Brendt Stephens
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Strength Test and Measurement Individual Deliverable: 49ers

Objectives

-To use a load cell design for measurement testing
-To design three experiments used to simulate different methods of obtaining strength measurements with the inspiration for GHD machine interfacing
-To accurately provide data to be easily manipulated by the User Interface Sub-team

Individual Experimental Setup

Ankle Strap Design

Similar to the NordBord two angle hook design, my individual experiment setup aims to test how the load cell sensor works in conjunction with ankle strap support to test the feasibility and reliability of having a two loops design for player testing. Each leg has one force sensor to combine to measure peak force, but also to compare the values to measure asymmetry.
Experimental design parameters for this setup include consistency and accuracy of measurements, as well as how they compare to the other strength testing setups. Diagram of setup included at end of report.

Reasoning and Analysis

Load Cell Selection

After researching various methods of force measurement, including force pads, strain gages, and load cells, we as a sub-team came to the conclusion that load cells were the best option for performing the measurements for each of our individual setups. Load cells are ubiquitously used in similar experimental setups like this, and are reliable in providing accurate measurements, regardless of how the weight is distributed upon it. Force pads were another option examined but they are not on the market and would make measuring peak force difficult. Strain gages are similar to load cells in how they are independent in how the weight is placed on the gage, but are more for small scale precise measurement and do not reach the max force we see during real GHD use.

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Pull Pressure Force S-type Load Cell Sensor

Max Output and Shape:

The chosen load cell , capable of measuring compression or tension up to 980N. The largest maginitute recorded for a hamstring test in the NFL is only 900N, with the average falling much below at about 450N. The small shape and S shape of the load cell make it easy to handle and built around during experiments, and also feasible for incorporation on an actual GHD machine at the ankle support.

Interfacing Capabilities

The S type load cell is also easily interfaced mechanically, as it has threaded holes for use with pegs and hooks to connect other parts of the experiment. Furthemore, these load cells are designed to communicate with simple amplifiers and arduino boards for easy access and manipulation of data on a computer and to the UI Sub-Team

Shopping List

- 2x Pull Pressure Force S-type Load Cell Sensor (Amazon link)
- M12 Ring Eye Bolts
- Plywood to act as a fixed object/hold the bottom of the load cell
- Bolts for plywood plate (Amazon)
- 2x Amplifier (Link)
- Arduino Board (Link)
- Jumper Wires (Link)
- Ankle Straps (Link)

Shipping Address:
5358 Abington Dr
Troy, MI
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