient's progress being tracked throughout their recovery process, we thought gamifying the application and providing real incentives will get patients motivated to complete their exercises. With that being said, gamifying the mobile application will not be an easy process, and I am researching the best methods of getting actors engaged.

Throughout this year, we were able to develop the system as desired, designing our own motion capture system and assembling it, while also coding the mobile application and web portal. Along with the engineering, we also did many hours of research finding out what the issues were in the physical therapy space and shaped our product in order to solve patient's and therapist's pain points. We learned to work together as a team, and overcame challenges with COVID, design flaws, and setbacks, and managed to come out with a working product. In terms of the future, and the work left to be done, we will need to get therapists to adopt this new form of technology, so patients everywhere can benefit from it.