

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

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**Progress Report 1 | Date:** January 26 to February 2, 2024

## **Problem Statement:**

Hamstring strain injuries (HSIs) are the most common musculoskeletal injuries experienced in many sports and recreational activities. Prior HSIs have been shown to significantly increase patients' risk for additional injury, due in part to neuromuscular alterations. In order to research this phenomena and supplement the current rehabilitation process, 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 assigned roles for the upcoming design project. This week, questions about the project description were brainstormed and have been answered in a meeting with the client. Using this background and understanding of the problem, preliminary research and design ideas have begun.

## **Difficulties / advice requests:**

There are no difficulties at the moment

## **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>										
									<b>\$0.00</b>	

**Previous Week Accomplishments/Activities:**

Team	<ul style="list-style-type: none"> <li>- The team overall conducted initial individual research on the biological and physiology of neuromuscular control and hamstring activation, existing hamstring loading devices, amongst more.</li> </ul>
Nikhil	<ul style="list-style-type: none"> <li>- Read over client meeting notes and read additional articles sent by client(1 hr)</li> <li>- Conducted additional research on project in various areas including competing designs in hamstring loading machines, research on neuromuscular control differences in the context of hamstring strain injuries, and discussion with team members about the project.(3 hr).</li> </ul>
Caelen	<ul style="list-style-type: none"> <li>- Corresponded with the client to arrange a meeting (0.5 hr)</li> <li>- Met with the client to discuss the project description and pertinent requirements (1 hr)</li> <li>- Researched hamstring activation exercises to use in the design, as well as other experiments with similar setups (4 hrs)</li> </ul>
Ethan	<ul style="list-style-type: none"> <li>- Met with the client to discuss the project, as well as his expectations for the design (1 hr)</li> <li>- Researched the anatomy and functionality of the hamstring to provide a good base of knowledge (2 hrs)</li> <li>- Researched similar studies in hamstring activation that had MR compatible activation devices (1 hr)</li> </ul>
Micah	<ul style="list-style-type: none"> <li>- Met with client to discuss project scope and some provided materials ( 1hr)</li> <li>- Research knee flexion and hamstring activation along side MRI compatible materials (3 hrs)</li> <li>- Reviews client’s materials and discussed scope of project with team (0.5 hr)</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, begin work 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>- Further research varying competing designs especially designs that have addressed hamstring activation with an individual laying in a supine position, and loading devices that deliver constant resistance.</li><li>- To begin work on the product design specifications with the team and begin doing individual brainstorming for potential design ideas</li></ul>
Caelen	<ul style="list-style-type: none"><li>- Continue research on necessary physiology, technology, and similar designs</li><li>- Complete the preliminary design specifications</li><li>- Begin formulating design ideas for use in the preliminary deliverables</li></ul>
Ethan	<ul style="list-style-type: none"><li>- Follow up on some of the questions posed in the journal entries in the notebook, as getting the answers could provide valuable information</li><li>- Pivot the research towards understanding some of the competing designs currently</li><li>- Work on the preliminary design specifications</li><li>- Continue formulating design ideas</li></ul>
Micah	<ul style="list-style-type: none"><li>- Continue research into MR compatible materials</li><li>- Look at referenced articles and keywords within documentation provided by client</li><li>- Start to think about PDS categories and prepare further questions for client</li></ul>

