BME Design-Fall 2024 - ELAINA RIZZO
Complete Notebook

PDF Version generated by

Elle Thom

on

Dec 11, 2024 @05:55 PM CST

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Team contact Information

Elle Thom - Sep 18, 2024, 6:13 PM CDT

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Project description

Elle Thom - Dec 09, 2024, 6:13 PM CST

Course Number: BME 200/300

Project Name: Low Interference Wheelchair Footrest

Short Name: Footrest Fanatics

Project description/problem statement:

Currently, on the market, there are no known wheelchairs that allow for users who have remaining function in their legs to maintain the use of their feet in everyday life. A revised wheelchair footrest should: adapt to the user's lifestyle and abilities, be easily removable and attachable, and function as a traditional footrest while in the original position.

About the client: Our client has muscular dystrophy with some remaining motion in his legs and wants a footrest that can allow him to have maximum space for his legs when sitting in the wheelchair while the footrest is not needed without having to detach the entirety of the footrest.

2024/09/27-Measurements

Elle Thom - Sep 27, 2024, 12:10 PM CDT

Title: Measurements

Date: 9/27/2024

Content by: Footrest Fanatics

Present: Footrest Fanatics

Goals: Record measurements of wheelchair and Client

Content:

Track length: 21''

Track Width: 1 3/4''

Cylinder length: 4.5''

Cylinder diameter: 1.25''

Foot length: 15''

Leg to back of chair: 10'' +- 1.5''

Width of Foot: 7'' +-1''

Floor to under chair: 16.5/17''

arm rest to the main wheel: 12''

heels all the way back under chair: 13''

2024/12/09-Client Meeting Notes

Elle Thom - Dec 09, 2024, 6:44 PM CST

Title: Client Meeting notes

Date: 12/09/2024

Content by: Footrest Fanatics team

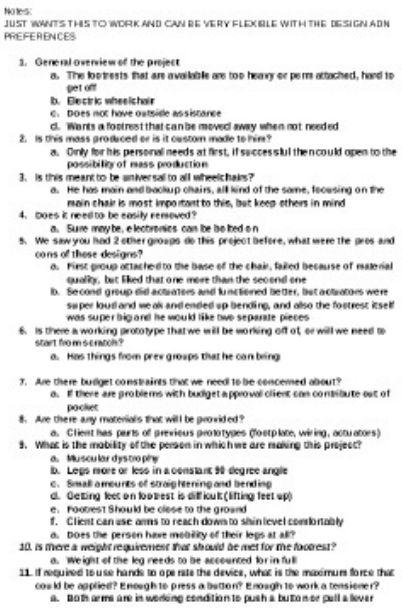
Present: Everyone and the client

Goals: Write notes on the client meeting

Content: Attached below

Conclusions/action items: Took Notes on the client meeting

Elle Thom - Dec 09, 2024, 6:44 PM CST



Notes:
JUST WANTS THIS TO WORK AND CAN BE VERY FLEXIBLE WITH THE DESIGN ADN PREFERENCES

1. General overview of the project
   a. The footrests that are available are too heavy or perm attached, hard to get off
   b. Electric wheelchair
   c. Does not have outside assistance
   d. Wants a footrest that can be moved away when not needed
2. Is this mass produced or is it custom made to him?
   a. Only for his personal needs at first, if successful then could open to the possibility of mass production
3. Is this meant to be universal to all wheelchairs?
   a. He has main and backup chairs, all kind of the same, focusing on the main chair is most important to this, but keep others in mind
4. Does it need to be easily removed?
   a. Sure maybe, electronics can be bolted on
5. We saw you had 2 other groups do this project before, what were the pros and cons of those designs?
   a. First group attached to the base of the chair, failed because of material quality, but liked that one more than the second one
   b. Second group did actuators and functioned better, but actuators were super loud and weak and ended up bending, and also the footrest itself was super big and he would like two separate pieces
6. Is there a working prototype that we will be working off of, or will we need to start from scratch?
   a. Has things from prev groups that he can bring
7. Are there budget constraints that we need to be concerned about?
   a. If there are problems with budget approval client can contribute out of pocket
8. Are there any materials that will be provided?
   a. Client has parts of previous prototypes (footplate, wiring, actuators)
9. What is the mobility of the person in which we are making this project?
   a. Muscular dystrophy
   b. Legs more or less in a constant 90 degree angle
   c. Small amounts of straightening and bending
   d. Getting feet on footrest is difficult (lifting feet up)
   e. Footrest Should be close to the ground
   f. Client can use arms to reach down to shin level comfortably
   g. Does the person have mobility of their legs at all?
10. *Is there a weight requirement that should be met for the footrest?*
    a. Weight of the leg needs to be accounted for in full
11. If required to use hands to operate the device, what is the maximum force that could be applied? Enough to press a button? Enough to work a tensioner?
    a. Both arms are in working condition to push a button or pull a lever

Download

client_meeting_notes.docx (10 kB)

2024/12/09-Client Questions

Elle Thom - Dec 09, 2024, 6:40 PM CST

Title: Client Questions

Date: 12/09/2024

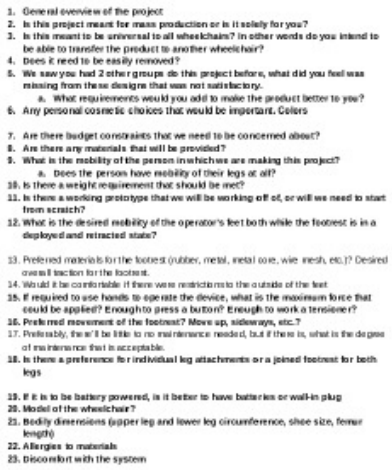
Content by: Footrest Fanatics team

Present: Everyone and the client

Goals: Create a list of questions to ask the client

Conclusions/action items: The team created a list of questions for the client to answer that will be the guideline for the PDS and design matrix.

Elle Thom - Dec 09, 2024, 6:38 PM CST



1. General overview of the project
2. Is this project meant for mass production or is it solely for you?
3. Is this meant to be universal to all wheelchairs? In other words do you intend to be able to transfer the product to another wheelchair?
4. Does it need to be easily removed?
5. We saw you had 2 other groups do this project before, what did you feel was missing from these designs that was not satisfactory.
    a. What requirements would you add to make the product better to you?
6. Any personal cosmetic choices that would be important. Colors

7. Are there budget constraints that we need to be concerned about?
8. Are there any materials that will be provided?
9. What is the mobility of the person in which we are making this project?
    a. Does the person have mobility of their legs at all?
10. Is there a weight requirement that should be met?
11. Is there a working prototype that we will be working off of, or will we need to start from scratch?
12. What is the desired mobility of the operator's feet both while the footrest is in a deployed and retracted state?

13. Preferred materials for the footrest (rubber, metal, metal core, wire mesh, etc.)? Desired overall traction for the footrest.
14. Would it be comfortable if there were restrictions to the outside of the feet
15. If required to use hands to operate the device, what is the maximum force that could be applied? Enough to press a button? Enough to work a tensioner?
16. Preferred movement of the footrest? Move up, sideways, etc.?
17. Preferably, there'll be little to no maintenance needed, but if there is, what is the degree of maintenance that is acceptable.
18. Is there a preference for individual leg attachments or a joined footrest for both legs

19. If it is to be battery powered, is it better to have batteries or wall-in plug
20. Model of the wheelchair?
21. Bodily dimensions (upper leg and lower leg circumference, shoe size, femur length)
22. Allergies to materials
23. Discomfort with the system

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Client_Meeting_Questions.docx (10 kB)

2024/09/13 Advisor meeting

ELAINA RIZZO - Sep 13, 2024, 11:25 AM CDT

Title: Advisor meeting

Date: 9/13/24

Content by: BME Design group

Present: Group, Prof. Melissa Skala

Goals: Take notes on advisor meeting

Content:

Conclusions/action items:

Progress Report 1

ELAINA RIZZO - Nov 15, 2024, 5:30 PM CST

BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 9/13/24

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

Elaina Rizzo

Yair Ben Shlomi

Ella Thorn

Timothy Moeller

Brief status update

Upcoming this week, the team has the first client meeting scheduled, where we will outline the requirements and constraints for this project. The team has also been working on researching general ideas for this project, as well as beginning the brainstorming phase that we can bring to the next team meeting.

Major team goals for the next week

1. Collect a list of client requirements and design specifications from the scheduled client meeting.
2. Start work on creating the Product Design Specification and Problem Statement.

Next week's individual goals

- Elaina Rizzo
  - Research problem and come up with more design ideas
  - Move forward with client information into prototyping stage
  - Create a PDS
  - Set up weekly team meetings around schedules
- Ellenas Thorn
  - Meet with the client to make introductions and collect information of design specifications and project requirements.
  - Meet my team since I was sick last week
  - Start researching more on the project
  - Meet with our project advisor
  - Create a PDS
- Yair Ben Shlomi
  - Go to BSAC meeting
  - Keep researching design ideas and useful information
  - PDS
  - Enter the research I did into lab archives
  - Work on design drawings to visualize ideas

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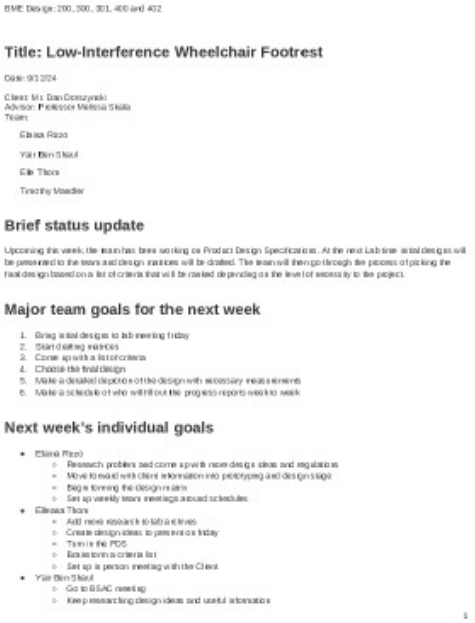
Progress Report 2

ELAINA RIZZO - Nov 15, 2024, 5:31 PM CST



BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 9/13/24

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

Elaina Rizzo

Yair Ben Shaul

Ella Thorn

Timothy Moeller

Brief status update

Upcoming this week, the team has been working on Product Design Specifications. At the next Lab time initial designs will be presented to the team and design matrices will be drafted. The team will then go through the process of picking the final design based on a list of criteria that will be ranked depending on the level of necessity to the project.

Major team goals for the next week

1. Bring initial designs to lab meeting friday
2. Start drafting matrices
3. Come up with a list of criteria
4. Choose the final design
5. Make a detailed depiction of the design with necessary measurements
6. Make a schedule of who will fill out the progress reports week to week

Next week's individual goals

- Elaina Rizzo
  - Research problem and come up with more design ideas and regulations
  - Move forward with client information into prototyping and design stage
  - Begin forming the design matrix
  - Set up weekly team meetings around schedules
- Ellenna Thorn
  - Add more research to lab activities
  - Create design ideas to present on friday
  - Turn in the PDS
  - Brainstorm a criteria list
  - Set up in person meeting with the Client
- Yair Ben Shaul
  - Go to BSAC meeting
  - Keep researching design ideas and useful information

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Progress Report 3

ELAINA RIZZO - Nov 15, 2024, 5:31 PM CST

BME Design: 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 9/26/24

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

- Elaina Rizzo
- Yair Ben Shaul
- Elle Thorn
- Timothy Moeller

Problem Statement

Currently on the market, there are no known wheelchairs that allow for users who have remaining function in their legs to maintain use of their feet in everyday life. Use of the feet may include opening doors, putting their feet on the ground for better mobility overall, and picking up objects from the ground. Current footrest models are static in their position and do not allow for modification in position, as well as heavy and are not easily removed for storage.

While wheelchair footrests are essential in supporting the user's legs and feet when inclined or tilted, it is vital to design the footrests to be able to allow for greater mobility of the feet should the user need it. The revised footrests should be adjustable to the user's abilities and lifestyle, be easily removable, and have reduced weight while still remaining functional as a traditional footrest when in the original position.

Brief status update

Upcoming this week, the team will begin work on the design matrix now that the final design has been determined and agreed upon. We are planning to research different materials and costs for the prototype footrest and will continue researching specifics about the individual parts and mechanisms we plan to use. Through this, we aim to iron out the final plan for our prototype and prepare for the purchase of the required resources.

Major team goals for the next week

1. Conduct further work on the design matrices
2. Research materials for the prototype and perform a degree of cost analysis
3. Sketches and consider upgrades to existing parts in the planned prototype
4. Schedule a team meeting and corroborate all data gathered
5. Begin planning for upcoming presentation

Next week's individual goals

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Progress Report 4

ELAINA RIZZO - Nov 15, 2024, 5:32 PM CST

BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 10/7/24

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

- Elaina Rizzo
- Yair Ben Shaul
- Elle Thorn
- Timothy Moeller

Problem Statement

Currently on the market, there are no known wheelchairs that allow for users who have remaining function in their legs to maintain use of their feet in everyday life. Use of the feet may include opening doors, putting their feet on the ground for better mobility overall, and picking up objects from the ground. Current footrest models are static in their position and do not allow for modification in position, as well as heavy and are not easily removed for storage.

While wheelchair footrests are essential in supporting the user's legs and feet when inclined or tilted, it is vital to design the footrests to be able to allow for greater mobility of the feet should the user need it. The revised footrests should be adjustable to the user's abilities and lifestyle, be easily removable, and have reduced weight while still remaining functional as a traditional footrest when in the original position.

Brief status update

Upcoming this week, the team will work on the preliminary presentation in preparation for Friday. We are still researching materials and costs for the prototype footrest and will continue researching specifics about the individual parts and mechanisms we plan to use. We are aiming to be able to purchase materials as soon as possible to begin working on a prototype.

Major team goals for the next week

1. Continue to research materials for the prototype and problem
2. Scrutinize and consider upgrades to existing parts in the planned prototype
3. Schedule a team meeting and coordinate all data gathered
4. Work on the preliminary presentation
5. Rehearse presentation before presenting on Friday

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Progress Report 5

ELAINA RIZZO - Nov 15, 2024, 5:32 PM CST

BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 10/30/24

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

- Elaina Rizzo
- Yair Ben Shaul
- Elle Thorn
- Timothy Moeller

Problem Statement

Currently on the market, there are no known wheelchairs that allow for users who have remaining function in their legs to maintain use of their feet in everyday life. Use of the feet may include opening doors, putting their feet on the ground for better mobility overall, and picking up objects from the ground. Current footrest models are static in their position and do not allow for modification in position, as well as heavy and are not easily removed for storage.

While wheelchair footrests are essential in supporting the user's legs and feet when inclined or tilted, it is vital to design the footrests to be able to allow for greater mobility of the feet should the user need it. The revised footrests should be adjustable to the user's abilities and lifestyle, be easily removable, and have reduced weight while still remaining functional as a traditional footrest when in the original position.

Brief status update

This week, the team completed the Preliminary report, which documents all of the research we have done thus far, and also the preliminary designs and the final design we will be working within for the remainder of this semester. In addition, the team has worked to narrow down the possibilities for materials for the main supports, as well as further refine ideas for the prototype.

Major team goals for the next week

1. Continue to research materials for the prototype and perform
2. Scrutinize and consider upgrades to existing parts in the planned prototype
3. Schedule a team meeting and corroborate all data gathered
4. Order materials by this Friday

Download

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Progress Report 6

ELAINA RIZZO - Nov 15, 2024, 5:33 PM CST

BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 10/17/24

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

Elaina Rizzo

Yair Ben Shaul

Elle Thore

Timothy Moeller

Problem Statement

Currently on the market, there are no known wheelchairs that allow for users who have remaining function in their legs to maintain use of their feet in everyday life. Use of the feet may include opening doors, putting their feet on the ground for better mobility overall, and picking up objects from the ground. Current footrest models are static in their position and do not allow for modification in position, as well as heavy and are not easily removed for storage.

While wheelchair footrests are essential in supporting the user's legs and feet when inclined or tilted, it is vital to design the footrests to be able to allow for greater mobility of the feet should the user need it. The revised footrests should be adjustable to the user's abilities and lifestyle, be easily removable, and have reduced weight while still remaining functional as a traditional footrest when in the original position.

Brief status update

This week the team will be discussing more about ordering materials to begin the fabrication process. Work on getting materials approved is currently in progress and more will be discussed at the meeting on friday. We are also discussing what companies to order from and possible shortcuts we can take to reduce cost and fabrication time.

Major team goals for the next week

1. Continue to research materials for the prototype and platform
2. Structures and consider upgrades to existing parts in the planned prototype
3. Schedule a team meeting and corroborate all data gathered
4. Updates on approvals for materials
5. Order materials

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Progress_Report_10_17.docx (18.4 kB)

Progress Report 7

ELAINA RIZZO - Nov 15, 2024, 5:33 PM CST

BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 10/24/24

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

Elaina Rizzo

Yair Ben Shaul

Elle Thorn

Timothy Moeller

Problem Statement

Currently on the market, there are no known wheelchairs that allow for users who have remaining function in their legs to maintain use of their feet in everyday life. Use of the feet may include opening doors, putting their feet on the ground for better mobility overall, and picking up objects from the ground. Current footrest models are static in their position and do not allow for modification in position, as well as heavy and are not easily removed for storage.

While wheelchair footrests are essential in supporting the user's legs and feet when sedated or ill ed, it is vital to design the footrests to be able to allow for greater mobility of the feet should the user need it. The revised footrests should be adjustable to the user's abilities and lifestyle, be easily removable, and have reduced weight while still remaining functional as a traditional footrest when in the original position.

Brief status update

We have just ordered most of the parts for our prototype. This week's goal is to finalize discussions on what to do with the final pieces we need ordered. For the most part, we are all working on different things this should help us get once work on the prototyping begins. Some of the group members are working on things such as getting welding and machining instructions, and others are working on learning the CAD software that we will be using soon.

Major team goals for the next week

1. Continue work on devising upgrades and possible points of failure for our prototype
2. Meet and decide how to proceed with the problematic part order
3. Work on getting skills that will be needed for construction of the prototype
4. Meet and figure out how to start approaching the next stages of the project that will arrive during and after prototype construction

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Progress_Report_10_24.docx (306 kB)

Progress Report 8

ELAINA RIZZO - Nov 15, 2024, 5:34 PM CST

BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 10/30/24

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

- Elaina Rizzo
- Yair Ben Shaul
- Elle Thorn
- Timothy Moeller

Problem Statement

Currently on the market, there are no known wheelchairs that allow for users who have remaining function in their legs to maintain use of their feet in everyday life. Use of the feet may include opening doors, putting their feet on the ground for better mobility overall, and picking up objects from the ground. Current footrest models are static in their position and do not allow for modification in position, as well as heavy and are not easily removed for storage.

While wheelchair footrests are essential in supporting the user's legs and feet when inclined or tilted, it is vital to design the footrests to be able to allow for greater mobility of the feet should the user need it. The revised footrests should be adjustable to the user's abilities and lifestyle, be easily removable, and have reduced weight while still remaining functional as a traditional footrest when in the original position.

Brief status update

Most of the parts to our project have been delivered and we can now start working on our prototype. Group members are getting the necessary training to fabricate the prototype (welding and shop tools certifications). We will also come up with our plan for the show and tell. We will see which of our materials have arrived and start working on what we can for the prototype.

Major team goals for the next week

1. Continue work on devising upgrades and possible points of failure for our prototype
2. Work on getting skills that will be needed for construction of the prototype
3. Meet and figure out how to start approaching the next stages of the project that will arrive during and after prototype construction
4. Plan out times where group members can work together on prototyping
5. Start constructing the prototype

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Progress Report 9

ELAINA RIZZO - Nov 15, 2024, 5:34 PM CST

BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 11/06/24

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

Elaina Rizzo

Yair Ben Shaul

Elle Thorn

Timothy Moeller

Problem Statement

Currently on the market, there are no known wheelchairs that allow for users who have remaining function in their legs to maintain use of their feet in everyday life. Use of the feet may include opening doors, putting their feet on the ground for better mobility overall, and picking up objects from the ground. Current footrest models are static in their position and do not allow for modification in position, as well as heavy and are not easily removed for storage.

While wheelchair footrests are essential in supporting the user's legs and feet when inclined or tilted, it is vital to design the footrests to be able to allow for greater mobility of the feet should the user need it. The revised footrests should be adjustable to the user's abilities and lifestyle, be easily removable, and have reduced weight while still remaining functional as a traditional footrest when in the original position.

Brief status update

Last week the team presented our progress at the Show and Tell, where the team got some ideas as to how to attach the telescoping rods to the chair, as well as how to keep the rods from falling into each other. Two team members have the welding certificate needed to be able to weld the pieces into place, and will take place soon. The team is meeting this Friday to talk about the fabrication and testing plans for November.

Major team goals for the next week

1. Continue work on devising upgrades and possible points of failure for our prototype
2. Meet and figure out how to start approaching the next stages of the project that will arrive during and after prototype construction
3. Plan out tasks where group members can work together on a prototype
4. Start constructing the prototype

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Progress Report 10

ELAINA RIZZO - Nov 15, 2024, 5:35 PM CST

BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 11/14/24

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

Elaina Rizzo

Yair Ben Shaul

Elle Thorn

Timothy Moeller

Problem Statement

Currently on the market, there are no known wheelchairs that allow for users who have remaining function in their legs to maintain use of their feet in everyday life. Use of the feet may include opening doors, putting their feet on the ground for better mobility overall, and picking up objects from the ground. Current footrest models are static in their position and do not allow for modification in position, as well as heavy and are not easily removed for storage.

While wheelchair footrests are essential in supporting the user's legs and feet when inclined or tilted, it is vital to design the footrests to be able to allow for greater mobility of the feet should the user need it. The revised footrests should be adjustable to the user's abilities and lifestyle, be easily removable, and have reduced weight while still remaining functional as a traditional footrest when in the original position.

Brief status update

This week the team created a list of fabrication plans and along with a timeline of needs to get what done by when. We also talked about some small changes that will be made to the overall design to keep the project lower maintenance during fabrication. Fabrication will start this week primarily Friday.

Major team goals for the next week

1. Continue work on devising upgrades and possible points of failure for our prototype
2. Meet and figure out how to start approaching the next stages of the project that will arrive during and after prototype construction
3. Plan out times where group members can work together on prototyping
4. Start constructing the prototype
5. Start thinking of testing and final deliverables

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2024/12/09-Design Matrix

Elle Thom - Dec 09, 2024, 6:32 PM CST

Title: Design matrix

Date: 12/09/2024

Content by: Fanatic Footrest Team

Present: Everyone

Goals: Figure out which design is best by judging them against the decided criteria

Content:

Attached below

Conclusions/action items:

The final design was chosen to be the telescoping rod design.

Elle Thom - Dec 09, 2024, 6:31 PM CST

BME Design: 200, 201, 300, 301, 400 and 402

BME Design: Design matrix

The design (or decision) matrix is an important step in the design process that allows you to critically evaluate the various design ideas for the project. An unbiased and inclusive approach should be taken when developing criteria, weights and scores for each design. It is critically important that the matrix compares apples to apples, that is, too many contrasting factors should not be included within each design. Therefore, in many cases, more than one design matrix is needed to effectively evaluate the design ideas for the project. For example, one matrix could evaluate a mechanism while another evaluates the materials for said mechanism or there might be several components to a project where each should be evaluated separately. The winning designs from each matrix can then be combined to create the final design.

