

LOWER EXTREMITY LOADING DEVICE DURING MAGNETIC RESONANCE IMAGING, BME 301

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Progress Report 3 | Date: February 10 to February 15, 2024

Problem Statement:

Hamstring strain injuries (HSIs) are the most common musculoskeletal injuries experienced in many sports and recreational activities [1]. Prior HSIs have been shown to significantly increase patients' risk for additional injury, due in part to neuromuscular alterations [1]. In order to research this phenomena and supplement the current rehabilitation process for HSIs in order to mitigate reinjury risk, a biomedical device is required. This device must be compatible with magnetic resonance imaging (MRI) and mechanically induce hamstring activation on a patient in the supine position in the MRI machine. The device will then collect knee flexion and resistance data that can be observed with the MR imaging.

Brief Status Update:

This week, the team identified three preliminary designs for the overall device mechanism as well as three preliminary designs for the method of providing resistance to the hamstring. With these designs, we identified important criteria that corresponded to the client requirements and graded each design against those criteria to determine the best design(s).

Difficulties / advice requests:

- The team was hoping to better understand the design project's budget
- The team was also hoping to receive help acquiring the dimensions of the specific GE MAGNUS MRI machine's table so as to better understand the dimensions the device should adhere to.

Current design:

N/A

Materials and expenses:

Item	Description	Manufacturer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost Each	Total	Link
Category 1										
Category 2										
									\$0.00	

Previous Week Accomplishments/Activities:

Team	<ul style="list-style-type: none"> - This week the team worked to further individual research and brainstorm individual ideas. After the team completed these tasks we met to discuss our ideas and to come up with three ideas for the design matrix. We then worked to complete the design matrix.
Nikhil	<ul style="list-style-type: none"> - I spent time individually brainstorming ideas then brought these ideas to our group brainstorming session while coming up with new ideas with the other team members (4 hours) - I am continuing to work on the design matrix in voting for a design and creating descriptions for various criteria and designs(1 hour)
Caelen	<ul style="list-style-type: none"> - Brainstormed and detailed initial design ideas (2 hours) - Met with the team to go over design ideas, identify preliminary designs, and plan the design matrix (1 hour) - Research optimal knee angle for hamstring activation, as well as physics of the biceps femoris long head (2 hours) - Wrote the descriptions for design criteria in the design matrix (1 hour)
Ethan	<ul style="list-style-type: none"> - Spent time working on individual designs as well as doing research into some of the factors that could play into our design criteria (3 hrs) - Met with the team to discuss individual ideas and to brainstorm potential improvements (1 hr) - Worked on the skeleton of the design matrix to be included in the progress report this week (1 hr) - Uploaded related documents to the project website (15 min)
Micah	<ul style="list-style-type: none"> - This week I research competitive designs to help form design ideas (2 hr.) - Completed 3 hand drawn design and detailed lists for each design on what makes it unique and how they were feasible (2 hr) - Worked on a design matrix explaining designs and justifications for our ratings (2 hr.)

