

# Preventing Weightlifting Injuries by Barbell Modifications

October 21st- October 25th, 2024

Client: Mr. Robert Gold

Advisor: Prof. William Murphy

Team Members:

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## Problem Statement

Thousands of weightlifting injuries occur every year. Injuries are often caused by an uneven distribution of load on the barbell, leading to the weight lifter favoring one arm over the other. The team has been tasked with designing a biomedical device that can prevent weight lifting injuries by targeting, identifying, and correcting improper form.

## Brief Status Update

The team has made progress with the coding of the Arduino and MPU-6050, and is currently working on graphing on MATLAB. We have fabricated a test casing for the technology via 3D print, and now look forward to fabricating the actual casing of the technology.

## Team Goals

Examine test casing for technology, and make necessary adjustments for the actual final design. Continue coding and working on MATLAB, as well as outline testing.

## Individual Accomplishments and Goals

Jackson: This week I coordinated with the team to land on a meeting time, where we could begin fabrication of the final design. Kai and I came to the conclusion that we would focus on the coding aspect, because we had more experience in that sphere, while allowing Luke and Gavin freedom in the 3D printing and fabrication of the technology casing. Kai and I worked to pair the arduino and MPU-6050, and were able to see coordinate data on Arudino. Looking forward, we look to translate this data on to MATLAB, as well as begin planning testing procedures

Kai: This week I met with my TA's and professor for biomechanics and spoke about some of the coding involved with calibrating the IMU sensor and how to properly track data from it. We also discussed the wiring and proper voltage to ensure that the circuit functions properly. I met with the team in the makerspace to work on our fabrication for the first prototype and successfully printed our first box element for the circuitry. The next steps for the team is to fine tune the coding to translate into MATLAB for digital analysis and provide data feedback for us to examine. We will also aim to assemble the components of the prototype to have a finished product for show and tell next friday.

Luke: This week I was able to have the opportunity with Gavin to learn about the process of 3D printing. I unfortunately was not fluent in any program so I had to do a little bit of research watching youtube videos in order to gain a better understanding which I can now use for future reference. I went into solid works and created a basic design as well for the compartment's latch, however, Gavin's was much better so we ended up going with his. I am going to continue to expand my knowledge regarding solid works this week as I play around with it, and depending on the plan with the 300's in the group for this upcoming week I might learn about some of the coding and circuitry of our design. I also plan to perhaps come up with some backup designs for the compartment if we decide to do more designing for that, as well as be ready to 3D print any other parts that would be necessary for us to consider for this project.

Gavin: This week I designed a latch and sliding cover for the container that will house the electronics. Luke and I made a 3-D Model that we will use to test the latching mechanism and the sliding cover. I 3D printed our first model but we didn't put in any tolerance for the sliding mechanism so it would jam and we couldn't test the latch. I redid the 3-D model and it is in the process of being printed, it should be done by tonight. In this upcoming week I hope to test the latch and if it is successful Luke and I will make a 3-D model for the whole containment unit and 3-D print it. If it doesn't work we will adjust it until it works then 3-D print the whole unit.

**Design Accomplishments**

Test model for technology casing. The weightlifting clips have arrived. We have calibrated the MPU-6050 to show coordinates on Arduino. We have made beginning progress on MATLAB coordination.

**Weekly/Ongoing Difficulties:**

N/A

**Project Timeline:**

| <b>Week #</b> | <b>Task</b>                                                                                            |
|---------------|--------------------------------------------------------------------------------------------------------|
| <b>1</b>      | <b>Choose project<br/>Assign roles</b>                                                                 |
| <b>2</b>      | <b>Finish first progress report<br/>BSAC meeting<br/>First client meeting</b>                          |
| <b>3</b>      | <b>PDS, Brainstorm, Research</b>                                                                       |
| <b>4</b>      | <b>Brainstorm, Literature Search, Design matrix<br/>criteria and design ideas (at least three) due</b> |
| <b>5</b>      | <b>Preliminary Oral Presentation</b>                                                                   |
| <b>6</b>      | <b>Preliminary Report, Electronic Notebook,</b>                                                        |

|           |                                                                                                            |
|-----------|------------------------------------------------------------------------------------------------------------|
|           | <b>Peer/Self Evaluation, Decide on final design</b>                                                        |
| <b>7</b>  | <b>Final Design</b>                                                                                        |
| <b>8</b>  | <b>Order materials, consider submitting invention disclosure</b>                                           |
| <b>9</b>  | <b>Fabrication, show and tell</b>                                                                          |
| <b>10</b> | <b>Fabrication</b>                                                                                         |
| <b>11</b> | <b>Fabrication</b>                                                                                         |
| <b>12</b> | <b>Design Testing and Modification, Poster Draft Review</b>                                                |
| <b>13</b> | <b>Design Testing and Modification, Final Report</b>                                                       |
| <b>14</b> | <b>Poster Presentation, Final Report, Final Electronic Notebook, Team Evaluation, Peer/Self Evaluation</b> |

Expenses  [BPAG Expense Spreadsheet](#)