Instructions

- **Designs:** The design matrix should have at least three distinct, feasible design alternatives.
- **Criteria:** The design criteria or constraints should reflect the ***most important design specifications*** from the Product Design Specifications (PDS). Approximately 6-10 categories is sufficient. Criteria should address appropriate public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors that are specific and important for your project.
- **Weight:** Each criteria must be assigned an appropriate weight as a percentage. Each weighting must be an integer divisible by five to allow for ease of understanding at a glance. The weighted total must add up to 100.
- **Score:** Criteria should be evaluated with a score of 1-5 for each of the design alternatives, with five being the best. The rating (1-5) is then divided by five and multiplied by the weight. Within each design evaluation column, include the rating (1-5) and the final score as a result of multiplication by the weight. For example, if your design receives a score of four in a category with a weight of 25, the final weighted score is: (4/5)*25 = 20.
- **Order:** The criteria should be listed in the table in the order of importance, with the most important (highest weight) at the top. Put the weight of each category in parentheses after the title, or in a separate column after the title. Each design should be ordered left to right in the same order that they were presented in the report and presentation.
- **Titles:** Choose short, self-explanatory titles for each design alternative (not design 1, 2, 3…).
- **Sketch:** Place a sketch of the design under each title.
- **Visual:** Use shaded colors/shadings/boldings/etc. to differentiate categories/weightings/winning design/etc., to allow easier understanding at a glance.
- **Justification:** Scoring criteria should be justified in your report. These and the values assigned to each design alternative for each criteria should also be thoroughly and clearly explained in the text of your report. You should also very briefly explain your scoring during your presentation. Presenting the design matrix with scores demonstrating a "winning" design without any explanation of the scoring criteria is unacceptable.

Example design matrix

Below is a depiction from a past project that illustrates the points above. Here, it is easy to quickly visualize the winning design and top criteria for each design. An image for each design helps to remind the audience the relationship between the design ideas and short design idea titles. The criteria are ordered from most important to least and the weights are clearly defined. Finally, the rows for criteria and columns for designs are the same height and width respectively across the table making this a visually appealing design matrix.

1

Download

Design_Matrix.docx (298 kB)

2024/12/09-Design Specifications

Elle Thom - Dec 09, 2024, 6:34 PM CST

Title: Design Specification

Date: 12/09/2024

Content by: Footrest Fanatics team

Present: Everyone

Goals: Create a list of specifications chosen by the client and the team

Content:

Attached below

Conclusions/action items:

The team created a list of specifications the final design will need.

Elle Thom - Dec 09, 2024, 6:31 PM CST

BME Design

Low-Interference Wheelchair Footrest

Product Design Specification

Sept. 19, 2024

BME 200/300 Lab 301 Design Project

Team Name: Footrest Fanatics

Clients/Advisors : Mr. Dan Domzynski, Prof. Melissa Skala

Team Members: Elaina Rizzo, Elleana Thom, Yair Ben Shaul, Timothy Meadler

Download

Product_Design_Specification.docx (126 kB)

Initial Materials and Expenses Chart

TIMOTHY MANDLER - Dec 11, 2024, 4:09 PM CST

Title: Materials and Expenses Chart

Date: 10/31/2024

Content by: Timothy Mandler

Present: Timothy Mandler on behalf of the whole team

Goals: Assemble a working table that covers all expenses accrued by the group

Content:

Part Name	Part Model	Distributor	Purchasing URL(s)	Cost of Item	Cost of Shipping/Tax	Quantity	Purchase Date
Telescoping Rods	SKU: AQT1.00F, AQT1.25F, AQT1.50F	Alcobra Metals	https://alcobrametals.com/product/1-1-2-x-110-6005a-t6/?attribute_length=24%22 https://alcobrametals.com/product/1-1-4-x-110-6005a-t6/ https://alcobrametals.com/product/1-x-110-6005a-t6/	$47.65		24” of each width	10/21
Cables	54DR93	Grainger	https://www.grainger.com/product/PRIME-LINE-Spring-Cable-Set-Carbon-Steel-54DR93?opr=PDPRRDSP&analytics=dsrrItems_54DR60	$8.48		1	10/21
Cable Ties	2VJZ2	Grainger	DAYTON, Oval Sleeve, Swage, Wire Rope Oval Sleeve - 2VJZ2|2VJZ2 - Grainger	$7.17		1	10/21
Wheels	B0C64ZB1G3	Amazon	https://www.amazon.com/L-Shaped-Casters-Locking-Castors-Furniture/dp/B0C64ZB1G3/ref=asc_df_B0C64ZB1G3?tag=bingshoppinga-20&linkCode=df0&hvadid=80814294281905&hvnetw=o&hvqmt=e&hvbmt=be&hvdev=c&hvlocint=&hvlocphy=&hvtargid=pla-4584413762733684&th=1	$18.99		1	10/21
Material for Rail-Mounting	782PR8	Grainger	https://www.grainger.com/product/Flat-Bar-Stock-6061-782PR8?opr=ILOF	$20.57		1 (12 in)	10/25

Conclusions/action items:

This chart gives us a accurate estimate as to how much money has been spent on R & D of the prototype.

Finalized Material Cost Spreadsheet

Title: Material Cost Spreadsheet

Date: 12/8/2024

Content by: Timothy Mandler

Present: Timothy Mandler on behalf of the whole team

Goals: To create a finalized cost spreadsheet that will be used in the final report.

Content:

Item	Description	Manufacturer	Mft Pt#	Vendor	Vendor Cat#	Date	QTY	Cost Each	Total	Link
Aluminum Telscoping Rods - 1.0" x 0.110"	Square Aluminum Rods	Alcobra Metals	SKU: AQT1.00F	Alcobra metals	SKU: AQT1.00F	10/21/2024	24"	$11.81	$11.81	https://alcobrametals.com/product/1-x-110-6005a-t6/
Aluminum Telscoping Rods - 1.25" x 0.110"	Square Aluminum Rods	Alcobra metals	SKU: AQT1.25F	Alcobra metals	SKU: AQT1.25F	10/21/2024	24"	$16.14	$16.14	https://alcobrametals.com/product/1-1-4-x-110-6005a-t6/
Aluminum Telscoping Rods - 1.5" x 0.110"	Square Aluminum Rods	Alcobra Metals	SKU: AQT1.50F	Alcobra metals	SKU: AQT1.50F	10/21/2024	24"	$19.70	$19.70	https://alcobrametals.com/product/1-1-2-x-110-6005a-t6/?attribute_length=2
Carbon Steel Cables - Item 54DR93	Carbon Steel Cables	PRIME-LINE	GD 52183	Grainger	54DR93	10/21/2024	1	$8.48	$8.48	https://www.grainger.com/product/PRIME-LINE-Spring-Cable-Set-Carbon-Steel opr=PDPRRDSP&analytics=dsrrItems_54DR60
Aluminum Swage Sleeves - 5/32" - Item 54DR93	Swage Sleeves	DAYTON	2VJZ2	Grainger	2VJZ2	10/21/2024	1	$7.17	$7.17	DAYTON, Oval Sleeve, Swage, Wire Rope Oval Sleeve - 2VJZ2|2VJZ2 - Grainger
2" L-Shaped Castor Wheels	Castor Wheels	LEE TEAM RISE	B0C64ZB1G3	Amazon	B0C64ZB1G3	10/21/2024	1	$18.99	$18.99	https://www.amazon.com/L-Shaped-Casters-Locking-Castors-Furniture/dp/B0C tag=bingshoppinga-20&linkCode=df0&hvadid=80814294281905&hvnetw=o&hvqmt=e&hvbmt=be 4584413762733684&th=1
12" x 12" x 1/4" Metal Plate - Aluminium	Aluminum Plate	Wendt Maker Space	N/A	Wendt Maker Space	N/A	11/8/2024	1	$30.00	$30.00	N/A
3/4" x 36" x 1/8" Flat Bar - Aluminium	Aluminum Flat Bar	Wendt Maker Space	N/A	Wendt Maker Space	N/A	11/8/2024	1	$5.00	$5.00	N/A
¼“ Flat Bolts and Nuts	Assorted Nuts and Bolts	ECB Shops	N/A	ECB Shops	N/A	11/26/2024	8	$0.10	$0.80	N/A
2Pcs Seat Belt Cover	Seat Belt Buckle	QYDHOUZHE	QYD-KOU01	Amazon	B0C1TB5CG8	11/12/2024	1	$6.50	$6.50	https://www.amazon.com/dp/B0C1TB5CG8?ref=ppx_pop_mob_ap_share

Conclusions/action items:

This gives us a nice and concise list of all the purchases which we have made. From this, we can get an insight into the amount of money which would be required to build future prototypes. The more cleaned up version of this chart.

2024/12/09- Fabrication summary

Elle Thom - Dec 09, 2024, 11:05 PM CST

Title: Fabrication Summary

Date: 12/9/2024

Content by: Fanatic Footrest Team

Present: Fanatic Footrest Team

Goals: Write a summary of the different elements of the final prototype and how all the parts fit together.

Content:

Footplate:

The Fabrication of the foot plates included cutting an aluminum sheet in half and sanding the edges to help mitigate any injury that could occur from sharp objects. Three holes were drilled into the bottom inner corners of the footplate to accommodate the wheels. Then a slim metal catch at the bottom was welded to the aluminum plate so the client's feet don't slip. Two more holes were drilled in the hollow where the telescoping rod mechanism was welded to the plate in order to feed the cable through the telescoping rod and fasten it to the footplate.

Footrest telescoping rods:

The telescoping rods were each cut in half to accommodate both sides of the chair. They were then brought into the machining area of the team lab and were fashioned with a slot where a pin was placed allowing the second telescoping rod to catch at the end of the first so the leg rest extends enough for the length of the client's legs but not enough for them to completely detach from each other. The first telescoping rod was then welded to a rectangular piece of aluminum that had one hole for a bolt to go through it.

Attachment to the wheelchair:

The bolt through the rectangular piece of aluminum is screwed into a slider on the inside of the rail system on the side of the wheelchair and is also attached to a seatbelt lock that is designed to connect to the seatbelt release that is bolted into the end of the rail. The cable that feeds through the telescoping rods is attached to the front of the rail and secured with a bolt and washer.

2024/12/11 Testing Protocols

Elle Thom - Dec 11, 2024, 3:59 PM CST

Title: Testing Protocols

Date: 12/11/2024

Content by: Elaina Rizzo

Present: Elaina and Tim

Goals: Write down the protocols for testing

Content:

Testing

Testing was performed with the goal to find metrics that fit within our goals for the semester and to quantify the quality of the final prototype. The tests performed were done in two sections: the speed test and the force test. The goal for testing was to be able to find the average time it takes to use the footrest for the average person, and to find out how much weight the footplates could hold without permanent deformation.

Speed Test

The first test run was to collect data on how fast it took to fully extend the footrest, and also how long to fully retract and lock into a fixed position. The test was run for a total of four trials each, four for extending and four retracting and locking. To simulate most accurately a user might use the device, the test participant sat in the wheelchair in a relaxed position to begin. For consistency purposes, the participant did not use any movement of their legs throughout the test, and any runs that did were deleted. The participant was then timed on the speed retracting, beginning when the foot was completely off the footplate, and ending when the locking mechanism was fully in place and the footplate cannot move any further. For the extension portion, the time began when the button on the back lock piece was pressed, and ended when the footrest was fully in contact with the ground. Data was collected into a chart and an average of the four runs was calculated, shown in Figure [**!4**] in the Results section.

Force Test

The second test aimed to measure the deflection of the footrest under various amounts of weight. The starting height off the ground was measured prior to the test beginning as a base measurement. The location of the measurement was consistent throughout the test, being a the far end of the footplate where the toes would rest, and in the middle of the width of the footplate. For each run, a fixed amount of weight was added to the center of the footplate, and the distance between the ground and the footplate was measured. Then, the deflection was calculated by subtracting the distance of the weighted footplate off the ground from the base measurement, taken at the beginning of the test. This test was then repeated over increasing weights and plotted onto a chart, shown in the experimentation folder.

2024/12/11-Testing Experimentation and Results

Elle Thom - Dec 11, 2024, 4:03 PM CST

Title: Testing experimentation and results

Date: 12/11/2024

Content by: Elaina Rizzo

Present: Elaina and Tim

Goals: Write down the Experimentation and results portion of testing.

Content:

Results

For the speed test, the data collected is displayed in a chart, with the average times listed on the bottom row. For the force test, the deflection calculations are shown in a plot of weight (lbs) vs. deflection (inches).

Trial	Time to extend (s)	Time to retract (s)
1	7.57	6.42
2	5.85	5.85
3	8.87	5.32
4	5.92	7.09
Avg	7.05	6.17

Figure [1]: Table of times recorded extending and retracting the footplate, and the average of all the trials.

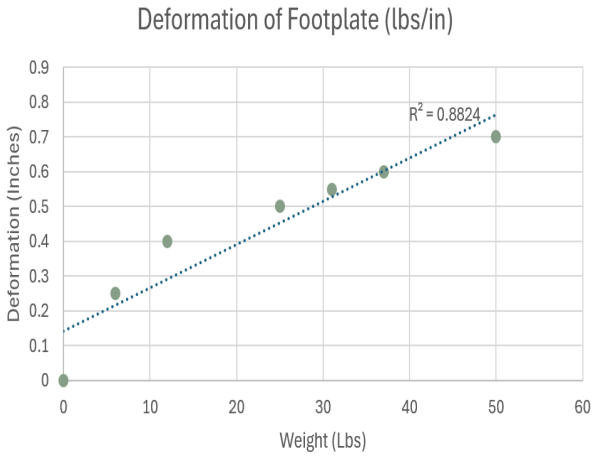

Figure [2]: Graph showing the deformation as weight increases from six to fifty pounds.

In the speed test, the average time taken to fully retract and lock the footrest was 7.05 seconds. The total time to fully extend the footrest was 6.17 seconds, making the combined time to operate the footrest through one cycle is 13.22 seconds. One possible reason for the extension being quicker than the retracting is the force of gravity working against or in favor of the motion of the footrest. When the footrest is extending, gravity works in favor of the motion of the footplate, accelerating the motion. The opposite occurs when the user is retracting the device, as the weight of the device is pulling itself down, making it more difficult to generate the same speed as retracting the device does.

For the force test, various tests had weights of the following: 6 lbs (2.7 kg), 12 lbs (5.4 kg), 25 lbs (11.3 kg), 31 lbs (14.1 kg), 37 lbs (16.8 kg), and 50 lbs (22.7). The weight tests having different amounts of weight between them is because of the available weights that

were accessible. That being said, the graph follows a linear line of best fit. The greater the weight, the more deflection occurs. On the line of best fit, the R_2 value is 0.88, or 88%, meaning that the plot points follow a linear line for a large majority of the test runs.

Progress Report 9/12

Elle Thom - Dec 09, 2024, 6:25 PM CST

BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 9/3/2024

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

Elissa Razo

Yair Ben Shlomi

Elle Thom

Timothy Moeller

Brief status update

Upcoming this week, the team has the first client meeting scheduled, where we will outline the requirements and constraints for this project. The team has also been working on researching general ideas for this project, as well as beginning the brainstorming phase that we can bring to the next team meeting.

Major team goals for the next week

1. Collect a list of client requirements and design specifications from the scheduled client meeting.
2. Start work on creating the Product Design Specification and Problem Statement.

Next week's individual goals

- Elissa Razo
  - Research problem and come up with more design ideas
  - Move forward with client information into prototyping stage
  - Create a PDS
  - Set up weekly team meetings around schedules
- Elissa Thom
  - Meet with the client to make introductions and collect information of design specifications and project requirements.
  - Meet my team since I was sick last week
  - Start researching more on the project
  - Meet with our project advisor
  - Create a PDS
- Yair Ben Shlomi
  - Go to BSAC meeting
  - Keep researching design ideas and useful information
  - PDS
  - Enter the research I did into lab archives
  - Work on design drawings to visualize ideas

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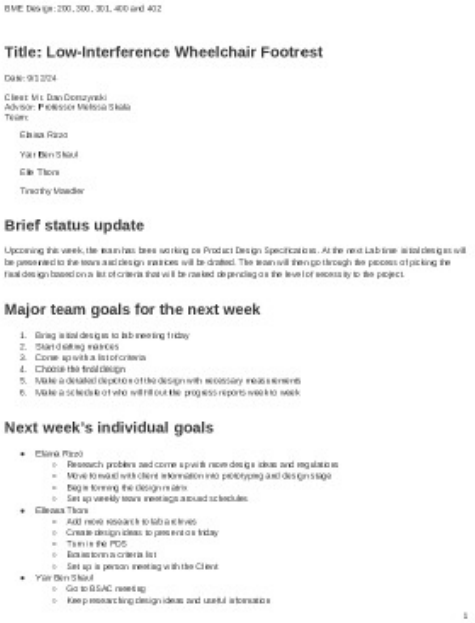
Progress_Report_9_12.docx (14.9 kB)

Progress Report 9/19

Elle Thom - Dec 09, 2024, 6:25 PM CST



BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 9/13/24

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

Elissa Rizzo

Yair Ben Shaul

Elle Thom

Timothy Moeller

Brief status update

Upcoming this week, the team has been working on Product Design Specifications. At the next Lab time initial designs will be presented to the team and design matrices will be drafted. The team will then go through the process of picking the final design based on a list of criteria that will be ranked depending on the level of necessity to the project.

Major team goals for the next week

1. Bring initial designs to lab meeting friday
2. Start drafting matrices
3. Come up with a list of criteria
4. Choose the final design
5. Make a detailed depiction of the design with necessary measurements
6. Make a schedule of who will fill out the progress reports week to week

Next week's individual goals

- Elissa Rizzo
  - Research problem and come up with more design ideas and regulations
  - Move forward with client information into prototyping and design stage
  - Begin forming the design matrix
  - Set up weekly team meetings around schedules
- Elissa Thom
  - Add more research to lab activities
  - Create design ideas to present on friday
  - Turn in the PDS
  - Brainstorm a criteria list
  - Set up in person meeting with the Client
- Yair Ben Shaul
  - Go to BSAC meeting
  - Keep researching design ideas and useful information

Download

Progress_Report_9_19.docx (15.4 kB)

Progress Report 9/26

Elle Thom - Dec 09, 2024, 6:25 PM CST

BME Design: 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 9/26/24

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

- Elissa Rizzo
- Yair Ben Shaul
- Elle Thom
- Timothy Moeller

Problem Statement

Currently on the market, there are no known wheelchairs that allow for users who have remaining function in their legs to maintain use of their feet in everyday life. Use of the feet may include opening doors, putting their feet on the ground for better mobility overall, and picking up objects from the ground. Current footrest models are static in their position and do not allow for modification in position, as well as heavy and are not easily removed for storage.

While wheelchair footrests are essential in supporting the user's legs and feet when inclined or tilted, it is vital to design the footrests to be able to allow for greater mobility of the feet should the user need it. The revised footrests should be adjustable to the user's abilities and lifestyle, be easily removable, and have reduced weight while still remaining functional as a traditional footrest when in the original position.

Brief status update

Upcoming this week, the team will begin work on the design matrix now that the final design has been determined and agreed upon. We are planning to research different materials and costs for the prototype footrest and will continue researching specifics about the individual parts and mechanisms we plan to use. Through this, we aim to iron out the final plan for our prototype and prepare for the purchase of the required resources.

Major team goals for the next week

1. Conduct further work on the design matrices
2. Research materials for the prototype and perform a degree of cost analysis
3. Sketches and consider upgrades to existing parts in the planned prototype
4. Schedule a team meeting and corroborate all data gathered
5. Begin planning for upcoming presentation

Next week's individual goals

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Progress_Report_9_26.docx (16.7 kB)

Progress Report 10/2

Elle Thom - Dec 09, 2024, 6:24 PM CST

BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 10/2024

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

- Elissa Rizzo
- Yair Ben Shaul
- Elle Thom
- Timothy Moeller

Problem Statement

Currently on the market, there are no known wheelchairs that allow for users who have remaining function in their legs to maintain use of their feet in everyday life. Use of the feet may include opening doors, putting their feet on the ground for better mobility overall, and picking up objects from the ground. Current footrest models are static in their position and do not allow for modification in position, as well as heavy and are not easily removed for storage.

While wheelchair footrests are essential in supporting the user's legs and feet when inclined or tilted, it is vital to design the footrests to be able to allow for greater mobility of the feet should the user need it. The revised footrests should be adjustable to the user's abilities and lifestyle, be easily removable, and have reduced weight while still remaining functional as a traditional footrest when in the original position.

Brief status update

Upcoming this week, the team will work on the preliminary presentation in preparation for Friday. We are still researching materials and costs for the prototype footrest and will continue researching specifics about the individual parts and mechanisms we plan to use. We are aiming to be able to purchase materials as soon as possible to begin working on a prototype.

Major team goals for the next week

1. Continue to research materials for the prototype and problem
2. Scrutinize and consider upgrades to existing parts in the planned prototype
3. Schedule a team meeting and coordinate all data gathered
4. Work on the preliminary presentation
5. Rehearse presentation before presenting on Friday

Download

Progress_Report_10_2.docx (17.3 kB)

Progress Report 10/10

Elle Thom - Dec 09, 2024, 6:24 PM CST

BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 10/30/24

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

- Elissa Rizzo
- Yair Ben Shaul
- Elle Thom
- Timothy Moeller

Problem Statement

Currently on the market, there are no known wheelchairs that allow for users who have remaining function in their legs to maintain use of their feet in everyday life. Use of the feet may include opening doors, putting their feet on the ground for better mobility overall, and picking up objects from the ground. Current footrest models are static in their position and do not allow for modification in position, as well as heavy and are not easily removed for storage.

While wheelchair footrests are essential in supporting the user's legs and feet when sedated or ill-fed, it is vital to design the footrests to be able to allow for greater mobility of the feet should the user need it. The revised footrests should be adjustable to the user's abilities and lifestyle, be easily removable, and have reduced weight while still remaining functional as a traditional footrest when in the original position.

Brief status update

This week, the team completed the Preliminary report, which documents all of the research we have done thus far, and also the preliminary designs and the final design we will be working with for the remainder of this semester. In addition, the team has worked to narrow down the possibilities for materials for the main supports, as well as further refine ideas for the prototype.

Major team goals for the next week

1. Continue to research materials for the prototype and problems
2. Scrutinize and consider upgrades to existing parts in the planned prototype
3. Schedule a team meeting and corroborate all data gathered
4. Order materials by this Friday

Download

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Progress Report 10/17

Elle Thom - Dec 09, 2024, 6:24 PM CST

BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 10/17/24

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

Elissa Rizzo

Yair Ben Shaul

Elle Thom

Timothy Moeller

Problem Statement

Currently on the market, there are no known wheelchairs that allow for users who have remaining function in their legs to maintain use of their feet in everyday life. Use of the feet may include opening doors, putting their feet on the ground for better mobility overall, and picking up objects from the ground. Current footrest models are static in their position and do not allow for modification in position, as well as heavy and are not easily removed for storage.

While wheelchair footrests are essential in supporting the user's legs and feet when sedated or ill-fed, it is vital to design the footrests to be able to allow for greater mobility of the feet should the user need it. The revised footrests should be adjustable to the user's abilities and lifestyle, be easily removable, and have reduced weight while still remaining functional as a traditional footrest when in the original position.

Brief status update

This week the team will be discussing more about ordering materials to begin the fabrication process. Work on getting materials approved is currently in progress and more will be discussed at the meeting on Friday. We are also discussing what companies to order from and possible shortcuts we can take to reduce cost and fabrication time.

Major team goals for the next week

1. Continue to research materials for the prototype and platform
2. Structures and consider upgrades to existing parts in the planned prototype
3. Schedule a team meeting and corroborate all data gathered
4. Updates on approvals for materials
5. Order materials

Download

Progress_Report_10_17.docx (18.4 kB)

Progress Report 10/24

Elle Thom - Dec 09, 2024, 6:24 PM CST

BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 10/24/24

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

- Elissa Rizzo
- Yair Ben Shaul
- Elle Thom
- Timothy Moeller

Problem Statement

Currently on the market, there are no known wheelchairs that allow for users who have remaining function in their legs to maintain use of their feet in everyday life. Use of the feet may include opening doors, putting their feet on the ground for better mobility overall, and picking up objects from the ground. Current footrest models are static in their position and do not allow for modification in position, as well as heavy and are not easily removed for storage.

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Brief status update

We have just ordered most of the parts for our prototype. This week's goal is to finalize discussions on what to do with the final pieces we need ordered. For the most part, we are all working on different things this should help us be more work on the prototyping begins. Some of the group members are working on things such as getting welding and machining instructors, and others are working on learning the CAD software that we will be using soon.

