Preventing Weightlifting Injuries by Barbell Modifications
October 7th - October 11th, 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 met on Monday to discuss the preliminary report, and how we would divide the sections in order to complete. Together we completed the report to document our progress on the project so far.

Team Goals
Our goals include beginning the 3D printing fabrication process, as well as ordering our necessary electronics. In the meantime, we will continue researching coding IMUs and Arduinos to get a headstart on the process.

Individual Accomplishments and Goals
Jackson: This week we met on Monday, where Kai and I explained our goals for the report and this coming week given everyone's schedules and midterms. I was able to do some additional research on the Arduino Nano as well as tough PLA as I completed my sections for the preliminary report. I worked with Gavin to create the BPAG spreadsheet, as he will place these orders within the coming days. I look forward to tackling the coding portion of this project as we look to pair the IMUs and Arduinos, and collect data to create a barbell path.

Kai: This week I spoke with my biomechanics professor about how to use IMUs and she showed me ones that are used for a lab. I was able to understand how to use them and did some testing in the ECB lab and was able to display data in 3D for the first time using MATLAB. This means that doing testing with our prototype is definitely possible and we will already have code that is very similar to what we want to do. Jackson and I laid out our goals for the next few weeks and let the rest of the team give feedback and we made modifications accordingly. I hope to have a prototype in the next 7 days and be able to do testing on that as well.

Luke: At the beginning of this week I read through my teammates Kai's research he had done on the function of IMU chips and how we are going to be using code to determine the position of our barbell relative to an origin by converting the reading we get from IMU chips which will be angular velocity into position. I tried to find the exact code that would be able to do these computations, but I unfortunately wasn't able to find anything that seemed applicable for our purposes. This upcoming week I will discuss with my group mates if we already have what we need for this code and how it actually works, perhaps learn a basic thing or two about the language of code we are going to use, which I believe will be python.

Gavin: This week I worked on the preliminary report and creating the BPAG spreadsheet with Jackson. I have also done some more research on how we will physically connect all of our electronics and set up our devices. In the upcoming days, I will order all of the parts and electronics that we need for prototyping. I also plan to start the 3D printing process for the shell of our design, so when the electronics are delivered we can start building our prototype right away, and start testing. I will also help work on the coding of our device.

Design Accomplishments
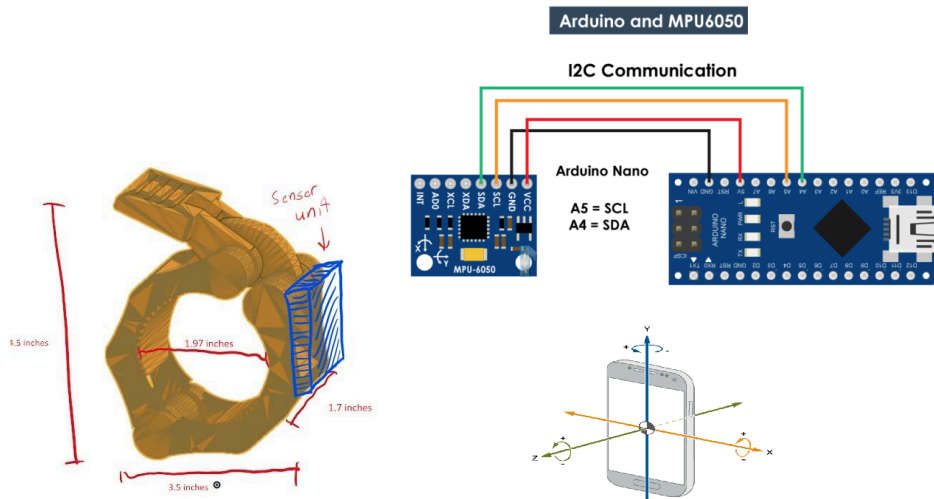
The team will move forward with the 3D printing of a functional weight lifting clip with necessary housing for the following technology. We will utilize an Arduino Nano in each clip, paired with a MPU6050. The arduino nanos will collect data and pair with each other via bluetooth, and the MPU6050 will collect data in terms of angular velocity and acceleration. We will derive this data to displacement, and establish a coordinate system and line of best fit of the barbell path from there.

Weekly/Ongoing Difficulties:
N/A

Project Timeline:

Week #	Task
1	Choose project Assign roles
2	Finish first progress report BSAC meeting First client meeting
3	PDS, Brainstorm, Research
4	Brainstorm, Literature Search, Design matrix criteria and design ideas (at least three) due
5	Preliminary Oral Presentation
6	Preliminary Report, Electronic Notebook, Peer/Self Evaluation, Decide on final design
7	Final Design
8	Order materials, consider submitting invention disclosure
9	Fabrication, show and tell
10	Fabrication
11	Fabrication
12	Design Testing and Modification, Poster Draft Review
13	Design Testing and Modification, Final Report
14	Poster Presentation, Final Report, Final Electronic Notebook, Team Evaluation, Peer/Self Evaluation

Expenses ✚ **BPAG Expense Spreadsheet**