

**Thesis Portfolio**

**Investigating Novel Proximity Monitoring Techniques Using Ubiquitous Sensor  
Technology**  
(Technical Report)

**Doping and the Athlete: The Effect of Anabolic Steroids on Elite Sport**  
(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science  
University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree  
Bachelor of Science, School of Engineering

Grayson DeBerry  
Spring, 2021

Department of Systems and Information Engineering

## **Table of Contents**

Sociotechnical Synthesis

Investigating Novel Proximity Monitoring Techniques Using Ubiquitous Sensor Technology

Doping and the Athlete: The Effect of Anabolic Steroids on Elite Sport

Thesis Prospect

## **Sociotechnical Synthesis**

In the advent of the COVID-19 pandemic, the measurement of social distancing has become more important than ever. The pandemic has specifically challenged sports teams to come up with ways to accurately measure distance between athletes to both abide by social distancing regulations and monitor contact tracing. This technical research will focus on the comparison of novel proximity detection techniques using three signal types: Bluetooth, ultrasound, and ultra-wideband. The paper will outline the differences between the three sensor types and the results of testing for mean squared error, accuracy, and precision. Ultimately, the research in this paper will help sports teams identify the most reliable and practical methods for proximity monitoring in practice and competition.

Another large issue facing athletes around the world is the use of performance enhancing drugs. In specific, anabolic steroids are abused by athletes at an alarming rate, and this can compromise the integrity of sport and create an uneven playing field. One area of study that is lacking in current literature is an analysis on the power dynamics at play between different entities involved in the sports world and how they affect anabolic steroid use. The power dynamics between athletes, sports organizations, anti-doping agencies, medical professionals, and more will be analyzed in this paper and will create a discussion about the ways in which athletes are simultaneously pressured to use the performance enhancing drugs but left without a voice in anti-doping processes. These two reports coupled together aim to create a safer environment for athletes in the COVID-19 pandemic and beyond.