Major team goals for the next week

1. Continue work on devising upgrades and possible points of failure for our prototype
2. Meet and decide how to proceed with the problematic part order
3. Work on getting skills that will be needed for construction of the prototype
4. Meet and figure out how to start approaching the next stages of the project that will arrive during and after prototype construction

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Progress_Report_10_24.docx (306 kB)

Progress Report 10/31

Elle Thom - Dec 09, 2024, 6:24 PM CST

BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 10/30/24

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

- Elissa Rizzo
- Yair Ben Shaul
- Elle Thom
- Timothy Moeller

Problem Statement

Currently on the market, there are no known wheelchairs that allow for users who have remaining function in their legs to maintain use of their feet in everyday life. Use of the feet may include opening doors, putting their feet on the ground for better mobility overall, and picking up objects from the ground. Current footrest models are static in their position and do not allow for modification in position, as well as heavy and are not easily removed for storage.

While wheelchair footrests are essential in supporting the user's legs and feet when inclined or tilted, it is vital to design the footrests to be able to allow for greater mobility of the feet should the user need it. The revised footrests should be adjustable to the user's abilities and lifestyle, be easily removable, and have reduced weight while still remaining functional as a traditional footrest when in the original position.

Brief status update

Most of the parts to our project have been delivered and we can now start working on our prototype. Group members are getting the necessary training to fabricate the prototype (welding and shop tools certifications). We will also come up with our plan for the show and tell. We will see which of our materials have arrived and start working on what we can for the prototype.

Major team goals for the next week

1. Continue work on devising upgrades and possible points of failure for our prototype
2. Work on getting skills that will be needed for construction of the prototype
3. Meet and figure out how to start approaching the next stages of the project that will arrive during and after prototype construction
4. Plan out times where group members can work together on prototyping
5. Start constructing the prototype

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Progress_Report_10_31.docx (22.3 kB)

Progress Report 11/06

Elle Thom - Dec 09, 2024, 6:24 PM CST

BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 11/06/24

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

- Elissa Rizzo
- Yan Ben Shaul
- Elle Thom
- Timothy Voeller

Problem Statement

Currently on the market, there are no known wheelchairs that allow for users who have remaining function in their legs to maintain use of their feet in everyday life. Use of the feet may include opening doors, putting their feet on the ground for better mobility overall, and picking up objects from the ground. Current footrest models are static in their position and do not allow for modification in position, as well as heavy and are not easily removed for storage.

While wheelchair footrests are essential in supporting the user's legs and feet when sedated or ill-fed, it is vital to design the footrests to be able to allow for greater mobility of the feet should the user need it. The revised footrests should be adjustable to the user's abilities and lifestyle, be easily removable, and have reduced weight while still remaining functional as a traditional footrest when in the original position.

Brief status update

Last week the team presented our progress at the Show and Tell, where the team got some ideas as to how to attach the telescoping rods to the chair, as well as how to keep the rods from falling into each other. Two team members have the welding certificate needed to be able to weld the pieces into place, and will take place soon. The team is meeting this Friday to talk about the fabrication and testing plans for November.

Major team goals for the next week

1. Continue work on devising upgrades and possible points of failure for our prototype
2. Meet and figure out how to start approaching the next stages of the project that will arrive during and after prototype construction
3. Plan out tasks where group members can work together on a prototype
4. Start constructing the prototype

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Progress_Report_11_6.docx (23 kB)

Progress Report 11/14

Elle Thom - Dec 09, 2024, 6:23 PM CST

BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 11/14/24

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

- Elissa Rizzo
- Yair Ben Shaul
- Elle Thom
- Timothy Moeller

Problem Statement

Currently on the market, there are no known wheelchairs that allow for users who have remaining function in their legs to maintain use of their feet in everyday life. Use of the feet may include opening doors, putting their feet on the ground for better mobility overall, and picking up objects from the ground. Current footrest models are static in their position and do not allow for modification in position, as well as heavy and are not easily removed for storage.

While wheelchair footrests are essential in supporting the user's legs and feet when inclined or tilted, it is vital to design the footrests to be able to allow for greater mobility of the feet should the user need it. The revised footrests should be adjustable to the user's abilities and lifestyle, be easily removable, and have reduced weight while still remaining functional as a traditional footrest when in the original position.

Brief status update

This week the team created a list of fabrication plans and along with a timeline of needs to get what done by when. We also talked about some small changes that will be made to the overall design to keep the project lower maintenance during fabrication. Fabrication will start this week primarily Friday.

Major team goals for the next week

1. Continue work on devising upgrades and possible points of failure for our prototype
2. Meet and figure out how to start approaching the next stages of the project that will arrive during and after prototype construction
3. Plan out times where group members can work together on prototyping
4. Start constructing the prototype
5. Start thinking of testing and final deliverables

Download

Progress_Report_11_14.docx (23.8 kB)

Progress Report 11/21

Elle Thom - Dec 09, 2024, 6:23 PM CST

BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 11/23/24

Client: Mr. Dan Domzynski
Advisor: Professor Melissa Skala
Team:

Elissa Rizzo

Yair Ben Shaul

Elle Thom

Timothy Moeller

Problem Statement

Currently on the market, there are no known wheelchairs that allow for users who have remaining function in their legs to maintain use of their feet in everyday life. Use of the feet may include opening doors, putting their feet on the ground for better mobility overall, and picking up objects from the ground. Current footrest models are static in their position and do not allow for modification in position, as well as heavy and are not easily removed for storage.

While wheelchair footrests are essential in supporting the user's legs and feet when inclined or tilted, it is vital to design the footrests to be able to allow for greater mobility of the feet should the user need it. The revised footrests should be adjustable to the user's abilities and lifestyle, be easily removable, and have reduced weight while still remaining functional as a traditional footrest when in the original position.

Brief status update

This week, the team has made major headway in the construction of the final prototype. We have mostly finalized the fabrication of the 6 plates and have finalized the plan for the remaining pieces such as the telescoping rods, rail systems, and cable systems. We have finished purchasing all needed materials that we are aware of.

Major team goals for the next week

1. Continue work on the prototype
2. Meet and figure out how to start approaching the next stages of the project that will arrive during and after prototype construction
3. Start testing of the final prototype once it is completed
4. Determine any necessary changes to the prototype via testing
5. Implement any changes that are absolutely necessary for the functionality of the prototype

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Progress Report 12/04

Elle Thom - Dec 09, 2024, 6:23 PM CST

BME Design 200, 300, 301, 400 and 402

Title: Low-Interference Wheelchair Footrest

Date: 12/04/24

Client: Mr. Dan Dorczynski
Advisor: Professor Melissa Skala
Team:

- Elissa Rizzo
- Yair Ben Shaul
- Elle Thom
- Timothy Moeller

Problem Statement

Currently on the market, there are no known wheelchairs that allow for users who have remaining function in their legs to maintain use of their feet in everyday life. Use of the feet may include opening doors, putting their feet on the ground for better mobility overall, and picking up objects from the ground. Current footrest models are static in their position and do not allow for modification in position, as well as heavy and are not easily removed for storage.

While wheelchair footrests are essential in supporting the user's legs and feet when inclined or tilted, it is vital to design the footrests to be able to allow for greater mobility of the feet should the user need it. The revised footrests should be adjustable to the user's abilities and lifestyle, be easily removable, and have reduced weight while still remaining functional as a traditional footrest when in the original position.

Brief status update

This week, the team has mostly completed the finalized prototype. Testing was completed and recorded. Final analysis of the design and prototype is now underway. The poster has been mostly finalized and is imminently pending being sent out for printing. The team has put in an incredible amount of work over the last two weeks with the final construction. Well done team!

Major team goals for the next week

1. Finalize the poster
2. Add any additional changes that are needed to the finalized prototype before presentation
3. Prepare for presentation
4. Start on and hopefully finish the final report
5. Finish up and add whatever is needed in our notebook
6. After that, some sleep would be nice

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Progress_Report_12_4.docx (25.2 kB)

Photos

Elle Thom - Dec 11, 2024, 4:56 PM CST

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Elle Thom - Dec 11, 2024, 4:56 PM CST

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Elle Thom - Dec 11, 2024, 4:58 PM CST

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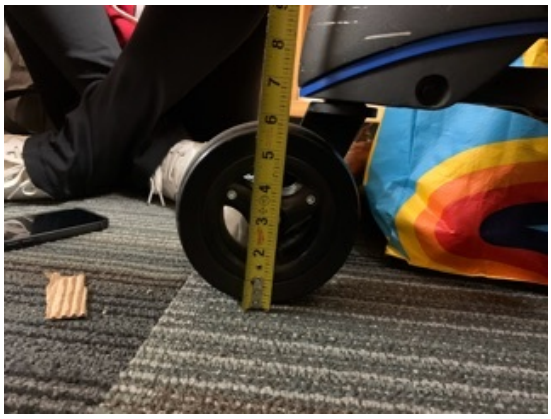
Elle Thom - Dec 11, 2024, 4:58 PM CST



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Elle Thom - Dec 11, 2024, 4:59 PM CST

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Elle Thom - Dec 11, 2024, 4:59 PM CST

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Elle Thom - Dec 11, 2024, 4:59 PM CST

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Elle Thom - Dec 11, 2024, 4:59 PM CST

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Elle Thom - Dec 11, 2024, 5:00 PM CST

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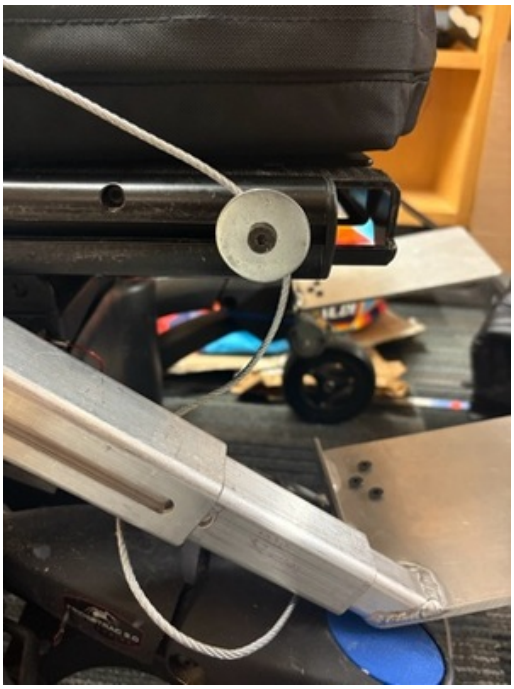
Elle Thom - Dec 11, 2024, 5:00 PM CST



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Elle Thom - Dec 11, 2024, 5:00 PM CST

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Elle Thom - Dec 11, 2024, 5:01 PM CST

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PDS

ELAINA RIZZO - Nov 15, 2024, 6:03 PM CST

BME Design | BME 200/300

Low-Interference Wheelchair Footrest

Product Design Specification

Sept. 19, 2024

BME 200/300 Lab 301 Design Project

Team Name: Footrest Fanatics

Client/Advisors : Mr. Dan Domzynski, Prof. Melissa Skala

Team Members: Elaina Rizzo, Eileana Thore, Yair Ben Shaul, Timothy Mendler

Download

Product_Design_Specification.docx (126 kB)

Preliminary Report

ELAINA RIZZO - Nov 15, 2024, 6:04 PM CST

BME Design 200, 300

Low-Interference Wheelchair Footrest

Preliminary Report

Oct. 9th, 2024

BME 200/300 Lab 301 Design Project

Team Name: Footrest Fanatics

Client: Mr. Dan Dzuzynski

Adviser: Prof. Melissa Skala (UW-Madison - Department of Biomedical Engineering)

Team Members: Elaina Rizzo, Elleana Thoro, Yair Ben Shaul, Timothy Meadler

1

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Preliminary Presentation

ELAINA RIZZO - Nov 15, 2024, 6:04 PM CST

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Preliminary_Presentation_-_Low_Interference_Footrest.pptx (4.85 MB)

Final Poster

Elle Thom - Dec 09, 2024, 6:34 PM CST

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Copy_of_FINAL_POSTER_.pptx (2.02 MB)

Final Report

Elle Thom - Dec 11, 2024, 5:54 PM CST

Low-Interference Wheelchair Footrest

Biomedical Engineering Design 200/300

Department of Biomedical Engineering

University of Wisconsin - Madison

December 11th, 2024

Team Members:

Elaina Rizzo (Lead)

Elleana Thom (Communicator)

Yair Ben Shaul (BSAC)

Timothy Mandler (BWIG, BPAG)

Download

Final_Report_-_Google_Docs.pdf (2.86 MB)

24/10/17 Carbon fiber vs Aluminum research

YAIR BEN SHAUL - Oct 17, 2024, 1:35 AM CDT

Title: Carbon Fiber Vs Aluminum

Date: 10/17/24

Content by: Yair Ben Shaul

Present: Individual work

Goals: Provide background for consideration of using aluminum vs carbon fiber in telescoping components of the design

Content:

Carbon fiber and aluminum are competing materials in many applications due to their lightweight properties combined with sturdiness

Notable comparisons:

- carbon fiber has a **specific tensile strength** of approximately **3.8** times that of aluminum[1]
- Carbon fiber has a **specific stiffness** of **1.71** times that of aluminum[1]
- Aluminum has approximately **six times** the **thermal expansion** of carbon fiber[1]
- Aluminum typically costs about **45 times** less than carbon fiber per kg[2]

other considerations:

- Aluminum will generally deform or yield before failing
- Carbon fiber does not yield under pressure and once its tensile strength is exceeded it will suddenly fail
- Carbon fiber has a superior weight-to-strength ratio
- Aluminum is highly rust resistant, while carbon fiber does not rust

[1]“DragonPlate | Engineered Carbon Fiber Composite Sheets, Tubes and Structural Components | Made in USA,” Dragon Plate. https://dragonplate.com/carbon-fiber-vs-aluminum

[2]SMITeam, “Aluminum vs. Carbon Fiber: What Are the Differences?,” SMI Composites, Mar. 31, 2023. https://www.smicomposites.com/aluminum-vs-carbon-fiber-what-are-the-differences/

Conclusions/action items:

In the technical details and statistic differences, carbon fiber emerges as the superior material. It has all the properties that Aluminum provides and performs even better. However, carbon fiber is more expensive, which must be taken into account in our project. If our budget can allow for acquiring carbon fiber, we should do so.

2024/09/14 footrest safety research

YAIR BEN SHAUL - Sep 14, 2024, 2:31 PM CDT

Title: Injury prevention and safety information for wheelchair footrests

Date: 9/14/2024

Content by: Yair Ben Shaul

Present: Individual Work

Goals: identify possible safety concerns and establish safety guidelines for designs

Content:

[1]J. Muniak, “Wheelchair Footrests & Leg Rests,” Robsonforensic.com, Feb. 05, 2024. https://www.robsonforensic.com/articles/wheelchair-footrest-leg-rest-expert (accessed Sep. 14, 2024).

-Wheelchair footrests and leg-rests can present safety concerns for wheelchair users if installed improperly or are not mechanically safe.

- It is important that our design prioritizes the safety of the client and complies with the standards for wheelchairs and attachments.

-According to the article wheelchair incidents often happen due to the footrest affecting the turning radius of the wheelchair and colliding with obstacles.

-Another key safety point of footrests is the ability to ensure that the user's feet remain on the footrest in different conditions to prevent the user's feet from being caught in parts of the wheelchair which could lead to significant injuries

-Requirements and standards for wheelchair devices can be found in title 21 of the Code of Federal Regulations (21 CFR 803).

Conclusions/action items:

During the design of our product we must constantly consider the safety implications of any design choices we make, and refer to the standards in place. We should make sure our client's feet can stay relatively secure in the footrest and that the footrest has minimal affects on maneuverability and turning radius.

24/09/27 Telescoping locking mechanisms

YAIR BEN SHAUL - Sep 27, 2024, 2:08 AM CDT

Title: Telescoping locking mechanism

Date: 9/26/24

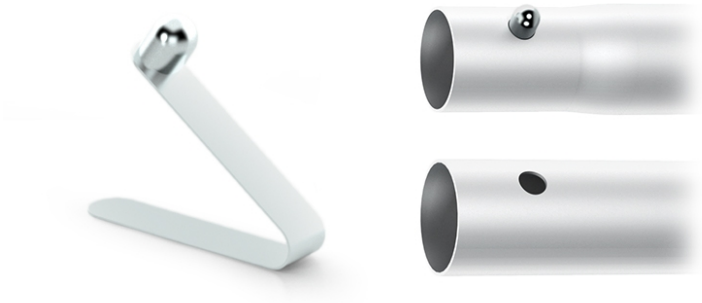
Content by: Yair Ben Shaul

Present: Individual work

Goals: Present an option for the locking mechanism of the telescoping part of the footrest

Content:

This type of simple spring button is used widely in telescoping mechanisms featuring tubes. It would be a cheap and simple option to use for our telescoping system



[1] “Testrite Instrument Co., Inc.: Products,” *Testrite Instrument Co., Inc.*, Sep. 27, 2023. https://www.testriteoem.com/products/tube-ends-joiners-attachments/spring-button-telescopic-tube-ends

Conclusions/action items: Our telescoping system will need a locking mechanism, and the spring button shown above should be considered for our system. It offers simplicity and cost efficiency. We could also attempt to make one ourselves.

24/11/05 MIG vs TIG welding for Aluminum

YAIR BEN SHAUL - Nov 05, 2024, 10:36 AM CST

Title: MIG vs TIG welding Aluminum

Date: 11/5/24

Content by: Yair Ben Shaul

Present: Individual work

Goals: compare different welding methods to determine which is better for the fabrication of our prototype

Content:

[1]Annalyn Bernaldo, “MIG vs TIG Aluminum Welder - Which is Better?,” Arccaptain, Dec. 16, 2023. https://www.arccaptain.com/blogs/article/mig-vs-tig-aluminum-welder?srsltid=AfmBOooPVAw6lTa4YY9G0OyXxqOo77dNdFiK1Ao6ZGlNGaZa4YlWKnTR (accessed Nov. 05, 2024).

MIG Welding:

- typically used for larger scale aluminum projects
- easier to learn and perform
- faster
- less accurate and precise
- more effective for thicker aluminum welding

TIG welding:

- used in projects that require clean high quality finishes
- more accurate than MIG
- used for smaller more delicate projects
- often used for Aluminum since it's a soft metal
- harder to perform and slower

Conclusions/action items:

I believe that MIG welding will be the better choice for the type of welding used in the fabrication of our prototype. This is due to our team members being inexperienced welders, as well as the aluminum used in our project being decently thick. If the welds come out bad or the metal ends up being to thin to MIG weld, we might consider utilizing TIG welding, but that will require further training.

24/09/19 Basic footplate iteration - Yair Ben Shaul

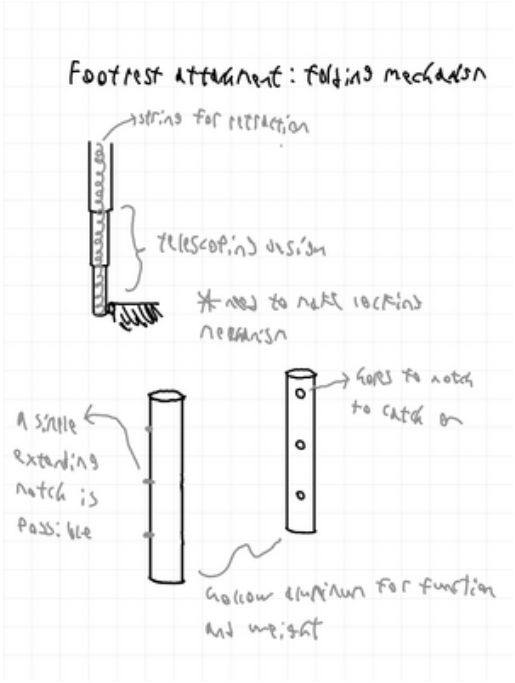
YAIR BEN SHAUL - Sep 19, 2024, 5:56 PM CDT

Download

Basic_footplate_iteration_-_Yair_Ben_Shaul (91.1 kB)

24/09/20 Telescoping collapse mechanism design - Yair Ben Shaul

YAIR BEN SHAUL - Sep 20, 2024, 2:28 AM CDT



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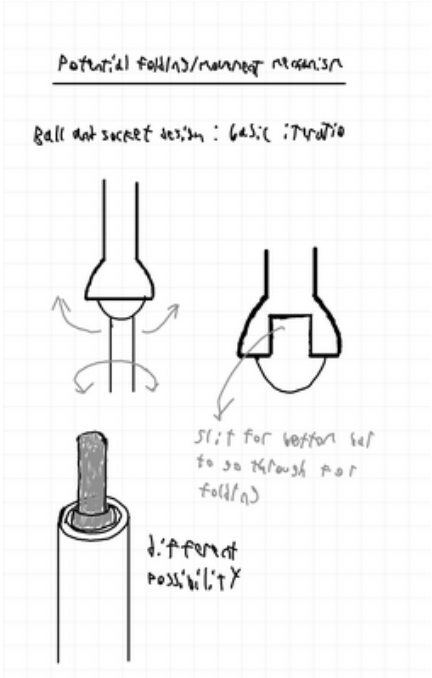
24/09/20 Ball and socket joint for folding

YAIR BEN SHAUL - Sep 20, 2024, 2:28 AM CDT



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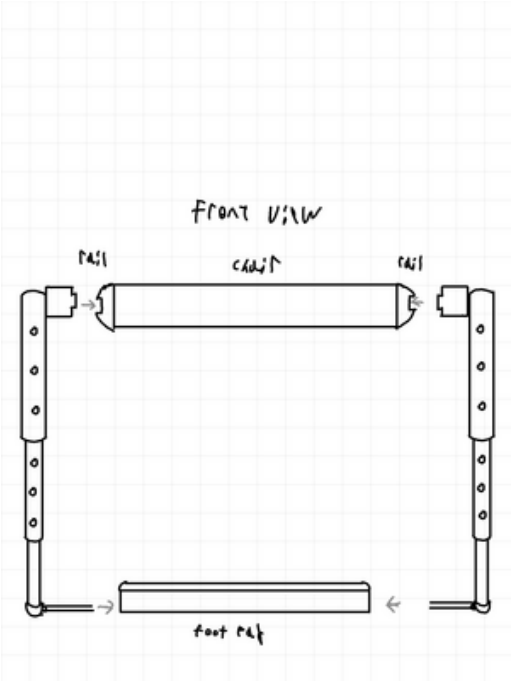
24/09/27 Final design drawing

YAIR BEN SHAUL - Sep 27, 2024, 1:59 AM CDT



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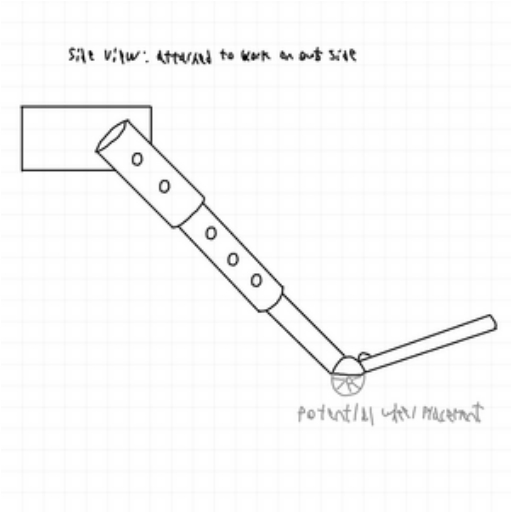
YAIR BEN SHAUL - Sep 27, 2024, 1:59 AM CDT



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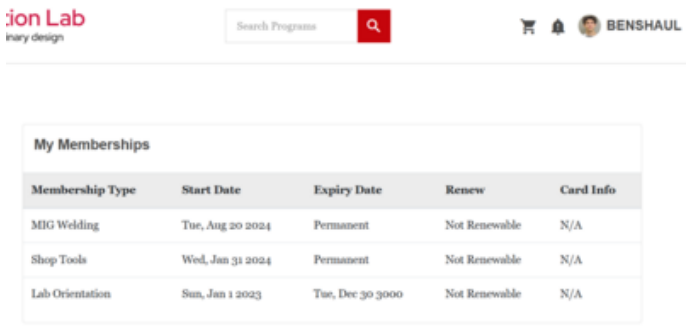
24/08/20 MIG Welding training documentation

YAIR BEN SHAUL - Dec 11, 2024, 5:07 PM CST



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24/11/15 Tong Lecture notes

YAIR BEN SHAUL - Nov 15, 2024, 8:51 PM CST

Title: Tong lecture entrepreneurship notes

Date: 11/15/24

Content by: Yair Ben Shaul

Present: Individual work

Goals: Note key business strategies for BMEs and learn about entrepreneurship

Content:

Title: Starting from scratch: how we built Tasso

The product: Tasso
- Blood collection device that can be used at home

Problems they identified:
- People don't like getting blood drawn
- Painful process
- System for blood draws is outdated and inefficient
- Patients have to come in to a clinic to get their blood drawn

Their idea/conclusion: **The future of healthcare is at home**
- Today most products are delivered to the consumer’s home
- Why not take that approach with healthcare

How they started their business:
- Asked around and came to the Law and Entrepreneurship Clinic in UW Madison
- Using resources provided by uw madison
- Send grants to everywhere possible: Darpa, NIH… other SBIR grants

Evolution of the technology:
- Make a better product, kill your product when needed
- You can change the technology if its for the right reasons, even if some people will be dissatisfied

Finding a key customer
- A champion with a problem: identify a “loud” voice in the industry with a problem you can solve
- USADA needed blood drawing for anti doping but athletes didn’t want to use conventional methods
- Tasso developed a temper-proof security case to solve chain of custody problem
- Tasso is now used by many sports organizations like the UFC and MLB
- Find one problem you can solve and scale it
- Work with people, solve their problem and others will seek the solution
- Tasso’s product saved the MLB ~million dollars

Scaling up - lessons in quality, culture, and HR
- They were making a new concept every day
- Covid led to demand for at-home testing, which was good for Tasso
- Quality is key, if product doesn’t have consistent quality you get unsatisfied customers
- Culture in the company is important, especially when expanding, so that people make decisions in line with your beliefs

FDA - place for creativity

- Read the labels and know what the regulations are
- You can sometimes go around regulations with creativity

Conclusions/action items:

Building a business and developing a product are very complicated and difficult processes, but if you approach them the right way they are absolutely possible. If we were to make a product out of our project this year and try to launch it, we should follow the steps of Erwin Berthier, and Benjamin Casavant when they were developing Tasso.

