

Johnny Fung
49ers Project
Individual Deliverable in lieu of Progress Report

Sensing Team Individual Deliverable

After researching sensors to test, we chose a pull pressure force sensor. This sensor was chosen for multiple reasons. In terms of the max force it can measure, it can get up to about 1 kN which is right above where the strongest hamstring force was found in the data from Nordbord. Their highest data point amongst all the players they have tested was about 900 N. Its accuracy is 0.03%, which, at the max weight load, has an uncertainty of 0.3 N. This s-type load cell is pretty standard for most strength/tensile tests, and with the test setups the sensing team is considering, it seems fitting. The NordBord also uses two load cells, each one connected to a hook for the ankles on the athlete. More on the testing setup will be discussed later. Price was also a large factor in the choice of load cell. Many load cells are expensive if wanting more precise measurements, and having a digital reader to the load cell also has an additional cost. Force pads were also an option, but it is limited in availability due to cost. Instead, we are planning to have our own output source using a microcontroller. We will need an amplifier, an arduino board and jumper wires to connect the load cell.



As for the test setup, each person on the sensing team will be constructing their own testing setup. The goal of each testing setup is to determine the best locations for the load cells on the exercise machine as well as determining how well the load cell measures forces for the

purpose of this project. My testing setup will have two load cells. A long rod will be attached to the load cells, which will act as the ankle roller on the glute-hamstring machine, and the bottom part of the load cell will be attached to a plate on the ground to act as a stationary reference point. The load cell has a threaded hole which will assist in connecting these parts together. This will be similar to the Nordbord in the sense that there are two load cells working to measure the forces. The main variation is putting the load cells at the center instead of on the side as well as having one rod acting on both load cells. Jonathan will be conducting a test that is very similar to mine except that his load cells will be apart from each other, on the sides.

List of things to buy:

- 2x Pull Pressure Force S-type Load Cell Sensor ([Amazon link](#))
- Foam Padding (I can acquire on my own)
- [M12 Ring Eye Bolts](#)
- 2x 1 inch diameter, 1 foot long aluminum rod extending from the load cell (will need a threaded M12 to attach to load cell w/ bolt) [McMaster](#)
- Plywood to act as a fixed object/hold the bottom of the load cell
- Bolts for plywood plate ([Amazon](#))
- Amplifier ([Link](#))
- Arduino Board ([Link](#))
- Jumper Wires ([Link](#))

Shipping Address: 4921 S. Rockwell St.
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