

# LOWER EXTREMITY LOADING DEVICE DURING MAGNETIC RESONANCE IMAGING, BME 301

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**Progress Report 1 | Date:** February 3 to February 8, 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:**

The design team met and worked together on the Product Design Specifications for the hamstring loading device that is to be fabricated this semester. This will ensure proper criteria and constraints are considered as the team begins formulating design ideas as well as a design matrix.

## **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
<b>Category 1</b>										
<b>Category 2</b>										
									\$0.00	

**Previous Week Accomplishments/Activities:**

Team	<ul style="list-style-type: none"><li>- The team overall continued individual research on the biological and physiology of neuromuscular control and hamstring activation, existing hamstring loading devices, amongst more. Additionally, the team worked together to complete the Product Design Specifications for the hamstring loading device that is to be fabricated over the semester.</li></ul>
Nikhil	<ul style="list-style-type: none"><li>- Conducted more research on standards and specifications, competing designs, hamstring biomechanics and physiology (3 hours)</li><li>- Coalesced relevant research in writing sections of the PDS (1 hour)</li><li>- Worked with the team to check over and complete PDS (1 hour)</li></ul>
Caelen	<ul style="list-style-type: none"><li>- Completed assigned PDS sections and adding details to other sections, as well as formatting much of the document (3 hrs)</li><li>- Refined the client meeting notes in order to better highlight client requirements (1 hr)</li></ul>
Ethan	<ul style="list-style-type: none"><li>- Researched design constraints in relation to the section of the PDS completed (ergonomics, accuracy, etc.) (2 hr)</li><li>- Completed assigned PDS sections and proofread document (3 hr)</li><li>- Completed Table of Contents and References for PDS (1 hr)</li></ul>
Micah	<ul style="list-style-type: none"><li>- Researched MR compatible material and similar loading device designs (2 hr)</li><li>- Worked on PDS sections and reviewed document (2 hr)</li><li>- Researched PDS categories (weight, size, materials) (1hr)</li></ul>

### Upcoming Team and Individual Goals:

Team	<ul style="list-style-type: none"><li>- Moving forward, the team will discuss our individual research collectively, continue working on the product design specifications, and further on will move into the brainstorming stage after a more thorough understanding of the design specifications and constraints.</li></ul>
Nikhil	<ul style="list-style-type: none"><li>- Begin brainstorming individual ideas and extracting inspiration from other competing designs and relevant research.</li><li>- Bring forth individual ideas to group brainstorming session and develop a design matrix with top ideas</li><li>- Begin work on preliminary presentation and next week's deliverables</li></ul>
Caelen	<ul style="list-style-type: none"><li>- Accumulate a better understanding on how to induce constant tension via literature research and current products</li><li>- Begin to brainstorm distinct design ideas</li><li>- Communicate with the client to go over the PDS and arrange remaining questions to be answered</li></ul>
Ethan	<ul style="list-style-type: none"><li>- Continue research into the different ways the device could apply constant tension to the hamstring as this is a major part of the design</li><li>- Continue formulating design ideas and determine which of the ideas could be most feasible</li><li>- Begin to make a mock design of one of the design ideas formulated in SolidWorks</li><li>- Update the website appropriately for this week's deliverables</li></ul>
Micah	<ul style="list-style-type: none"><li>- Continue research in the areas of hamstring flexion and similar devices</li><li>- Make sure notebook is up to date and apply previous notebook check feedback</li><li>- Continue to formulate design ideas and resistance options</li><li>- Work with team to setup a meeting with client</li></ul>