2024/09/18 - Article-Battery Powered Wheelchair

Elle Thom - Sep 18, 2024, 8:08 PM CDT

Title: Article Notes on Electric Wheelchairs

Date: 9/18/2024

Content by: Elleana Thom

Goals: Research different articles pertaining to the electric wheelchair safety features of the project

Content:

Article title: Evaluation of the safety and durability of low-cost nonprogrammable electric powered wheelchairs

Citation: [1]“Battery-Powered Wheelchair and Mobility Aid Guidance Document Battery-Powered Wheelchair and Mobility Aid Guidance Document Transport of Battery-Powered Wheelchair and Mobility Aid Carried by Passengers Revised for the 2022 Regulations,” 2022. Available: https://www.iata.org/contentassets/6fea26dd84d24b26a7a1fd5788561d6e/mobility-aid-guidance-document.pdf

Summary:

This article discusses how standards have been applied to electric wheelchairs from several manufacturers. Results showed a variety of braking distances and dynamic tipping scores. More measurements were taken on safety features, impact, fatigue life, energy consumption, and power/control systems. Conclusions drawn discussed the need to revise these low-cost models to make the chairs safer and more reliable to the user. I used this article to research more about the safety requlations required of electric wheelchairs and our our team can apply them to the footrest wheelchair extension.

2024/09/18 - Standard - Electric wheelchair

Elle Thom - Sep 18, 2024, 8:08 PM CDT

Title: Standards on safety regulations required of electric wheelchairs

Date: 9/18/2024

Content by: Elleana Thom

Goals: Take notes and research the safety regulations required for electric wheelchairs

Content:

Standard Title: Battery-Powered Wheelchair and Mobility Aid Guidance Document Transport of Battery-Powered Wheelchair and Mobility Aid Carried by Passengers - Revised for the 2022 Regulations

Citation: [1] J. L. Pearlman, R. A. Cooper, J. Karnawat, R. Cooper, and M. L. Boninger, “Evaluation of the Safety and Durability of Low-Cost Nonprogrammable Electric Powered Wheelchairs,” Archives of Physical Medicine and Rehabilitation, vol. 86, no. 12, pp. 2361–2370, Dec. 2005, doi: https://doi.org/10.1016/j.apmr.2005.07.294.

Summary: A document of safety regulations required of electric wheelchair manufacturers updated in 2022. This standard talks about the standard practices that need to be implemented to travel through the air and with batteries easily. It also goes over emergency response procedures if something dangerous were to occur. I used this standard in my research on safety requirements to keep in mind while creating the footrest.

2024/11/13- Article on Wheelchairs

Elle Thom - Nov 15, 2024, 3:12 PM CST

Title: Wheelchair Users

Date: 11/15/2024

Content by: Elleana Thom

Goals: Write a summary of the research that's cited

Content:

“Wheelchair Users,” *Physiopedia*. https://www.physio-pedia.com/Wheelchair_Users

Conclusions/action items:

This article provides an overview of the different types of wheelchairs, their uses, and considerations for wheelchair users. It covers the functional needs of individuals who rely on wheelchairs for mobility, including factors like posture, positioning, and accessibility. The article also discusses the various challenges wheelchair users face in daily life, such as navigating public spaces and transportation. Additionally, it highlights the importance of proper wheelchair fitting, the role of healthcare professionals in supporting wheelchair users, and strategies for improving accessibility and independence.

2024/11/15-Article on leg elevation systems

Elle Thom - Nov 15, 2024, 3:19 PM CST

Title: Leg elevation systems

Date: 11/15/2024

Content by: Elleana Thom

Goals: Write a summary on the research that's cited

Content:

[2]J.C. Gerkhe, "Leg Elevator System," United States, US20080276375A1, 2008-11-13

https://patents.google.com/patent/US20080276375A1/en?q=(foam+leg+elevators)&oq=foam+leg+elevators

Conclusions/action items:

Reference: Dr. Jon C. Gerkhe specializes in general orthopedics and is associated with Mahaska Health in Oskaloosa, IA.
Summary: Patent constructing an elevation system that will lift and elevate the lower extremities supporting the upper and lower leg as well as the foot.

2024/11/15-Article on seating systems

Elle Thom - Nov 15, 2024, 3:18 PM CST

Title: Seating Systems

Date: 11/15/1014

Content by: Elleana Thom

Goals: Write a summary of the cited research

Content:

[3]"Development of intelligent seating system for cerebral palsy," 13055979, K. Anzai, T. Kikuchi and T. Shibuya, 2012 Proceedings of SICE Annual Conference (SICE), Akita, Japan, 2012, pp. 1652-1655.
https://ieeexplore-ieee-org.ezproxy.library.wisc.edu/document/6318717

Conclusions/action items:

*I went through UW-Madison Libraries under resources and searched on IEEE Xplore for this standard.

References:

J. B. Williamson, "Management of the Spin in Cerebral Palsy", Current Orthopaedics, vol. 17, pp. 117-123, 2003.

I. A. Trail et al., "The Matrix Seating System", The Journal of Bone and Joint Surgery, vol. 72-B, no. 4, 1990.

A. Tomitaro et al., "Handbook of Cerebral Palsy" in , Ishiyaku publishers, pp. 127-136, 2002.

T. Kikuchi, "Basic study on development of transformable seating system for cerebral palsy", ABML 2011, pp. 02-13, 2011.

Summary: Standard on what a seating system should look like with a patient who has Cerebral Palsy. It mainly contains information about the backrest but it does touch on information about the legs as well.[3]

2024/11/13-Article on everyday wheelchair use

Elle Thom - Nov 15, 2024, 3:22 PM CST

Title:

Date:

Content by:

Present:

Goals:

Content:

Conclusions/action items:

2024/11/13-Article on everyday wheelchair use

Elle Thom - Nov 15, 2024, 3:22 PM CST

Title:

Date:

Content by:

Present:

Goals:

Content:

Conclusions/action items:

2024/11/13-Article on everyday wheelchair use

Elle Thom - Nov 15, 2024, 3:25 PM CST

Title: Everyday Wheelchair use

Date: 11/15/2024

Content by: Elleana Thom

Goals: Write a summary on the research

Content:

ciaran67, “The Benefits of a Custom Wheelchair,” NPL Home Medical, Jul. 08, 2022. https://www.nplhomemedical.com/post/the-benefits-of-a-custom-wheelchair-ohio (accessed Oct. 09, 2024).

Conclusions/action items:

describes how custom wheelchairs are tailored to meet the specific needs of individual users, improving comfort, mobility, and quality of life. It highlights the advantages of personalized seating and positioning, which can prevent pressure sores and promote better posture. The piece also emphasizes that custom wheelchairs offer better support, enhance independence, and reduce the risk of long-term health issues like joint pain. The article underscores the importance of working with healthcare professionals to choose the right custom wheelchair based on factors such as lifestyle, body type, and functional requirements.

2024/11/15- Disabilities that require wheelchairs

Elle Thom - Nov 15, 2024, 3:31 PM CST

Title: Disabilities that require wheelchairs

Date: 11/15/2024

Content by: Elleana Thom

Goals: Write a summary of the cited research

Content:

Redman Power Chair, “Disabilities that Require Wheelchairs,” Redman Power Chair, Aug. 23, 2019. https://www.redmanpowerchair.com/disabilities-that-require-wheelchairs/

Conclusions/action items:

Describes various conditions and disabilities that may necessitate the use of a wheelchair. It covers a range of medical issues, including spinal cord injuries, cerebral palsy, muscular dystrophy, and multiple sclerosis, which can impair mobility and require assistive devices like wheelchairs for independence and daily function. The article also emphasizes the importance of selecting the right type of wheelchair based on the specific needs and capabilities of the individual, ensuring comfort, support, and enhanced mobility for those living with these disabilities.

2024/12/09-Article on Muscular Dystrophies

Elle Thom - Dec 09, 2024, 10:12 PM CST

Title: Muscular Dystrophies

Date: 12/9/2024

Content by: Elleana Thom

Goals: Write a summary on the cited article

Content:

J. C. Carter, D. W. Sheehan, A. Prochoroff, and D. J. Birnkrant, “Muscular Dystrophies,” Clinics in Chest Medicine, vol. 39, no. 2, pp. 377–389, Jun. 2018, doi: https://doi.org/10.1016/j.ccm.2018.01.004.

This article reviews the effects of muscular exercise on patients with muscular dystrophy, focusing on randomized controlled trials. While exercise did not improve muscle strength, it showed some benefits in walking endurance, especially in conditions like facio-scapulo-humeral and myotonic dystrophy. The study highlights the need for more targeted research to establish effective exercise protocols for muscular dystrophy.

2024/11/15- Article on ramp slopes

Elle Thom - Nov 15, 2024, 3:08 PM CST

Title: Article in electric wheelshairs

Date: 11/15/2024

Content by: Elleana Thom

Goals: Write a summary on research

Content:

“Americans with Disabilities Act Ramp Slope - HandiRamp,” *handiramp.com*. https://handiramp.com/ada-guidelines/ada-ramp-slope.htm

Conclusions/action items:

This page goes over the different regulation set in place for wheelchair user safety while using ramps. It includes guidlines for the width, height, and length as well as a ratio that needs to be met for a ramp. Overall it covers the regulations that the Americans with Disabilities Act put in place to cover the safety of the user from both issues arising from the ramp and the wheelchair itself.

2024/12/09- Article on the fold and go wheelchair footrest

Elle Thom - Dec 09, 2024, 9:36 PM CST

Title: Fold and Go Footrest

Date: 12/9/2024

Content by: Elleana Thom

Goals: Write a summary on the cited article

Content:

“FOLD + GO Hideaway Footrest,” FOLD + GO Wheelchairs®, Sep. 17, 2024. https://www.foldandgowheelchairs.com/travel-friendly/fold-go-hideway-footrest/ (accessed Sep. 19, 2024).

The fold and go hideaway footrest is a folding accessory for specific wheelchair models, designed for easy storage and use. It folds under the seat cushion when not in use, allowing the user to place their feet on the floor while entering or exiting the chair. The footrest is compatible with more heavy-duty models of wheelchairs, for easy installation and the ability to fold and unfold the chair with the footrest in place. It weighs about 2 lbs, measures 12" in length, and includes attachment bolts and rubber end caps. It is a bit pricey, at $129.95.

2024/12/09-Article on the swing away footrest

Elle Thom - Dec 09, 2024, 9:40 PM CST

Title: Swing away footrest

Date: 12/09/2024

Content by: Elleana Thom

Goals: Write a summary of the cited article

Content:

“Swing-Away Footrests, Composite Footplates (No Heel Loops),” Aracent Healthcare, 2024. https://aracent.com/swing-away-footrests-composite-footplates-no-heel-loops/ (accessed Sep. 19, 2024).

The swing-away footrests with composite footplates are a practical solution for wheelchair users who need more flexibility. By swinging to the side, they make transfers easier and allow for extra space when standing or adjusting positions. They are designed for convenience and are lightweight, tool-free, and adjustable, for a better more comfortable, and adaptable fit for different users. These footrests enhance mobility and usability by offering easy access to the feet and enabling quick, efficient changes.

2024/12/09- Article on mechanisms used for the reconfigurable wheelchair

Elle Thom - Dec 09, 2024, 9:51 PM CST

Title: Mechanisms used for the reconfigurable wheelchair

Date: 12/09/2024

Content by: Elleana Thom

Goals: Write a summary on the cited article

Content:

I.-E. Popescu, F. Florescu, C. Sticlaru, D. T. Mărgineanu, and E.-C. Lovasz, “A Review on Mechanisms Used for the Reconfigurable Wheelchairs,” Mechanisms and machine science, pp. 19–28, Jan. 2023, doi: https://doi.org/10.1007/978-3-031-25655-4_3.

this article explores the design and mechanisms behind reconfigurable wheelchairs, focusing on how these wheelchairs can be adjusted for different needs and environments. It also discusses various techniques, such as modular components and mechanical adaptations, that enhance user comfort, mobility, and ease of use. The paper reviews the challenges and innovations in developing these systems, aiming to provide a more versatile and user-friendly wheelchair experience.

2024/09/11 - Lecture 1 (BME Career Prep)

Elle Thom - Sep 11, 2024, 1:55 PM CDT

Title: BME 300 Lecture 1 - BME Career Prep

Date: 9/11/2024

Content by: Elleana Thom

Present: BME 300 Lecture

Goals: Take notes on topics presented in the lecture

Content:

Notes -

- BME Career Prep - Stephanie Salazar Kann
  - Job search
    - Keep track of what I've applied to (ECS tracking sheet)
      - ecs/wisc.edu
    - Use of sources
      - LinkedIn, Handshake, Indeed
    - After application follow-up should take 2-3 weeks
    - Focus on skills, industry, exposure
  - Resume Tips
    - Tailor resume to position
    - Create balance
      - show full picture of your experience
    - ATS Proofed resume
      - MS Word
      - No columns, charts, colors
      - Design projects WITHOUT years or semesters - what did you do
      - Technical skills and coursework
      - jobs - Organizational + location, Position title + Dates
  - Cover Letter Tips
    - Not needed at the career fair
  - Career Fair Advice
    - Identify your purpose
    - Looking beyond the obvious, overlap with other disciplines
    - Research the employer - feedback from our partners
    - Develop your "valued added" statement - why you?
  - Handshake Logic
    - read about what organizations do
  - Career Fair
    - BME
    - ME
    - Materials
    - 16th-19th
    - 11am-5pm
    - EH Lobby, ME Lobby, and ECB Lobby

Conclusions/action items:

Stephanie came to talk about career prep especially with tips on our upcoming career fair.

2024/09/18-Lecture 2 - Exploring your leadership styles

Elle Thom - Sep 18, 2024, 2:02 PM CDT

Title: Exploring your leadership style

Date: 9/18/2024

Content by: Elle Thom

Present: BME 300

Goals: Take notes on the lecture

Content:

Exploring your leadership style

- qualities of a leader
  - there were a lot of words that involved helping others
- Autonomy of a good leader
  - self-awareness
  - vision
  - transparent
  - communication
- Styles
  - Power model
    - Thought - someone has to take control
    - qualities - great man theory, people being born to lead
      - being in control
      - hierarchy, authority, command
  - Servant
    - Thought: it's not about me, the most important thing is to be of service to others
    - Qualities: Being of service, empathetic, shared decision making
  - Authenticity
    - Thought: By being my genuine self I'll gain ad build trust
    - Qualities: Transparency, genuineness, honesty
  - Consider your strengths
    - people oriented
      - glue that holds people together
    - Proscess oriented
      - set the pace for the team and get things done efficiently
    - Thought oriented
      - big picture
    - Impact oriented
      - set the bar high
  - Explore how you lead
    - self assess
    - observe and reflect
    - seek out feedback
  - Goal setting
    - Team goal
      - I want our team to be able to use time effectively to create minimal stress throughout the project. I think we can do this by utilizing the time provided for us as well as being excited to come to meetings.
    - Self goal
      - I think it would be a good idea to build more relationships in the team, in the past I would just come to meetings to get work done instead of actually bonding with my team mates. I think I could also be better at voicing my ideas more regularly too, I'm not very outspoken when I first meet people and the fact that I don't build relationships with my team doesn't help that.

Conclusions/action items: This lecture is all about finding what leader we are and we can develop good traits and find what we're good at and how to apply it to our leadership skills.

2024/09/25 - Lecture 3

Elle Thom - Sep 25, 2024, 2:09 PM CDT

Title: BME advising session Part II: Fall post Graduate Planning

Date: 9/25/2024

Content by: Elleana Thom

Present: BME 300

Goals: Write notes on the lecture.

Content:

Notes:

- Fall post graduate planning
  - general pointers
    - undergrad=build a story
    - do research
    - think about references - 3 strong people
    - prepare for entrance exams
  - Writing your story
    - avoid basic coverletters
    - start with what you want to do
    - Personal statement: show a reasonable idea of what
    - Defend your plan with life experiences-most recent first
    - CV is in paragraph form - Be specific
  - Grad School
    - Masters
      - one year!
      - industry focused
      - rewrite your story
      - need time to prep for entrance exams
      - powerful if you add in industry experience
      - BME masters programs
        - research
          - need a lab
          - thesis is required
        - accelerated program
          - Funded if you're a ta
          - Coursework only
          - 24 credits
        - Biomedical innovation, Design, and Entrepreneurship
          - project based
          - partnered with business school
            - take entrepreneurship or project management
        - Doctoral PHD
          - independent researcher
          - write research grants
          - work in academia
          - lead projects in industry, startups, and consulting
  - Applying for BME accelerated MS programs
    - apply online, pay fee, and submit
    - statement of purpose
    - people that can refer you
    - deadline 12 /15
    - need a 3.0 in the last 60 credits or overall
  - Masters elsewhere
    - MS in Global health
    - MBA - generally industry pays for credits or evening options
  - PhD additional advice

        - Do your research
        - build resume
        - external funding
            - apply fall senior year
            - due oct 15th
        - application process
            - 3.5 gpa
            - 75% GRE
            - individual reviews
            - sought after candidates are invites for a visit weekend
    - MD or pre-health advice
        - med school requirements
            - two semesters of gen chem
            - chem 344 and 345
            - two semesters of physics
            - two semesters of English
            - comm b
            - psychology and sociology
            - biochemistry
    - Beyond the classroom
        - research is required
        - Volunteer (clinical setting)
        - shadow physicians
        - patient contact time
        - Build relationships
        - use your design experience
        - requirements vary by degree

Conclusions/action items:

Took notes and gained knowledge on more engineering advising and how to pursue our careers moving forward.

2024/10/02-Lecture 4

Elle Thom - Oct 02, 2024, 2:06 PM CDT

Title: Lecture 4 - Near Peer Mentoring

Date: 10/2/2024

Content by: Elleana Thom

Present: BME 300

Goals: Take notes on the lecture

Content:

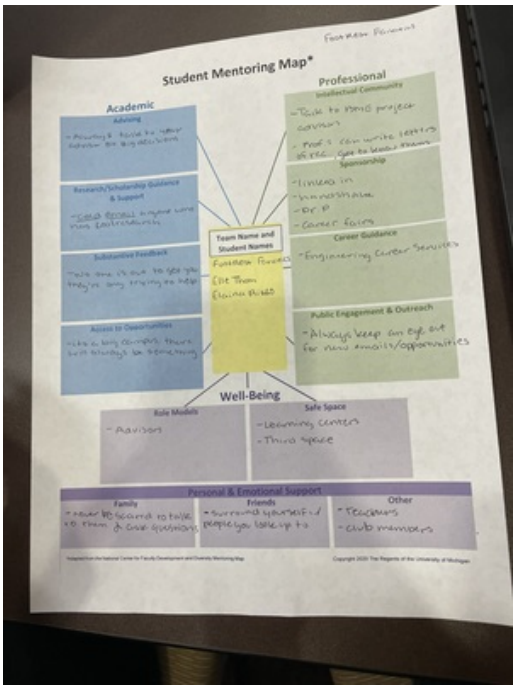
Notes:

- Near Peer Mentoring
  - Mentoring BME 200 students
    - Additional instruction and emotional support
    - Peer mentors are more approachable
    - share experiences
    - increase belonging
    - Mutual benefits
      - leadership
      - communication
      - active listening
      - study practices
      - self-awareness
      - interpersonal skills
  - General benefits of mentoring
    - increased self-esteem and confidence
    - patience
    - build positive habits
    - Personal Growth
    - identify gaps in knowledge
    - sense of accomplishment
  - good mentor
    - building trust
    - psychological safety
    - reliability
    - support/enthusiasm
    - availability
    - transparent
    - be the coach
    - listening
      - get rid of distractions
      - stop talking
      - act like you are interested
      - look at the person
      - get the main idea
      - ask questions
      - check understanding
      - react to ideas and not the person
      - avoid hasty judgments
  - What do you wish you knew in BME 200
    - time management
    - the importance of getting to know your team

Conclusions/action items:

Took notes on what it means to be a good mentor and how to give advice about different topics

ELAINA RIZZO - Oct 02, 2024, 2:01 PM CDT



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2024/10/09-Lecture 5

Elle Thom - Oct 09, 2024, 2:06 PM CDT

Title: Lecture 5 Sustainable Engineering

Date: 10/9/24

Content by: Elleana Thom

Present: BME 300

Goals: Take notes on lecture

Content:

Notes:

- circular economy
  - keeping things out of landfills
  - keeping them in the economy
- Life cycle assessment
  - how you get a carbon footprint
  - look at the environmental impacts of products and processes
  - 1969 coke company was the first to implement this
- Look at material composition of the product you're making
  - will they hold up and not degrade with cleaning supplies or chemicals they may come in contact with
- Single use medical devices are very popular now
  - This helps with making products sterile
- Spike during COVID pandemic
  - more masks being bought
  - infection control
  - need for sterile covid tests
  - shortages of materials
    - hospitals gave out 1 respirator per person
- How does this fit into our project
  - make the footrest out of materials that can be recycled but not biodegradable
  - Make it last a long time so people won't need multiple footrests in a lifetime

Conclusions/action items:

Took notes on lecture about sustainability engineering

2024/10/16-Lecture 6

Elle Thom - Oct 16, 2024, 2:07 PM CDT

Title: Introduction to WARF, IP, Disclosing & Licensing

Date: 10/16/24

Content by: Elleana Thom

Present: BME 300 Lecture

Goals: Write notes on lecture

Content:

Notes:

- WARF
  - supports research at the university as the patenting office.
  - venture office invests in startup
- Technology transfer
  - intellectual property licenses
  - industry sponsored research
  - consulting arrangements
  - fee for service
  - move research from campus to market
- Intellectual Property overview
  - Patents
  - copyrights
  - trademarks
  - trade secrets
  - other WARF
    - biomaterials
    - technique and know how
    - Data
- Overview of non patent
  - Copyrights
    - Protection for creative works that are expressed in a tangible medium
    - a wide range of subject matter
  - trademarks
    - Protection for names, marks, logos, dress, etc.
    - Requires use in commerce
    - Source-identifying function
  - trade secrets
    - Can be used to protect anything of value
    - protection is good so long as the concept is not generally known
- Patents generally
  - right granted by a government agency
  - three types
    - Design
      - 15 year time limit, limited to ornamental features
    - utility
      - Provisional (1 year place holder)
      - non provisional (20 years)
    - plant
- Utility Patents
  - new and useful process, machine, manufacture, or composition of matter + improvements
  - 2-5 years to issue
  - cost is 30k-mostly attorney's fees
  - 90% of patents
- Requirements for patenting
  - eligible- cannot be a product of nature, no abstract ideas, or natural phenomenon

    - novel - new
    - non obvious - cannot be simple modification or combination of existing concepts
    - enabled and described - provide detail to teach others
    - patent examiners are real people
- Disclosing an innovation to WARF
    - 400 new innovation disclosures per year
    - disclosing
        - submitting a description of the innovation
        - funding sources
- Assessing university inventions
    - IP considerations
        - type of IP protection
        - potential breadth and strength of IP protection
        - Public disclosure
        - Stage of development
    - Licensing considerations
        - applications
        - likelihood of identifying a commercial partner
        - likely return from licensing
- Marketing and licensing
    - Market analysis
        - market status
        - size and type
        - potential licensees
    - license negotiation
        - type and terms
        - consideration
    - ongoing
        - technology development, enforcement, amendment, termination
- Value of licensing
    - Benefits of the company
        - reduced R&D costs
        - improved time to market
        - oppurtunity to enter new markets and expand your company quickly
        - New features or products provide additional revenue oppurtunities
    - Determining the value
        - technology application
- AI and IP
    - Cannot invent
    - can assist in inventing
    - copyrights
        - original works of human authorship
        - AI must be incidental to conception and creation
        - Original conception by human master mind - Are prompts sufficient
        - combinations of derivative works requires more than de minimis contribution from human

Conclusions/action items:

Took notes on lecture about WARF, IP, Disclosing & Licensing and completed them by 2:10pm

2024/10/23- Lecture 7

Elle Thom - Oct 23, 2024, 2:05 PM CDT

Title: Do I need an IRB?

Date: 10/23/2024

Content by: Elleana Thom

Present: BME 300 Lecture

Goals: Take notes on guest speaker's lecture

Content:

Notes:

- Do I need an IRB?
  - Institutional review board
    - protects people participating in research studies
    - ethical
  - Origins
    - known unethical research projects using people
      - Nazi prisoner experiments 1947 Nuremburg
      - Hepatitis studies at willowbrook state school for children
      - Milgrim shock experiments at Yale
      - Tuskegee Syphilis study
    - Belmont principles
    - Regulations for protection of human 'subjects'
      - Dept. of Health and human services
      - FDA
  - Boards
    - Common rule
  - UW- madison IRBs
    - minimal risk research
      - Biomedical, education, and social behavior sciences research
      - secondary analysis of data, survey research, behavioral health, interventions, evaluations of educational practice.
    - health sciences IRB
      - biomedical, interventional, any risk level
      - all FDA regulated and VA regulated research
  - Is it research under common rule?
    - research means a systematic investigation, including research development, testing, and evaluation, designed to develop or contribute to generalizable knowledge.
  - Does it involve people
    - human subject: a living individual about whom an investigaor conducting research
      - obtains information or biospecimens through intervention or interaction, and uses, studies, or analyzes the information or biospecimens; or
      - obtains, uses, studies, analyzes, or generates identifiable private information or identifiable biospecimens
  - Is it human research under FDA device regs?
    - device
    - research/clinical investigation
    - subject
  - Preparing for IRB review
    - researcher responsibilities
      - complete required training for researchers through CITI
        - Human subjects protection training
        - conflict of interest training
        - Good clinical practice training
      - complete annual Outside Activities Reports
    - Develop your research plan
      - identify appropriate principal investigator and study team

        - Collect preliminary data background
        - Develop a researach question
        - Consult UW's FDA regulated research oversight program
        - Consider research participants
    - Online program
        - ARROW
        - protocol based and non-protocol based
    - Review steps
        - UROC review
        - SRC/PRMC review
        - pre-review by IRB staff
        - Review at IRB meeting
        - Committee determination: approved, modifications requested, deferred

Conclusions/action items:

Took notes on the guest speaker's lecture about basics of human participants research requirements, what they mean for me, and how to learn more.

2024/10/30-Lecture 8

Elle Thom - Oct 30, 2024, 2:09 PM CDT

Title: Navigating FDA Device Requirements

Date: 10/30/2024

Content by: Elleana Thom

Present: BME 300

Goals: Take notes on guest speaker's lecture

Content:

Notes:

- Navigating FDA regulations
  - define a medical device
    - What is a medical device
      - anything that's intended to improve health and support function of the body that isn't a drug or biologic
  - Understand different categories
    - traditional medical devices
      - MRI machine, syringe, bandage
    - Non traditional medical devices
      - lab developed tests, software, medical mobile apps(apple watch), mouthwash
  - Applicable FDA regulations
    - protection of human subjects
    - institutional review boeards
    - labeling
    - medical device reporting
    - Investigational device exemption
    - Premarket approval of medical devices and the humanitarian use device
    - Quality systems regualtions (devices)
  - Device classification overview
    - Device classes- class1, class2, class3
    - Risk-low, moderate, highest
    - Marketing- Exempt from premarket approval, 510(k) showing substantial equivalence, premarket approval
  - Regulatory controls
    - General controls
      - registration and listing
      - Adverse Event reporting
      - General labeling
      - Good manufacturing Practice
    - Special Controls
      - Performance standards
      - special labeling requirements
      - post market surveillance
      - Potential data requirements
    - Premarket Approval
      - Data to show safety and effectiveness
  - Class one devices
    - Low risk
    - mostly exempt from premarket notification and quality system requirements
    - follow certain general controls
    - self registration and listing with the FDA
  - Class two
    - higher risk
    - must follow general and special controls
    - submission of a 510(k) application to show substantial equivalence; may be exempt
  - Class three
    - Highest risk

        - Must folloe general and additional controls
        - PMA submission - review of safety and effectiveness
    - Market submission types
        - 510(k) exempt
        - 510(k) premarket notification
        - PMA
        - De Novo Classification
    - Product code
        - Device definition and classification
        - submission type
        - GMP requirements
        - Recognized consensus standards
    - key points for classification
    - quality management systems
    - QMS
    - MAny components
    - Design controls
        - Design reviews

Conclusions/action items:

Took notes on lecture about FDA requirements

2024/11/06-Lecture 9

Elle Thom - Nov 06, 2024, 2:09 PM CST

Title: Regulatory strategy

Date: 11/6/2024

Content by: Elleana Thom

Present: BME 300

Goals: Take notes on lecture

Content:

Notes:

- Regulatory Strategy - the framework guiding advanced therapeutic product development
  - objectives
    - understand overall structure of FDA
    - understand how that influences product development
    - Understand quality
    - learn about science
  - Starting out
    - Websites in slides that are accessible
  - FDA structure and advanced therapuetics
    - genome editing
    - Gene delivery
    - Cell therapy
  - Dramatic Implications
    - 361
      - minimally manipulated and homologous use
      - does not have to go through the whole process to show it is safe and effective
      - is essentially taking something from the patient and putting it back into the same patient (liposuction)
    - 351
      - taking something from the patient, changing it minimally or a lot, then putting it back into the same patient
      - needs to go through the full process of getting a biological license
      - ex: taking a bone sample, changing the cells makeup or genome, then putting it back in for a different outcome
  - Target Product Profile (TPP)
    - attempts to answer:
      - when to use the product?
      - why to use the product?
      - how to use the product?
    - Is it medically and commercially compelling?
    - who would benefit from a TPP?
      - physicians or leaders in the market
      - manufacturing plants
      - investors
  - Considerations when developing a 351
    - nonclinical
      - non GLP (good laboratory practice) studies, and pilot studies
    - quality
      - CMC (Chemistry and Manufacturing Controls) development
      - demonstration of manufacturing quality, initiation of stability studies
      - GMP batches release, process and method validation
    - Clinical
      - phase 1 and 2 trials
      - phase 3 trials
      - filling and launch preparation

            - post-market studies and RWE
        - Overarching: regulatory
            - TPP
            - Pre-IND meeting
            - IND submission
            - EOP1/2 meeting or special protocol assessment
            - Pre-BLA meeting
            - BLA submission
            - US sBLA
    - what does quality mean in a developing industry
        - a system that documents policies, processes, internal rules, procedure, and other records to ensure consistent quality
    - Career Options:
        - Characterization and analytics
        - process development
        - manufacturing development
        - gene delivery

Conclusions/action items:

Took notes on regulatory strategy lecture

2024/11/13- Lecture 10

Elle Thom - Nov 13, 2024, 2:01 PM CST

Title: Lecture 10

Date: 11/13/24

Content by: Elleana Thom

Present: BME 300

Goals: Take notes on lecture

Content:

notes:

- Medical Device FDA Pathways
  - Device classification
    - Class 1, class 2, class 3
    - 510k exempt, premarket notification 510k, 510k de novo, premarket approval, Humanitarian device exemption.
- Regulatory Timelines
  - 180 PMA
- Breakthrough devices program
  - Formerly expedited access program
  - Timely access to medical devices for life-threatening illness
  - Elon Musk Neuralink device
- Medical device process at a glance
  - innovation idea and development
  - Human testing data acquisition with IRB Oversight
  - FDA regulatory Process
  - Reimbursement or financial incentive
  - sales
- New medical tech ecosystem
  - Materials/supply
  - Biomed
  - Informatics Health IT
  - Patient Safety
  - Pharmacy
  - Nursing clinicians
  - Other clinical professionals
  - physician
- General steps from approval to adoption
  - clinical study
  - FDA approval
  - CPT codes
  - CMS national Insurance decisions
  - Standards of practice
  - National regional buying groups
  - Regional/Local IDNs, Hospitals
  - Hospital/IDN Value analytics Groups
  - Product Evaluations
  - Regional/ Just in Time distribution
  - Product Implementation
- Workflow: Patient Care pathway as a starting point
  - Diagonosis or intervention
  - Where is the patient coming from
  - what needs to be improved
- Stakeholders
  - Think about chosen stakeholders
  - patient point of care

    - administrative
    - national clinical oversight
    - National/regional groups
    - Standards organizations
    - National and regional payment/reimbursement
- Value Based Healthcare
    - mix of clinical, economic and patient
    - more affordable
    - care for patients better
    - better care with lower cost
- Trickle down influence for new technology
    - national policy standards of practice and clinical practice guidelines
    - health system and provider
- Hospital new product Adoption Process
    - Clinical champion
    - Value analysis, technology assessment
    - c-suite strategy, Final decision
    - Trial evaluation and metrics
- Values drivers to discover
    - economic
        - money
        - staff time
        - resources
        - waste
        - metrics
    - Clinical
        - improve outcomes
        - reduce risk
        - reduce complications
        - shorten length of stay
    - Mission impact
        - Patient satisfaction
        - academic leadership
        - innovation in care
    - Evidence more compelling than 'hand waving' benefit assumptions
- Who buys, Pays and gets reimbursed
    - CMS for medicare and medicaid services
    - DRG Diagnostic related groups
    - CPT Current procedural code
    - ICD 10 international categorization of diseases
    - GPO Group purchasing organizations
    - IDN integrated delivery networks
    - Payer Mix (%private, capitated, medicare)
- Understand Potential Reimbursement Path
    - type of product or solution
    - Stand alone or part of DRG or other procedures
    - Established/replacement
    - established CPT codes
    - Established DRG In or outpatient
    - CMS vs. Commercial insurance
    - Formulary or Drug Plans
    - research then confirm/learn with a good consultant
- Discover through research and interviews
    - Start with detailed patient flow/care pathways
    - Explore pain points
    - Expand knowledge
    - Examine about how products or therapies are adopted
    - understand the impact of outside organizations
- Start Sales
- Overlooks
    - legal consideration
    - manufacturing
    - engineering

Conclusions/action items:

Took notes on lecture

2024/11/15-Tasso Lecture

Elle Thom - Nov 15, 2024, 2:53 PM CST

Title: Tasso Lecture

Date: 11/15/2024

Content by: Elleana Thom

Present: BME 300/400

Goals: Write a summary of the lecture.

Content:

Summary:

Tasso is a company that was formed back in 2009 by two grad students working in a lab at UW-Madison. It was really difficult to find work or a position to take on a graduate degree at the time. Both founders had an interesting way of finding their way to Wisconsin. Benjamin Casavant who had achieved in an undergraduate degree in bioengineering in California was rejected from many institutions until he decided to individually email professors around the U.S. to find a position and this ended up working when he finally got a position in a lab at UW-Madison. Erwin Berthier is originally from France and then moved to New Zealand to work in a lab before eventually finding his way to Wisconsin and that's where the two founders of Tasso met. Tasso was a company that began with Benjamin and Erwin putting together all the money they could to create a prototype for a product that would allow people to eventually be able to draw their own blood at home instead of traveling to the hospital or wasting valuable time waiting for their next doctor's appointment. It was really interesting how they began setting up this business. They took every opportunity they could to talk to people in the medical industry to figure out what the client needed as well as traveling to big conventions where they knew people in their field would be. They also talked about how their scaling-up process worked and how it began in a little room. When COVID-19 hit in 2020 their company had been up and running and making 100 products a day. However, with the lockdowns from the virus came companies and the medical world reaching out to them to sell more of the product. By this time they were backlogged 160,000 products. In order to fix this problem they moved the manufacturing equipment to a larger warehouse nearby and were then able to make 300,000 products in one month. I think their story was really interesting in that they took every opportunity to grow and expand their company even if they needed to scrap an idea and start again. Seeing where they are now after selling their 1 millionth device, it was really inspiring hearing what they had to say and the advice they had to give.

Conclusions/action items:

This was a really inspiring lecture to listen too. I think they address a lot of really good points from how they got an idea off the ground to being able to have a good work-life balance in the middle of it.

2024/11/20- Lecture 11

Elle Thom - Nov 20, 2024, 2:07 PM CST

Title: How New Product Development Works in the medical device industry

Date: 11/20/2024

Content by: Elleana Thom

Present: BME 300

Goals: Take notes on lecture

Content:

Notes:

- Russ
  - BMe undergrad University of Iowa
  - Masters in bioengineering, clemson University
  - 25 years in industry
    - smith and nephew
    - gyrus ENT(now Olympus)
    - Cardinal health
    - Hollister
    - TIDI Products
- Learning objectives
  - understand how new products are selected
  - how they're managed
  - define hurdles and barriers
- NPD in the medical device industry
  - highly regulated
  - expensive
  - resource intense
  - competitive
- Selecting and prioritizing projects
  - Corporate strategy
  - Product portfolio
  - Project review
  - Budgeting and resource allocation
- Types of NPD projects
  - line extensions
    - additional sizes and configurations
  - Product improvement
    - Existing product change
  - new to compamy
    - product that isn't new but new to company
  - new to world
    - completely new
- Typical NPD Members
  - Product development engineer, marketing, project management, etc.
- Managing NPD: Stage-Gate process
  - Ideation-Stage0
  - exploration-stage1
  - concept development-stage 2
  - Design development -stage 3
  - Design confirmation - Stage 4
  - Design transfer and commercialization-stage 5
  - post-market surveillance
- Case Study
  - fluid management solutions for high volume (>8L) cases existing in 2007
    - Manuel suction canisters

        - goal: Provide clinicians with an innovative solution for high-volume collection during surgical procedures
- Ideation
    - Choose area of oppurtunity
    - Review market trends ans/or competitive threats
    - Conduct primary and secondary research
    - Identify customer unmet needs
    - Create high level back of the napkin ideas
- Stage 1 Exploration
    - Typical activities
        - Define problem to be solved and customer requirements
        - Review refine and screen list of ideas from stage 0 for exploration
        - create concepts for 8-10 ideas
        - develop high level business case
        - Conduct preliminary technical scouting and intellectual property landscaping
- Defining the problem
    - ask questions to the customer
- Stage 2 Concept definition
    - Typical activities
        - go down to one leading concept
        - Develop a business case
        - Conduct a comprehensive IP examination
        - Next gate review is go/no go business decision
- Stage 3 Design development
    - typical activities
        - functional prototype
        - continue design process
        - confirm regulatory pathway
        - design control documentation
- Design control
    - mandatory for FDA class 2&3 and almost all EMA devices
    - includes documentation of customer needs, design requirements, design input / output, testing, design reviews
    - Tightly aligned with risk management
- Stage 4 design confirmation
    - typical activities
        - Conduct extensive verificastion and validation testing
        - Finalize product and component drawings/models
        - accelerate manufacturing process developing along with plans for quality control
        - freeze design at the end of this stage
        - Submit regulatory documentation
- Stage 5 design transfer and commercialization
    - typical activities
        - complete any remaining tests
        - final design changes
        - build molds assembly test equipment
- Post market surveillance
    - typical Activities
        - regulate sales cycle and adjustments
        - track customer feed back
        - 4-6 month cadence, project teams report out to stakeholders
            - account sale
            - business and regulatoty issues observed
            - complaints
            - product and process imporvementoppurtunities
- Summary
    - hard to manufacture products
        - complex
        - expensive
            - limited resources
        - people resources
    - good product design and development is necessary fro commercial success but not sufficient.

Conclusions/action items:

Took notes on the lecture about how new product development works in the medical device industry

2024/11/15-Designs from my notebook

Elle Thom - Nov 15, 2024, 3:42 PM CST

Title: My Personal Notebook

Date: 11/15/2024

Content by: Elleana Thom

Goals: Upload pictures of my BME notebook

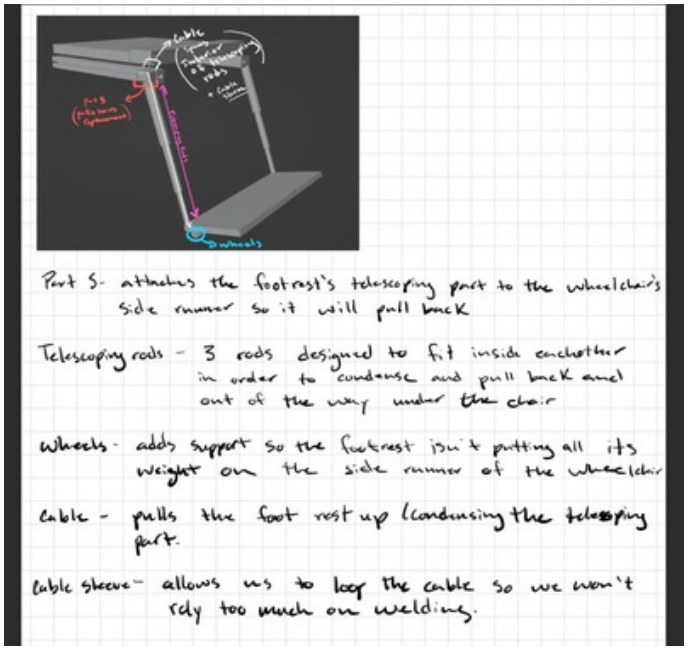
Content:

Uploaded in images below

Conclusions/action items:

This is a compilation of details and designs of our project, its design, and specifics for materials.

Elle Thom - Nov 15, 2024, 3:38 PM CST



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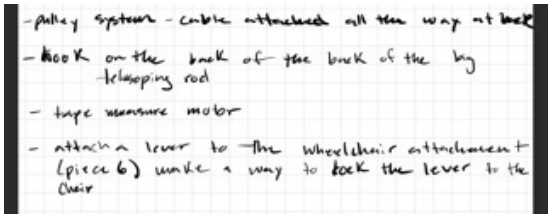
Elle Thom - Nov 15, 2024, 3:39 PM CST



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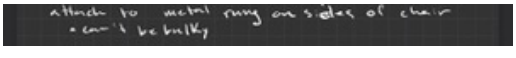

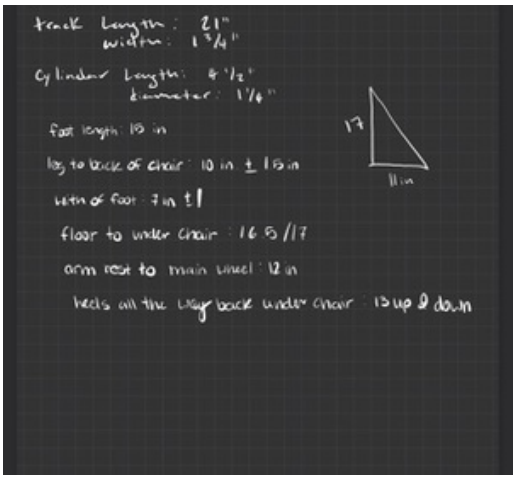

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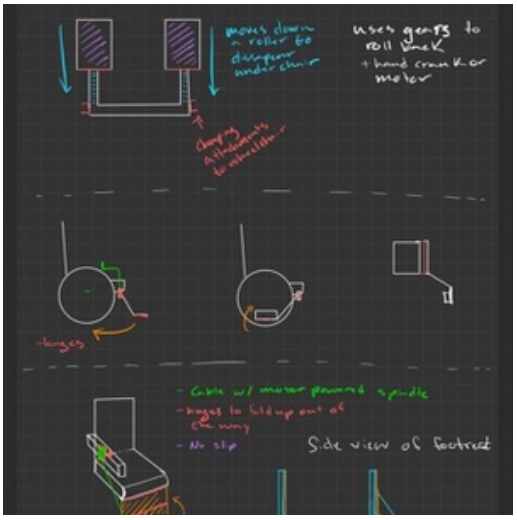
Elle Thom - Nov 15, 2024, 3:39 PM CST



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2024/09/13 Wheelchair Statistics

ELAINA RIZZO - Sep 13, 2024, 11:24 AM CDT

Title: Fact Sheet on Wheelchairs

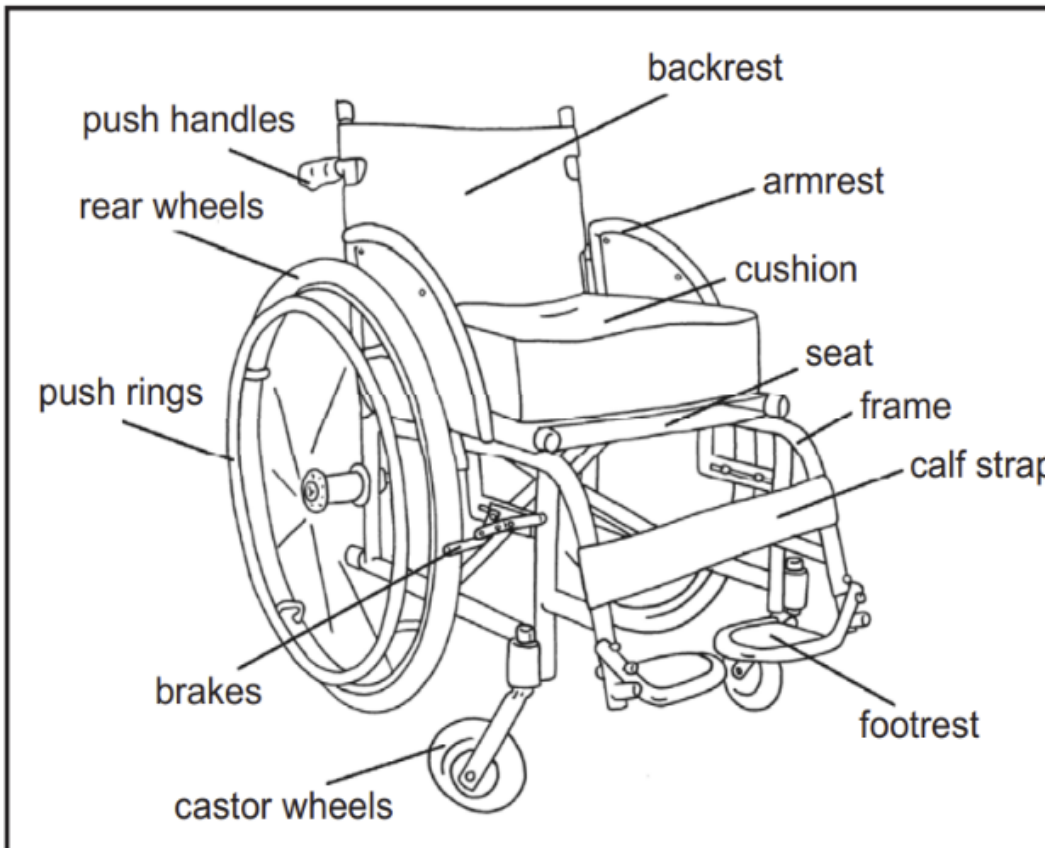
Date: 9/13/24

Content by: Elaina Rizzo

Goals: Use the fact sheet for general knowledge about wheelchair users

Content:

Below Attachment



Conclusions/action items:

The sheet has many good facts and models about wheelchairs that can be used and referred back to when thinking about possible ideas. It can be used during prototyping and seeing the fittings when wanting to make an attachable model.

ELAINA RIZZO - Sep 13, 2024, 11:18 AM CDT


World Health Organization

Fact sheet on wheelchairs

October 2010

Fact Sheet

The wheelchair is one of the most commonly used assistive devices for enhancing personal mobility, which is a precondition for enjoying human rights and living in dignity. Wheelchairs assist people with disabilities to become productive members of their communities.

About 10% of the global population, i.e. about 650 million people, have disabilities [1]. Studies indicate that, of these, some 10% require a wheelchair. In 2003, it was estimated that 20 million of those requiring a wheelchair for mobility did not have one. There are indications that only a minority of those in need of wheelchairs have access to them, and of those very few have access to an appropriate wheelchair [2].

Rights to wheelchair

Freedom: Life story of Sharmin from Bangladesh

Sharmin, now 18 years old has moderate cerebral palsy. For years she lived a life virtually restricted to the boundaries of her home. She did not have friends, did not participate in games or go to school. When her parents went out they locked her inside fearing for her safety.

In 2007, Sharmin and her family were severely affected by Cyclone Sidr. During the rehabilitation process following Sidr, she received a wheelchair. It was a day of liberation and happiness for Sharmin. This was the first time she went out of her home with dignity. She is now able to earn by selling goods from a shop and

The UN Standard Rules (1994) Rule 4, Convention on the Rights of Persons with Disabilities (CRPD 2006) Article 20 (personal mobility) and Article 26 (habilitation & rehabilitation) request Member States to support the development, production, distribution and servicing of assistive devices and equipment and the dissemination of knowledge about them. It is to be noted that to make optimum use of a wheelchair, an accessible/ barrier-free environment is equally important.

Benefits of wheelchairs

Providing appropriate wheelchairs not only enhances mobility but begins a process of opening up a world of education, work and social life. In addition to providing mobility, an appropriate wheelchair benefits the physical health and quality of life of the users by helping in reducing common problems such as pressure sores, progression of deformities and improve respiration and digestion.

by recharging mobiles of her neighbours from the electricity generated from a solar panel. She says, *'If I had the wheelchair at a younger age, I could have studied as other children do'*

Download

wheelchair.pdf (1.38 MB)

2024/11/15 Ambulatory Wheelchair Users

ELAINA RIZZO - Nov 15, 2024, 5:53 PM CST

Title: Ambulatory Wheelchair Users

Date: 11/15/24

Content by: Elaina Rizzo

Content:

R. Gilani, “Ambulatory Wheelchair Users & Their Unique Experience,” *Gilani Mobility*, Mar. 14, 2024. https://www.gilanimobility.ae/ambulatory-wheelchair-user/

The article from Gilan Mobility talks about ambulatory wheelchair products, designed for users who can walk short distances but may need assistance for longer trips or during fatigue. These wheelchairs are lightweight, compact, and easy to maneuver, offering greater mobility and independence. They are especially suitable for individuals who experience limited endurance or balance issues, allowing them to transition between walking and sitting when necessary. The article also highlights the features, benefits, and availability of such wheelchairs to enhance the quality of life for those with mobility challenges.

Conclusions/action items:

For this project, our client has limited mobility with his feet, which is why he needs to have the full range of his motion in front of the wheelchair. The footrest hinders this, and is the main reason for the design and manufacturing of this project.

Telescoping Footplate

ELAINA RIZZO - Sep 12, 2024, 9:57 PM CDT

Title: Competing design for footrests

Date: 9/12/24

Content by: Elaina Rizzo

Goals: Briefly explain the concept of a telescoping footrest that is on the market

Content:

https://lith-tech.com/shop/telescopic-extendable-footplate/

This product is an add on to an electric wheelchair that can extend based on the leg size of the user, and can also fold up when not in use. This product is similar to what this team needs to do in that the product is versatile to the user and also allows the footrest to be out of the way completely when not in use or if the user needs to put their legs down for any reason. Also, this accessory seems to only be available to the company's product itself, which limits the accessibility to those who do not have the correct wheelchair to use it.

Video of the product being used: https://youtu.be/Q_GB5QJhVSs?feature=shared

Conclusions/action items:

ensure that the design that the team ends up using is not too similar to those on the market and to this product.

Fold and Go Footrest

ELAINA RIZZO - Sep 13, 2024, 11:03 AM CDT

Title: Fold and Go Footrest for Wheelchairs

Date: 9/12/24

Content by: Elaina Rizzo

Goals: Describe a product on the market that is a foldable footrest for wheelchairs.

Content:

https://www.foldandgowheelchairs.com/travel-friendly/fold-go-hideway-footrest/

This device is similar to the telescoping Footplate in that it folds up and is stowed at a positive 90 degree angle to the foot. The downsides to this design is that the feet have to be moved out of the way in order for the footrest to be moved up and away, which is not feasible for all people and is not ergonomic. In addition, this piece only works on 2 types of wheelchair types, which is not accessible to people.

Conclusions/action items:

Ensure during the design phase that this product is not similar to the design that we use

2014/11/03-Template - Copy

ELAINA RIZZO - Sep 13, 2024, 1:28 PM CDT

Title:

Date:

Content by:

Present:

Goals:

Content:

Conclusions/action items:

2024/09/11 BME Career Prep

ELAINA RIZZO - Sep 11, 2024, 1:59 PM CDT

Title: BME Career Prep

Date: 9/11/24

Content by: Elaina Rizzo

Present: BME 300

Goals: Taking notes on the presentation on career fair and "job searching"

Content:

Keep track of what you do - ECS tracking sheet ecs.wisc.edu/resources

Connect before you apply to get insights into what they are looking for

Applying is step-one; follow up is required in 2-3 weeks

Resume tips:

- tailor your resume to the position - quick changes
- create balance - show a full picture of your experience
- ATS proofed resume is do-able
- MS Word
- No columns, charts, colors
- Design projects WITHOUT years or semesters- what did you do?
- technical skills and coursework
- jobs - Organization, Location, Position title and date

Cover Letter:

Based on the job posting

amplifies the best selling points

BME is highly interdisciplinary

identify your purpose - more than just and internship

overlap with other disciplines

research your employer

develop your "valued added" statement - why you?

Think outside of the box when searching for jobs as it is a niche major and has a lot of facets

read about what they do, then read about the job titles

BME, ME, and EE, maybe MATERIALS

Conclusions/action items:

this presentation answered many questions about the career fair and what I should be focusing on when it comes to my resume.

TO-DO:
go to resume workshop

research companies for the career fair

2024/09/18 Leadership Styles

ELAINA RIZZO - Sep 18, 2024, 2:03 PM CDT

Title: Exploring your Leadership Style

Date: 9/18/24

Content by: Elaina Rizzo

Goals: take notes on the lecture and presentation

Content:

Leadership:

important qualities (menti): confidence, understanding, communication, organization, reliable

anatomy of a good leader: self-awareness , vision, transparent, communication, decision-making, and empathy

Styles:

Power model

"someone has to take control and it should be me"

Great man theory where people were born to lead

being in control is the most important

see it a lot in crisis situations

Servant model

"its not about me or my needs, its about the needs of my followers"

being of service to others

sharing power

shared decision making

empathetic and empowering

Authentic model

"by being my genuine self, I will gain and build trust"

building self-esteem and self-awareness

emotional intelligence

creating authentic relationships in hopes to build rapport with other people

transparency, genuineness, honesty

so many kinds of leaders - need to find what works for you

Clifton Strengths

Orientations: people (get to know the people there), process (setting the pace of the team), thought (see the big picture and looking ahead), impact (set the bar high and push for excellent performance).

Connect:

leadership does not require a particular job title

leading others starts with how you lead yourself

How to:

self-assess - what drives you, strengths weakness

observe and reflect - what makes you excited, where do you show up well, how do you get in your own way

seeking out feedback - others can identify areas that you cannot see yourself

Goal Setting:

what would you like to try?

start small, slow down

focus on one element etc.

Team goal: I would like the team to be able to bounce off of each other and be able to show our strengths in place of others weaknesses. I can help to make it happen by being able to hear my team and allow for freedom of ideas, while also adding onto the ideas to make them better and providing structure.

self goal: I would like to develop trust and confidence in what I do, as well as being able to take responsibility for the things I say I will do. Success in that will look like a well-rounded project that has deadlines and is useable for the client.

Conclusions/action items:

This presentation showed me the different types of leadership and how it can affect how people view you and how they trust you. It is super interesting how different people have different priorities when leading a team and how that can either work or not work depending on who is in the team.

2024/09/25 Post-grad Planning

ELAINA RIZZO - Sep 25, 2024, 2:10 PM CDT

Title: Post Grad planning

Date: 9-25-24

Content by: Elaina Rizzo

Goals: take notes on the lecture by Dr. P

Content:

use the undergrad to tell a story

tie them together - big picture of who you are/what you have done

think about letter writers or references early - 3 strong ones

do your homework, location, career development, people, disease, research, courses

connect with alumni and ask them questions

personal statement or cover letter: do not say chronological order, they have resume already

better way: start with what you want to do:

- your narrow experiences that apply to general interest

- specific to each place you apply

personal statement:

- you will achieve at univ X

- what you want to do afterwards

Grad school options:

Masters:

- stepping stone, change directions, gain depth, credentials

- industry focused

- generally ONE YEAR

- MS will make you more desirable

- allows you to really rewrite your story

- get paid more if you have masters

- opens doors tho

- gives you time to find your dream job

PhD:

- Desire to be independent researcher

- writes research grants

- work in academia

- lead projects in industry, startups, and consulting

Master's programs at Madison

Research (1.5-2 years)

- for continuing to PhD

- thesis required (must have lab PI say you can come into their project to be accepted)

Accelerated (1 year)

- coursework

- independent study is allowed

-funding for TA's

BIDE Accel (1 year)!!!!!!!!!

- project based (project continuity)

- partnership with business school

- funding for TA's

for BME alums:

we do not need letters of recommendation for masters program

easy to meet deadline

gives special consideration to BME undergrad students

need at least a 3.0 for automatic in

Masters elsewhere

MEng: just straight up engineering not usually for research/PhD

MS global health

MS other engineering discipline (generally takes longer)

MBA (industry will generally pay for credits or night options)

PhD additional advice

network!!

conferences!!!!!

build your resume/CV

Med-School additional advice

CHECK REQUIREMENTS EARLY

Consider clinical engineer

check out biosense webster (Scott Anderson works there!!!!!!)

research is required

shadow physicians

patient contact time

use design experience (physician clients, etc.)

Conclusions/action items:

Look into the MD BIDE program (could be interesting)

talk to Dr. P about the LSAT and if he knows anything about it

Very eye-opening lecture and showed me some other options that I can take post-grad if I would like. I would like to know how the LSAT could be achieved and the route to Patent Engineering or Attorney.

2024/10/02 Near Peer Mentoring

ELAINA RIZZO - Oct 02, 2024, 1:59 PM CDT

Title: Near Peer Mentoring

Date: 10/2/24

Content by: Elaina Rizzo

Present: BME 300

Goals: take notes on the BME 300 lecture

Content:

why are we mentors for 200?

- emotional support
- more approachable than 400
- share experiences
- mutual benefits
    - leadership
    - communication
    - active listening
    - study practices
    - self awareness
    - interpersonal skills

general benefits to mentoring:

- increased self-esteem/confidence
- increased patience
- build positive habits and be a good role model
- foster personal growth
- help identify gaps in knowledge
- sense of accomplishment

What does it mean to be a good mentor?

- building trust
- psychological safety (share without fear)
- reliability
- support and enthusiasm
- being available
- transparent (open and honest)
- humanizing their challenges
- good listening
    - to do so:
    - get rid of distractions
    - stop talking
    - act like you are interested
    - look at the person
    - get the main idea
    - ask questions
    - check for understanding
    - react to ideas, not to the person
    - avoid hasty judgements

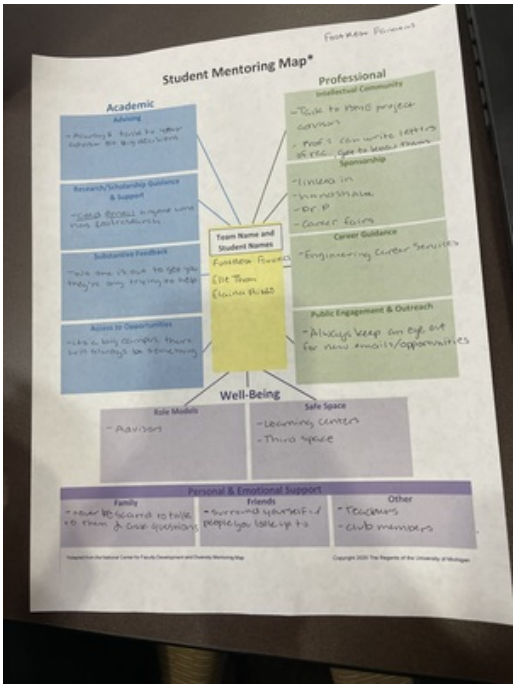
What do you wish you knew in BME 200?

- How to get involved in extracurriculars
- how to be okay with asking questions when you do not know something
- how to manage your time effectively
- put everything into lab archives

- how to deal with being overwhelmed
-

Conclusions/action items:

ELAINA RIZZO - Oct 02, 2024, 2:00 PM CDT



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2024/10/09 Sustainable Engineering

ELAINA RIZZO - Oct 09, 2024, 2:07 PM CDT

Title: Sustainable Engineering by Andrea Hicks

Date: 10/9/24

Content by: Elaina Rizzo

Present: BME 300

Goals: Take notes on the lecture

Content:

- "meeting the needs of the present without compromising the ability of future generations to meet their own needs"
- the healthcare field is responsible for 5 percent of global emissions and 8.5 percent of emissions at the national level in the United States
    - this is causing issues on the quality of life
- Circular economy: keeping things out of the landfills and reusing them in general economy
    - trying to recover materials
- nutrification: when there is too many nutrients in the water systems
- life cycle assessment: how you get a carbon footprint and beyond
    - looks at the environmental impact of a product as a whole
    - Coca-Cola was the first company to do a life cycle assessment in 1969
    - looks at the material types and costs, setting and regular use, etc.
- has been a big push for single use materials in the medical field because of risk of infections
    - notion that things can never be as clean as single use
- spike during COVID
    - lack of materials
    - single use was there in abundance and did better because they did not have to focus on supply lines
- How does sustainability play into our project?
    - make a footrest that can be recycled
    - use materials that last for a while so there are less that need to be made

Conclusions/action items:

- Talk to the team on friday about using the least amount of materials possible

2024/10/16 WARF and IP

ELAINA RIZZO - Oct 16, 2024, 2:06 PM CDT

Title: Introduction to WARF, IP, Disclosing and Licensing

Date: 10/16/24

Content by: Elaina Rizzo

Goals: Take notes on the lecture

Content:

- WARF supports the school through licensing and patenting
  - has a venture office that helps people get their businesses off the ground
- Technology transfer - moving the projects from the school to the market
  - intellectual property licenses
  - industry sponsored research
  - consulting arrangements
  - fee for service
- Intellectual Property overview
  - set of rights for products of the mind
  - things like patents, copyrights, trademarks, trade secrets
  - other, WARF IP:
    - biomaterials
    - technique and know-how
    - data
  - Copyrights:
    - protection for creative works that are expressed in a tangible medium
    - wide range of subject matter
  - Trademarks:
    - protections for names, logos, marks etc.
    - requires use in commerce
    - source-identifying function
  - Trade-Secrets:
    - can be used to protect anything of value
    - protection is good so long as the concept is not generally known
- Patents Generally:
  - USPTO
  - there is no global patent
  - patent holder has the right to exclude others from making, using, selling, or importing their claimed invention
  - 3 types:
    - Design: ornamental features, something that does not have function, 15 years
    - Plant: 20 year term
    - Utility:
      - provisional: one year life term to hold place
      - Non-provisional: 20 year term, claim property
  - Utility (NP):
    - issued for the invention of a new and useful process, machine, manufacture +, or composition of matter
    - 20 years from filing
    - often takes 2-5 years to issue after filing
    - cost on average 30k, mostly attorneys' fees
  - Requirements for patenting:
    - 101 - Eligible: cannot be a product of nature, abstract ideas, or natural phenomenon
    - 102 - Novel: is it new
    - 103 - Non-obvious: it cannot be simple modification or combination of existing concepts
    - 112 - Enabled and Described: must provide enough detail to teach other how to make or use the invention
- Assessing university inventions:
  - IP considerations:
    - type of IP protection
    - potential breadth and strength of IP protection
    - public disclosure (past and planned)

        - stage of development
    - Licensing considerations
        - applications
        - likelihood of identifying a commercial partner
        - likely to return from licensing
- Marketing and licensing
    - market analysis
        - market status- established, emerging, new
        - size and type- e.g. large and growing, medium and contracting, etc.
        - potential licensees- companies in the market
    - license negotiation
        - types and terms- exclusive and field limited, sublicensing etc.
        - consideration- upfront payment, royalties, reimbursement
    - ongoing
        - technology development, enforcement, amendment, termination
- value of licensing
    - benefits to the company:
        - reduced r and d costs
        - improved time to market
        - opportunity to enter new markets and expand
        - new features or products provide additional revenue opportunities
    - determining the value
        - technology application
        - key selling points/features/benefits
        - technology trends
- AI and IP
    - Patents
        - can AI invent (no)
        - limited to US only (no)
        - can AI assist in inventing
            - Evolving, but likely yes under Pannu Factors
    - Copyrights
        - original works of human authorship
        - ai must be incidental to conception and creation
        - original conception by human master mind - are prompts sufficient (no)
        - traditional elements of authorship generated by AI (no)

Conclusions/action items:

This lecture was fascinating to me because I have been trying to gain more information on WARF and how the IP considerations work. This is most definitely a possible career path for me.

2024/10/23 IRB

ELAINA RIZZO - Oct 23, 2024, 2:10 PM CDT

Title: Do I need and IRB

Date: 10/23/24

Content By: Elaina Rizzo

Present: BME 300

Goals: take notes on the guest speaker

Content:

IRB - Institutional review board

- unethical research leads to research regulations
  - infamous research
    - WWII research on prisoners -> Nuremberg Code
    - hepatitis studies at willow brook state school for children
    - Milgram shock experiments at Yale
    - Tuskegee Syphilis Study -> National Research Act
  - Belmont principles: respect for persons, beneficence, justice
  - regulations for protection of human "subjects"
    - department of health and human studies (DHHS) aka "Common Rule"
    - FDA
- IRBs are instituted by common rule and FDA
- at UW Madison there are two
  - Minimal risk IRB (MRRIB)
    - secondary analysis of data, survey research, behavioral health interventions
  - Health Science IRB (HSIRB)
    - biomedical, interventional, any risk level
    - all FDA regulated and VA regulated research
- IRB considerations:
  - is it research under the common rule?
    - **systematic** investigation including research development, testing, and evaluation, **designed** to develop or contribute to **generalizable** knowledge
  - does it involve human subjects?
    - human subject is a living individual about whom an investigator conducting research
      - are you communicating with them and asking them to do something?
  - is it human research under the FDA?
    - device = intended for use in diagnostics, treatment, or prevention of disease, or that affects stucture or function of the body
    - clinical investigation = involves one or more subjects to determine device safety or effectiveness
    - subject = individual on whom or on whose specimen an investigational device is used or as a control in an investigation
- Preparing for an IRB review:
  - researcher responsibilities:
    - complete required training for researchers through CITI
    - complete annual Outside Activities Reports
  - identify appropriate principal investigator and study team
  - consider research participants
    - who will you need and why? how many? where do you find them?
    - what will they need to do? how will you minimize possible harms/burdens?
    - what will they need to know to make and informed choice to participate?
- Resources:
  - IRB website
    - toolkit library
    - education and training
    - link to ARROW
    - news, IRB meeting dates

- contact with staff

Conclusions/action items:

I do not think that our project requires an IRB this semester, but the lecture was informative in the case where I may be on a project in the future that i will be using human subjects

2024/10/30 Navigating FDA Requirements

ELAINA RIZZO - Oct 30, 2024, 2:08 PM CDT

Title: Navigating FDA Device Requirements

Date: 10/30/24

Content by: Elaina Rizzo

]Goals: Take notes on the speaker's lecture

Content:

- Defining a medical device
  - anything that is meant to improve the body's function that is not a drug or biological
  - traditional medical devices: MRI machine, bandages, syringes, stethoscope, thermometer
  - non-traditional devices: lab developed tests, software for health tracking, mouthwash,
- software as a medical device:
  - standalone software that is intended to run on general purpose computers or phones
    - ex: wheelchair tank
- Applicable FDA regulations:
  - Quality systems part 820
  - Labeling part 801
  - Medical Reporting part 803
  - Institutional Review Boards part 56
  - Protection of Human Subjects part 50
  - Investigational Device Exemption part 812
- Device Classification Overview:
  - Class I
    - low risk, exempt from premarket approval, Band-Aids, floss, tongue depressor
    - approximately 40% of all devices
  - Class II
    - moderate risk, 510(k) showing substantial equivalence, BP cuffs, sutures, catheters
    - regulatory: must follow general and special controls
    - could be exempt from the 510(k)
  - Class III
    - High risk, premarket approval, hip joint, pacemaker
    - regulatory: must follow general controls and additional stringent requirements
    - sustains or supports life, implanted, or potential for unreasonable risk
    - PMA submission, which involves a comprehensive FDA review of safety and effectiveness data before marketing
- Regulatory Controls Key Elements
  - General Controls
    - registrations and listing
    - adverse event reporting
    - general labeling
    - good manufacturing practice
  - Special Controls
    - performance standards
    - special labeling requirements post-market surveillance
    - potential data requirements
  - Premarket Approval
    - data to show safety and effectiveness
- De Novo Classification: novel medical devices, no legally marketed predicate
- QMS
  - begins when you decide to develop devices
  - many components
    - document controls
    - labeling and records
    - management responsibility
  - design controls
    - design/development

- design reviews

Conclusions/action items:

Taking notes on FDA requirements and planning if our device would need one in the future

2024/11/06 Regulatory Strategy

ELAINA RIZZO - Nov 06, 2024, 2:06 PM CST

Title: Regulatory Strategy

Date: 11/6

Content by: Elaina Rizzo

Goals: take notes on the lecture in BME 300

Content:

- FDA structures
  - Device (covered in last week) (CDRH)
    - 510k
    - PMA
    - IDE
  - Drugs (CDER)
    - NDA
    - IND
  - Biologic (CBER)
    - BLA
    - IND
  - Genome editing
    - target a precise genome locus and change existing sequences
  - Gene delivery
    - transfer molecular tools and assembles gene systems into the cell
  - Cell therapy
    - use expanded cells to transfer medicinal bio-activity to regenerate damaged tissue or restore health
- FDA framework
  - Laws
    - Federal food drug and cosmetic act (FD&C)
    - public Health service act (PHS)
    - 21st century cures act of 2016 (CURES)
    - corona aid relief and economic security act (CARES) of 2020
  - regulations are based on the laws made by the FDA
  - Guidance - made by the FDA with help from the public to help industry and the public interpretation regulations
- Dramatic Implications
  - 361
    - minimally manipulated and homologous use
    - does not have to go through the whole process to show it is safe and effective
    - is essentially taking something from the patient and putting it back into the same patient (liposuction)
  - 351
    - taking something from the patient, changing it minimally or a lot, then putting it back into the same patient
    - needs to go through the full process of getting a biological license
    - ex: taking a bone sample, changing the cells makeup or genome, then putting it back in for a different outcome
- Target Product Profile (TPP)
  - attempts to answer:
    - when to use the product?
    - why to use the product?
    - how to use the product?
  - Is it medically and commercially compelling?
  - who would benefit from a TPP?
    - physicians or leaders in the market
    - manufacturing plants
    - investors
- Considerations when developing a 351
  - nonclinical
    - non GLP (good laboratory practice) studies, and pilot studies
  - quality

            - demonstration of manufacturing quality, initiation of stability studies
            - GMP batches release, process and method validation
        - Clinical
            - phase 1 and 2 trials
            - phase 3 trials
            - filling and launch preparation
            - post-market studies and RWE
        - Overarching: regulatory
            - TPP
            - Pre-IND meeting
            - IND submission
            - EOP1/2 meeting or special protocol assessment
            - Pre-BLA meeting
            - BLA submission
            - US sBLA
- what does quality mean in a developing industry
    - a system that documents policies, processes, internal rules, procedure, and other records to ensure consistent quality
- Career Options:
    - Characterization and analytics
    - process development
    - manufacturing development
    - gene delivery

Conclusions/action items:

I have been curious about quality systems and operations systems internships for a little while, because it allows me to use my engineering degree while also being able to learn different areas. I would like to know more about how to get into this field while still in undergrad.

2024/11/13 Medical Device FDA Pathways

ELAINA RIZZO - Nov 13, 2024, 2:04 PM CST

Title: Medical Device FDA Pathways

Date: 11/13/24

Content by: Elaina Rizzo

Goals: Take notes on lecture

Content:

notes:

- Medical Device FDA Pathways
  - Device classification
    - Class 1, class 2, class 3
    - 510k exempt, premarket notification 510k, 510k de novo, premarket approval, Humanitarian device exemption.
- Regulatory Timelines
  - 180 PMA
- Breakthrough devices program
  - Formerly expedited access program
  - Timely access to medical devices for life-threatening illness
  - Elon Musk Neuralink device
- Medical device process at a glance
  - innovation idea and development
  - Human testing data acquisition with IRB Oversight
  - FDA regulatory Process
  - Reimbursement or financial incentive
  - sales
- New medical tech ecosystem
  - Materials/supply
  - Biomed
  - Informatics Health IT
  - Patient Safety
  - Pharmacy
  - Nursing clinicians
  - Other clinical professionals
  - physician
- General steps from approval to adoption
  - clinical study
  - FDA approval
  - CPT codes
  - CMS national Insurance decisions
  - Standards of practice
  - National regional buying groups
  - Regional/Local IDNs, Hospitals
  - Hospital/IDN Value analytics Groups
  - Product Evaluations
  - Regional/ Just in Time distribution
  - Product Implementation
- Workflow: Patient Care pathway as a starting point
  - Diagonosis or intervention
  - Where is the patient coming from
  - what needs to be improved
- Stakeholders
  - Think about chosen stakeholders
  - patient point of care
  - administrative
  - national clinical oversight

        - National/regional groups
        - Standards organizations
        - National and regional payment/reimbursement
- Value Based Healthcare
    - mix of clinical, economic and patient
    - more affordable
    - care for patients better
    - better care with lower cost
- Trickle down influence for new technology
    - national policy standards of practice and clinical practice guidelines
    - health system and provider
- Hospital new product Adoption Process
    - Clinical champion
    - Value analysis, technology assessment
    - c-suite strategy, Final decision
    - Trial evaluation and metrics
- Values drivers to discover
    - economic
        - money
        - staff time
        - resources
        - waste
        - metrics
    - Clinical
        - improve outcomes
        - reduce risk
        - reduce complications
        - shorten length of stay
    - Mission impact
        - Patient satisfaction
        - academic leadership
        - innovation in care
    - Evidence more compelling than 'hand waving' benefit assumptions
- Who buys, Pays and gets reimbursed
    - CMS for medicare and medicaid services
    - DRG Diagnostic related groups
    - CPT Current procedural code
    - ICD 10 international categorization of diseases
    - GPO Group purchasing organizations
    - IDN integrated delivery networks
    - Payer Mix (%private, capitated, medicare)
- Understand Potential Reimbursement Path
    - type of product or solution
    - Stand alone or part of DRG or other procedures
    - Established/replacement
    - established CPT codes
    - Established DRG In or outpatient
    - CMS vs. Commercial insurance
    - Formulary or Drug Plans
    - research then confirm/learn with a good consultant
- Discover through research and interviews
    - Start with detailed patient flow/care pathways
    - Explore pain points
    - Expand knowledge
    - Examine about how products or therapies are adopted
    - understand the impact of outside organizations
- Start Sales
- Overlooks
    - legal consideration
    - manufacturing
    - engineering

Conclusions/action items:

Took notes on lecture

2024/11/15 Tong Entrepreneurship Lecture

ELAINA RIZZO - Nov 15, 2024, 12:46 PM CST

Title: Tong Lecture

Date: 11/15/24

Content by: Elaina Rizzo

Present: Tasso CEO and CTO

Goals:

Content:

Tasso is a blood collection company that brings the ability to take a blood draw to your home. The company is extremely innovative and came at a time where everyone was getting things delivered to their home, which added to their appeal. I think this company went into the right market because as a kid and teenager, I had to get blood drawn once a month, and I could not drive at that time. I had to have my parents take time off of work once a month to be able to get the medication and the treatment I needed, which took a toll on their performance in their jobs. Had we known about Tasso, that could have been a solution to my family's problem.

- make sure to cater to the customer when doing medical devices
- for any idea you have, continual iteration is the way to solve the issues that you have early on
- when you are going to scale up, the most important thing is quality, especially when it gets out to the customer
- being able to rethink how you define the label of your product can help you with FDA clearance
- if you have some idea, and you put in the work and allow yourself to learn on the way, something good can come out of this

2024/11/20 New Product Development

ELAINA RIZZO - Nov 20, 2024, 2:07 PM CST

Title: How New Product Development Works in the Medical Device Industry

Date: 11/20/24

Content By: Elaina Rizzo

Goals: Take notes on the lecture

Content:

- NPD in the medical device industry is
  - highly regulated
  - expensive
  - resource intensive
  - competitive
- types of NPD products
  - line extensions: addition of additional sizes and configurations
  - improvements: existing product changes
  - new-to-company: not new to market but company has never made it before
  - new-to-market: revolutionary
- Stage-Gate process:
  - stage 0: innovation
    - broad brainstorming
  - stage 1: exploration
    - take the brainstorming and narrow them down
  - stage 2: concept development
    - full body CAD modeling, be able to get approved
    - conduct comprehensive IP examination
  - stage 3: design development
    - how to make your product work
    - confirm regulatory pathway
    - begin formal design control documentation
  - OPTION: design control
    - mandatory for FDA class II and III and almost all EMA devices
    - includes documentation of customer needs, design in/outputs, and testing
  - stage 4: design confirmation
    - does this mee the specifications
    - finalize product and component drawings/models
    - "freeze" design at the end of this stage
    - accelerate manufacturing process development along with plans for quality control
  - stage 5: design transfer and commercialization
    - comes to the business and into the market
    - create instructions for use and user manuals
    - develop service plans and resources
    - finalize go-to-market strategy and start limited release (if applicable)
  - post-market surveillance
    - regulatory companies are expecting that companies are monitoring and documenting customer complaints and field issues and post launch
    - companies continuously track customer and salesforces feedback via interviews and surveys
- case study:
  - be able to define the problem
  - be able to find the parts of the project that are most important to the success

Conclusions/action items:

2024/09/09 - Research Notes

TIMOTHY MANDLER - Sep 09, 2024, 8:01 PM CDT

Title: Laws Pertaining to Wheelchair Footrests and Attachments in Wisconsin

Date: 9/9/2024

Content by: Timothy Mandler

Present: Individual Work

Goals: To determine what is legal or illegal to incorporate into a wheelchair footrest and to determine if it might be covered by programs such as Medicaid.

Content:

In the Medicare Coverage Database, it was determined that there is no additional charge unless the footrest is one that specifically has angle adjustment incorporated into it.

- This indicates that as long as the footrest is not classified as one that has "angle adjustment", it would not have another charge when obtained through Medicare.

- A later section labeled "Miscellaneous Accessories" states that removable hardware is non-covered if the main purpose of it is to act as a Manual Standing System or if it is meant to move the passenger closer to a desk or other surface. As our product technically does not move a person closer, it would pass this test, possibly allowing the cost to actually be covered by Medicare.

Article - Wheelchair Options/Accessories - Policy Article (A52504). (2024). Cms.gov. https://www.cms.gov/medicare-coverage-database/view/article.aspx?articleId=52504&ver=52

In regards to the legality of footrests, as of now little has been found to show that there is a requirement for or against most types of footrests as long as they do not cause injury to the user. However, there have been several accounts that highlight the importance of footrests on wheelchairs.

- This account was of a person whose leg got caught under their wheelchair and broke their ankle. This is is a demonstration that while it may not be required, a good footrest is incredibly important for personal safety. This also demonstrated that a solid back of the footrest should be incorporated so that the legs of the operator may not get caught under the seat.

Doyle, B. G. (2020, February 11). *Lack of footrests on wheelchair leads to broken ankle at South Holland Manor - The Law Offices of Barry G. Doyle, P.C.* The Law Offices of Barry G. Doyle, P.C. https://www.accidentlawillinois.com/blog/lack-of-footrests-on-wheelchair-leads-to-broken-ankle-at-south-holland-manor/#:~:text=Without%20the%20use%20of%20footrests

While there is no statement about the legality of the height that the footrest must be off the ground, my research found that the average elevation of a wheelchair ramp is about 1:12 inches or 5 degrees of incline.

Wheelchair Ramp Slope | ADA Compliance. (n.d.). BraunAbility. https://www.braunability.com/us/en/blog/disability-rights/wheelchair-ramp-slope.html#:~:text=The%20ADA%20provides%20good%20direction

Conclusions/action items:

While there are very few standards set for the specifics of customized footrest accessories for wheelchairs, this information leads me to conclude that it is a requirement to guarantee that the footrest will never be lower than one inch per foot of length from the center off the ground, likely with at least 3 inches added to avoid complications in irregular or unstandardized terrain. It also is apparent that a solid or netted back is required for the footrest to avoid the operators legs from getting caught under the chair.

While largely unimportant at this stage of development and in future production, it is intriguing to know that it does pass some of the standards to be covered by Medicare. While this doesn't provide any direct benefit at the moment, it indicates that what we are working on is likely not dangerous, as to be covered by Medicare attachments of this type have likely been proven both safe and useful for the operators.

2024/09/16 - Research Notes

TIMOTHY MANDLER - Sep 16, 2024, 11:54 AM CDT

Title: Regulations Regarding Battery Attachments on Wheelchairs

Date: 9/16/2024

Content by: Timothy Mandler

Present: Individual Work

Goals: Individual research regarding batteries and charging devices for wheelchairs

Content:

ISO 7176-25:2022 Wheelchairs - Part 25: Batteries and chargers for powered wheelchairs stipulates that lead-acid batteries are within the scope of usability on wheelchairs. It states that chargers have requirements to have a rated input voltage not greater than 250V AC and an output voltage less than 36 volts.

Russotti, R. (2015, November 18). *Assistive Device Standards for Wheelchairs*. The ANSI Blog. https://blog.ansi.org/assistive-device-standards-for-wheelchairs/

In order to facilitate the operator's usage of a retractable footrest, it is quite possible that a degree of automation will be added. In order to power these new attachments, a battery attachment will most likely be added to increase portability of the device. As such, these regulations have stated that most if not all batteries are applicable for usage on wheelchairs.

If batteries will be used, it is also likely that they will be rechargeable. The most prominent and widely accessible rechargeable battery type is NiMH (Nickle-Metal Hybrid) batteries. These batteries last for hundreds of charges, with an energy drain half life of 6 months. As these batteries will likely not be in constant use (used approximately 3-10 times a day, for an estimated average of 10 seconds each usage), the batteries will probably only need to be recharged once the battery drain half life comes into effect. Preferably, the batteries will not have to be recharged more than once a month, allowing the batteries to easily live to their full 2-5 year lifespan.

Energizer ® Rechargeable Batteries and Chargers: Frequently Asked Questions Click on the question to view the answer: q. (n.d.).

https://data.energizer.com/pdfs/rechargeable_faq.pdf

Conclusions/action items:

There are very few limitations to the batteries that can be used on wheelchairs. For rechargeable batteries, simple NiMH batteries should do the trick, only having to be replaced 2-5 times in the entire projected 10 year lifespan of the wheelchair. As the wall output voltage of an outlet here in the US is 120V and the batteries only charge up to 1.2 volts (less than the 250V and 36V requirements respectively), there should be few to no restrictions on the consumer batteries that we can procure and utilize if needed.

2024/10/02 - Research Notes

TIMOTHY MANDLER - Nov 13, 2024, 3:40 PM CST

Title: Formula for Testing the Strength of Telescoping Rods

Date: 10/2/2024

Content by: Timothy Mandler

Present: Independent Research

Goals: To determine a formula that will allow us to calculate the structural stability of differently sized telescoping units made from varied materials.

Content:

The first task was to find a formula that allows us to determine the shear force upon a hollow rod. The formula I found was $ShearForce = \frac{VQ}{It}$ where:

V = Total force at the location of question

Q = Statical moment of area

t = thickness of the material perpendicular to shear

I = moment of inertia across the entire cross sectional area

[1] "Shear Stress Equations and Applications - Engineers Edge," *Engineersedge.com*, 2009. https://www.engineersedge.com/material_science/shear-stress.htm

This equation allows us to find the shear force upon a cylinder if the force is applied a distance away from an axis (torque). The formula to find Q (the moment of area) is simply the cross sectional area times the distance from the point of rotation. For our uses, this distance will be the length of each individual segment of the telescoping rod.

[2] "First moment of area: Definition, Formula, Example, Explained, Pdf," Mar. 17, 2022. https://mechcontent.com/first-moment-of-area/

Putting this all together, we get an equation for shear stress placed on a given cylinder given that the I of a cylinder is $I = \frac{\pi}{4}\left(R_{\text{outer}}^4 - R_{\text{inner}}^4\right)$, the V is simply the force applied, and t is the outer radius minus the inner radius.

Our equation for shear force is $\text{Shear Force} = \frac{F*\pi\left(R_{\text{outer}}^2 - R_{\text{inner}}^2\right)*d}{\frac{\pi}{4}\left(R_{\text{outer}}^4 - R_{\text{inner}}^4\right)*\left(R_{\text{outer}} - R_{\text{inner}}\right)}$

However, this is not the final equation. The force applied will be a maximum of 250N as given by the client. As we are only focused on the force perpendicular to the rods, we will substitute F * sin(theta) where theta is the angle between the tubes and the vertical. We also have two tubes on each side of the footrest, so the overall shear force will be divided by 2. Please remember that this is only for a singular tube, and for safety's sake, we are presuming that the entire telescoping mechanism is a singular tube of the dimensions of the weakest segment of the tube. This should give us a high margin of safety with the measurements.

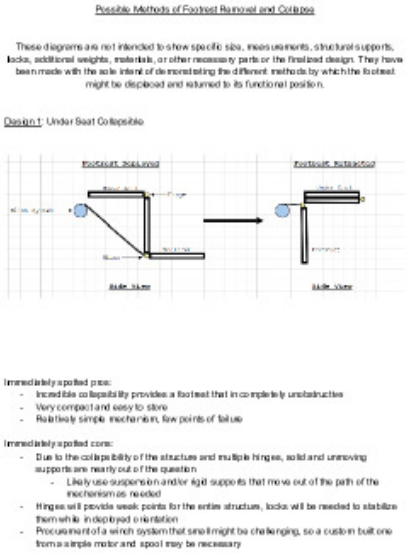
The final equation will be $\text{Shear Force} = \frac{Fsin\theta*\pi\left(R_{\text{outer}}^2 - R_{\text{inner}}^2\right)*d}{\frac{2\pi}{4}\left(R_{\text{outer}}^4 - R_{\text{inner}}^4\right)*\left(R_{\text{outer}} - R_{\text{inner}}\right)}$

Conclusions/action items:

From this, we can determine the shear force placed on any telescoping mechanism that exists on the market as long as we know the material, overall diameter, the distance that it extends, and the width of each individual layer. We can then find the maximum shear strength of a material (using a USS to UTS approximation table) and determine if the material and shape of the telescoping unit will be sufficient. As there are no actual equations found online for the shear strength of a telescoping unit, I intend to ask my Physics professor if there is a way for me to create one or it that's a needlessly complex task.

Ideas for Possible Methods of Footrest Removal and Collapse

TIMOTHY MANDLER - Sep 12, 2024, 5:21 PM CDT



Possible Methods of Footrest Removal and Collapse

These diagrams are not intended to show specific size, measurements, structural supports, locks, additional weights, materials, or other necessary parts or the finalized design. They have been made with the sole intent of demonstrating the different methods by which the footrest might be displaced and returned to its functional position.

Design 1: Under Seat Collapsible

Immediately spotted pros:
- Incredible collapsibility provides a footrest that is completely unobstructive
- Very compact and easy to store
- Relatively simple mechanism, few points of failure

Immediately spotted cons:
- Due to the collapsibility of the structure and multiple hinges, solid and unmoving supports are nearly out of the question
  - Likely use suspension and/or rigid supports that move out of the path of the mechanism as needed
- Hinges will provide weak points for the entire structure, locks will be needed to stabilize them while in deployed orientation
- Procurement of a winch system that small might be challenging, so a custom built one from a simple motor and spool may be necessary

Download

Possible_Methods_of_Footrest_Removal_and_Collapse.pdf (248 kB)

Finalized 3D Concept Models for Footrests

TIMOTHY MANDLER - Oct 11, 2024, 7:44 AM CDT

Title: 3D Concept Models for Final Footrest Designs

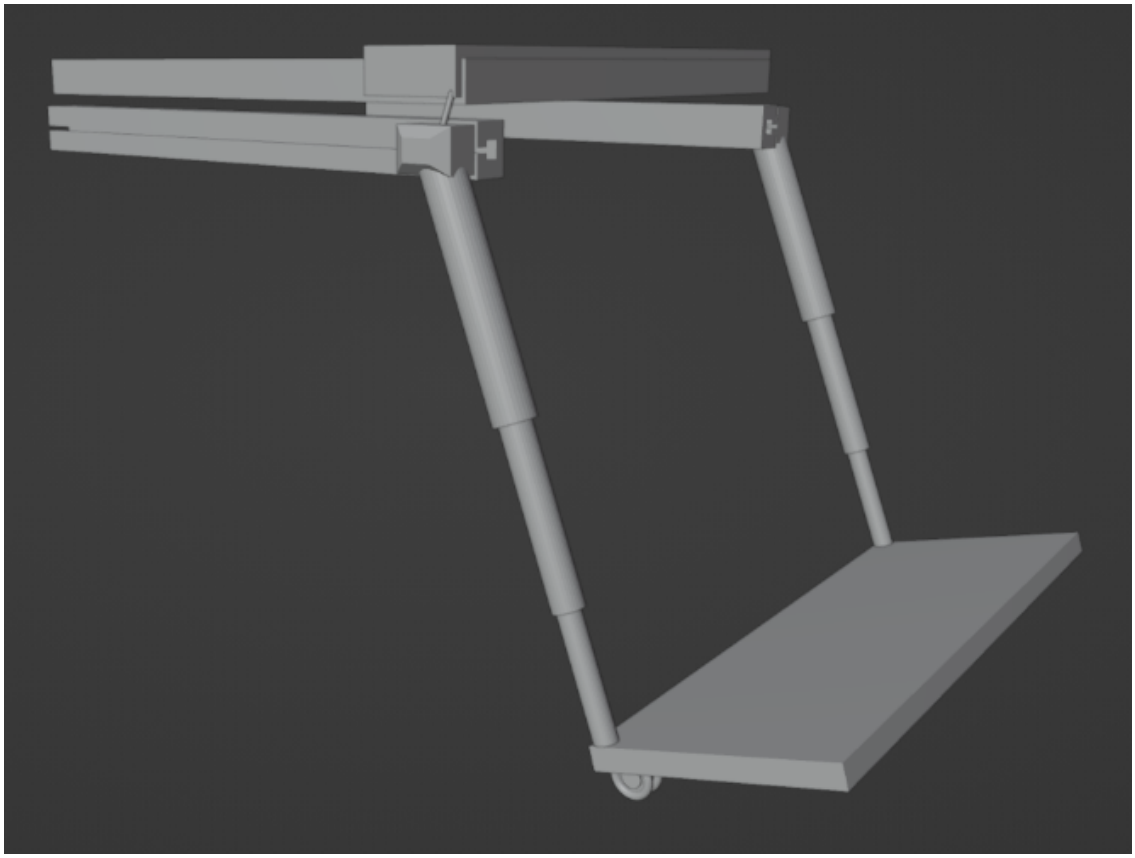
Date: 10/9/2024

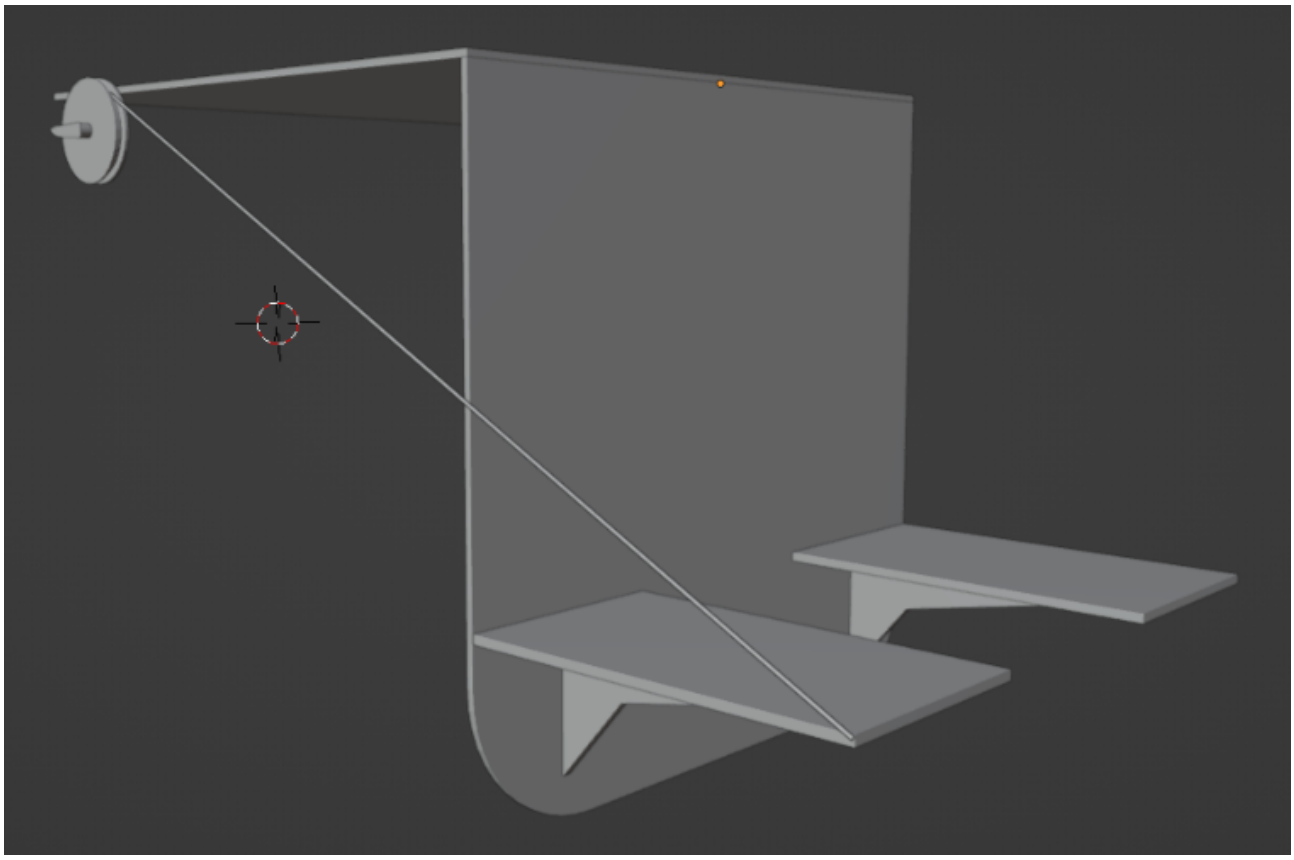
Content by: Timothy Mandler

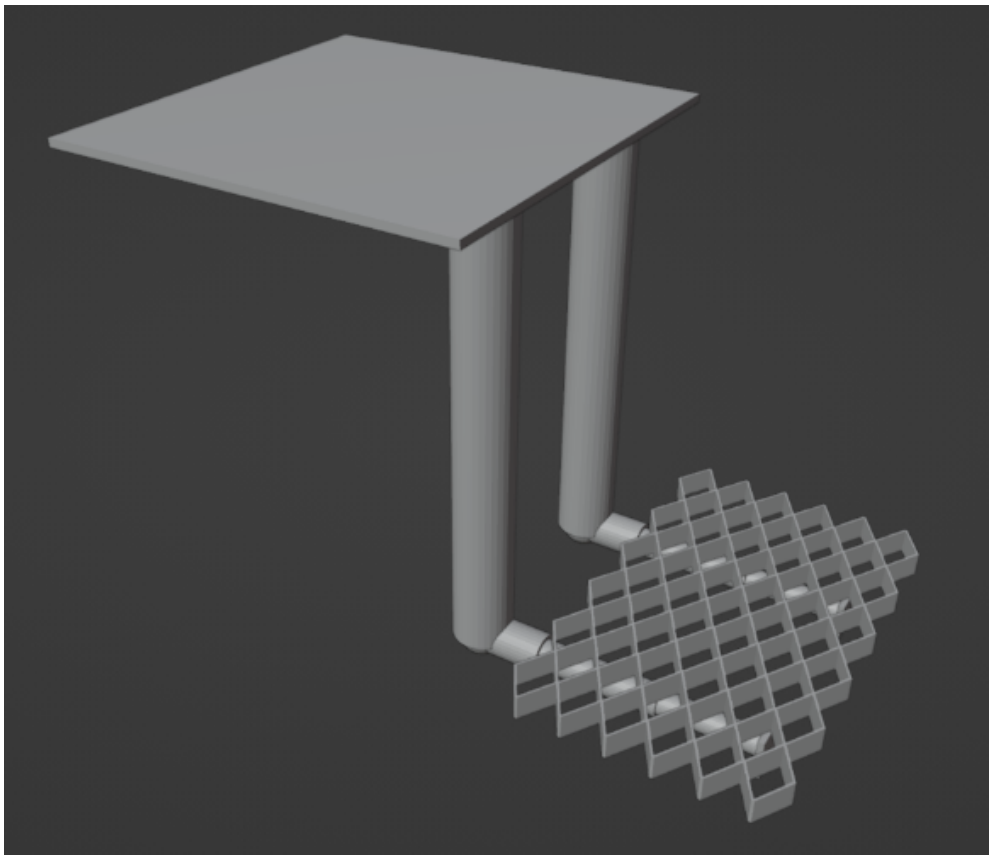
Present: Individual Work

Goals: The creation of 3D animations for all of the final footrest designs for simple analysis of the different methods.

Content:







Conclusions/action items:

From these items, I've realized that the positioning of the wheels under the footrest in our selected design will likely have to be at an angle underneath the footrest, as if the wheels are not directly placed at an angle, when the operator places their feet upon the footrest, the wheels will be slightly forwards of the center of pressure. This will cause the footplate itself to slip forwards, subsequently putting a much greater deal of stress on the

telescoping units. This is the exact opposite of our reasoning for placing wheels on the footrest. More testing will have to be done with the physical footrest prototype itself to determine the exact connectivity of the wheels.

Footplate CAD Test

TIMOTHY MANDLER - Nov 07, 2024, 1:36 PM CST

Title: CAD Practice

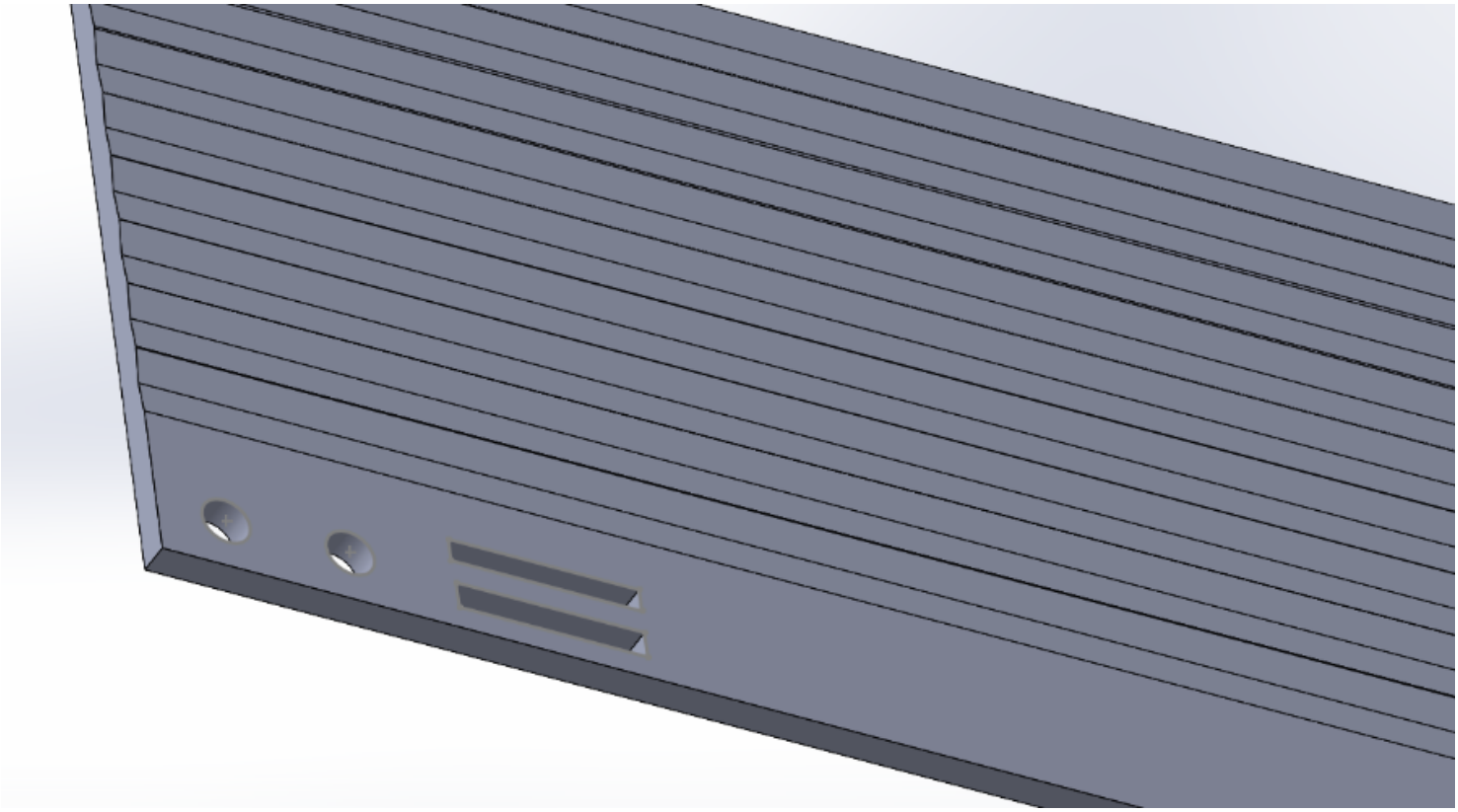
Date: 11/7/2024

Content by: Timothy Mandler

Present: Timothy Mandler

Goals: Begin familiarizing myself with how to use Solidworks to create a adequate CAD model to perform virtual stress testing on.

Content:



This test model allowed me to practice computerized sketching of models, the extrusion thereof, and more complex usages of the cut extrusion tool to create simple textures and precise incisions in the model.

Conclusions/action items:

Primarily, I need to further my practice in creating drawings to extrude. The drawings I based this piece from were simplistic at best, and I need to learn how to control them better. I also need to learn how to use construction lines and similar to make more mechanically precise modifications and edits to the model.

WIP Footplate CAD

TIMOTHY MANDLER - Nov 10, 2024, 2:17 PM CST

Title: WIP Footplate CAD model

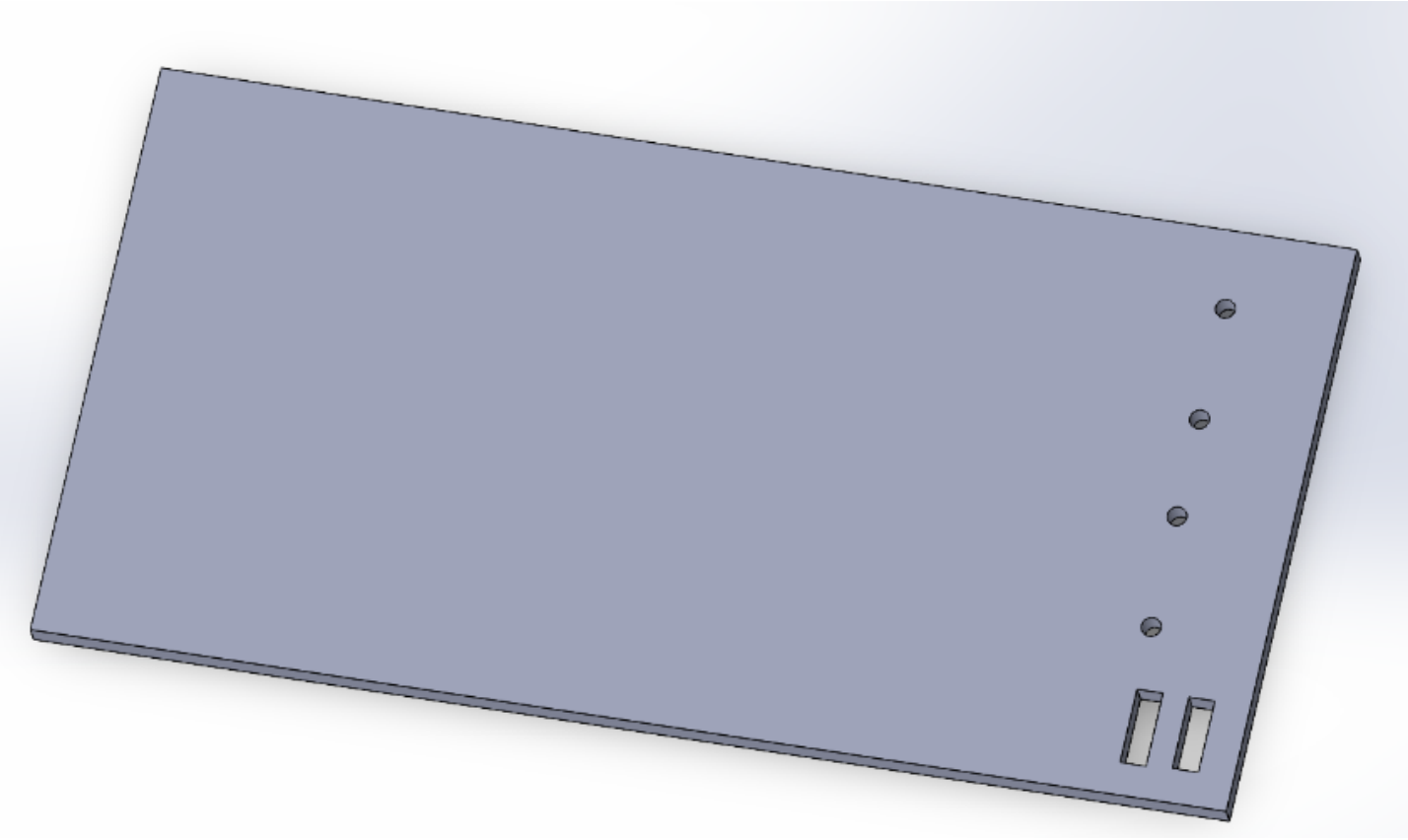
Date: 11/10/2024

Content by: Timothy Mandler

Present: Timothy Mandler

Goals: Create a base model for the footplate with accurate enough measurements that it would be usable if required for the finalized piece

Content:



Conclusions/action items:

Measurements need to be take for the additional screw holes and work should be done to determine if texturing will be possible with the machines utilized.

WIP Footplate CAD #2

TIMOTHY MANDLER - Nov 11, 2024, 4:33 PM CST

Title: WIP Footplate CAD #2

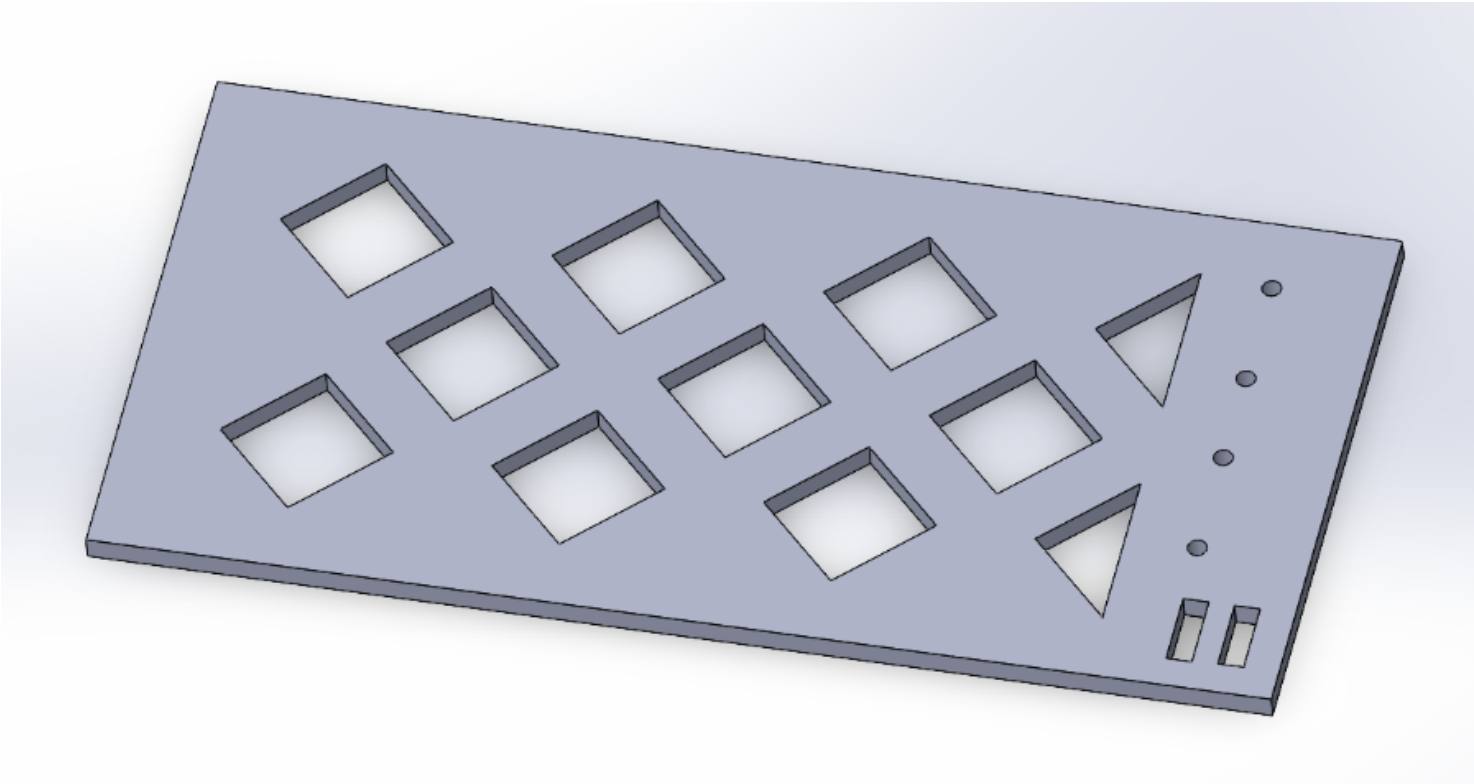
Date: 11/11/2024

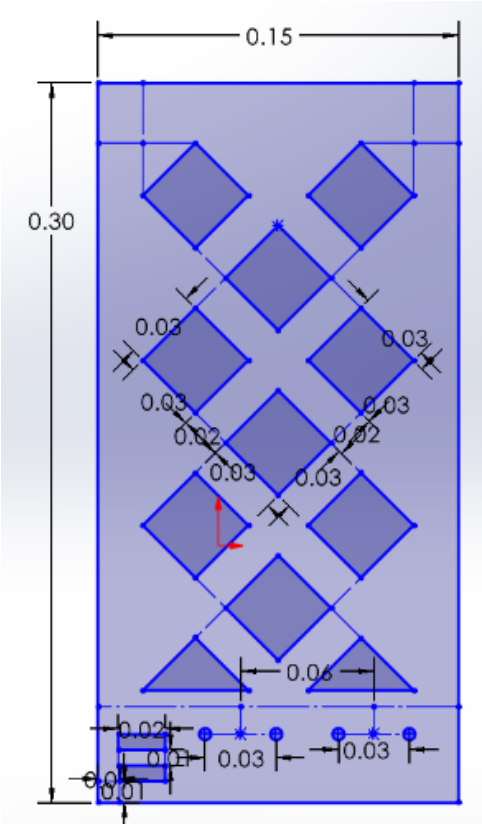
Content by: Timothy Mandler

Present: Timothy Mandler

Goals: Update the footrest CAD model to get it closer to a viable finalized model

Content:





Conclusions/action items:

As of now, the only additions needed are the additional screw holes as well as possible reorganization and spacing of the lower holes to allow better ease of welding. Stress testing will also need to be conducted to ensure viability of the design. If failed, the likely remedy will be the removal of less material for the traction pattern to increase structural stability.

Tong Distinguished Entrepreneurship Lecture

TIMOTHY MANDLER - Nov 15, 2024, 4:37 PM CST

Title: Tong Distinguished Entrepreneurship Lecture

Date: 11/15/2024

Content by: Timothy Mandler

Present: Timothy Mandler

Goals: Glean as much info as I can about how to progress when running your own company.

Content:

- Product created is Tasso - a painless blood collection diagnostic device that can be used at home
    - Numerous people (myself included) detest blood draws as they are painful
    - Not only that, but many people live far away from clinics where they can receive possibly live saving blood draws
        - The issue is that blood draws are incredibly important for assessing the physical wellbeing of large portions of the populations
        - Tasso works to solve both of these problems
- The CEO and CTO started at different places and eventually reached Madison after begging to get into any institute
    - From here, they started building prototypes of their products from next to nothing
    - They jumped at every opportunity they could for help and funding, eventually landing them a contract from DARPA, who believed the technology could allow soldiers far from high quality labs to have their blood tested
- Covid hit
    - Everybody suddenly saw the value in home blood tests, Tasso jumped on the opportunity when nobody else would
        - Problem, their facilities were far too small to handle the demand
        - So, they bought up a much bigger warehouse and quickly turned it over into a full production lab for Tasso apparatuses
        - They ran into several issues, like with getting their work past FDA standards
            - They looked at the underlying meaning of the boxes that needed to be checked and worked the system to allow the product to get passed the FDA in another way that still maintained the integrity of the product
- Now, Tasso is being used predominantly in sports for PED checks
    - Many players seem to have an excellent impression of it, as it is quick and painless
    - As such, it has been granted clearance for usage in the major leagues, and will likely been seen permeating more and more fields as time progresses

Conclusions/action items:

One of the most major things I've learned from this lecture is that while luck in both encounters and timing is critical for starting a company, that luck only was made available when they put themselves in the right situation for luck to reach them. There is a clear survivorship bias, as we don't hear from the hundreds of start-up companies that put in just as much effort and skill, yet failed simply due to a lack of luck. However, the chances that a perfect opportunity will come to you at all approach 0 if you never allow them to.

Another thing that I noticed was simply the tenacity of the people who started Tasso. They were always chomping at the bit for whatever opportunity they could find. Frequently, they went to find people far above and beyond what they would be thought to and pitched ideas to them. This worked well for them

A final note is that they really gamed the system a lot of the time. Society has many rule that all abide by almost by default. However, those who can find a way to make those rules and events work to their favor will almost certainly progress beyond the norm. If one progresses too far outside the rules and standards we have formed though, it might be detrimental to them. As such, a tightrope must be walked your whole life, maintaining a balance between normality and something far the opposite of that.

Receipt for Alcobra Purchase

TIMOTHY MANDLER - Dec 08, 2024, 4:15 PM CST

Title: Receipt for Alcobra Purchase

Date: 12/8/2024

Content by: Timothy Mandler

Present: Timothy Mandler

Goals: Post documentation for the purchase placed for Alcobra

Content:

See attachments below

Conclusions/action items:

This gives us a good documentation and confirmation that the needed purchases have arrived as then should have. They have all been put to good use for the construction of the prototype.

TIMOTHY MANDLER - Dec 08, 2024, 4:14 PM CST

Outlook

Re: Your Alcobra Metals order has been received!

From: John Puccinelli <john.puccinelli@wisc.edu>
Date: Tue 10/29/2024 8:40 PM
To: TIMOTHY JAMES MANDLER <tmandler@wisc.edu>

All of your materials have arrived I believe. I placed them in 1080 ECB on the table by the door when you walk in

From: John Puccinelli <john.puccinelli@wisc.edu>
Sent: Monday, October 21, 2024 5:57:31 PM
To: TIMOTHY JAMES MANDLER <tmandler@wisc.edu>
Subject: Re: Your Alcobra Metals order has been received!

John P. Puccinelli, PhD (he/him)
Associate Chair of the Undergraduate Program
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Department of Biomedical Engineering

Connect with BME on Facebook!

"Better health by design"

From: alcobrametals@send.zipliemail.com <alcobrametals@send.zipliemail.com> on behalf of Alcobra Metals <alcobrametals@send.zipliemail.com>
Sent: Monday, October 21, 2024 9:09 PM
To: John Puccinelli <john.puccinelli@wisc.edu>
Subject: Your Alcobra Metals order has been received!

Download

Alcobra_Metal_Order_-_Mail_-_TIMOTHY_JAMES_MANDLER_-_Outlook.pdf (309 kB)

TIMOTHY MANDLER - Dec 08, 2024, 4:14 PM CST

Download

Fw__Your_Alcobra_Metals_order_has_been_received_.eml (24.1 kB)

Receipt for Amazon Purchase

TIMOTHY MANDLER - Dec 08, 2024, 4:15 PM CST

Title: Receipt for Amazon Purchase

Date: 12/8/2024

Content by: Timothy Mandler

Present: Timothy Mandler

Goals: Post documentation for the purchase placed for Amazon

Content:

See attachments below

Conclusions/action items:

This gives us a good documentation and confirmation that the needed purchases have arrived as then should have. They have all been put to good use for the construction of the prototype.

TIMOTHY MANDLER - Dec 08, 2024, 4:16 PM CST


Outlook

Re: Your Amazon.com order of "2" L-Shaped Caster Wheels...".

From: John Puccinelli <john.puccinelli@wisc.edu>
Date: Mon 10/21/2024 9:57 PM
To: TIMOTHY JAMES MANDLER <tmandler@wisc.edu>

John P. Puccinelli, PhD (he/him)
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"Better health by design"

From: Amazon.com <auto-confirm@amazon.com>
Sent: Monday, October 21, 2024 9:54 PM
To: John Puccinelli <john.puccinelli@wisc.edu>
Subject: Your Amazon.com order of "2" L-Shaped Caster Wheels...".

amazon business

Hello John Paul Puccinelli,

Thank you for shopping with us. We'll send a confirmation once your item has shipped. Your order details are indicated below. The payment details of your transaction can be found on the order invoice. If you would like to view the status of your order or make any changes to it, please visit Your Orders on Amazon.com.

This order is placed on behalf of University of Wisconsin-Madison.

Download

Amazon_Castor_Wheels_Order_-_Mail_-_TIMOTHY_JAMES_MANDLER_-_Outlook.pdf (230 kB)

TIMOTHY MANDLER - Dec 08, 2024, 4:16 PM CST

Download

Fw__Your_Amazon.com_order_of__2__L-Shaped_Caster_Wheels..._..eml (87.7 kB)

Receipt for Grainger Purchase

TIMOTHY MANDLER - Dec 08, 2024, 4:17 PM CST

Title: Receipt for Grainger Purchase

Date: 12/8/2024

Content by: Timothy Mandler

Present: Timothy Mandler

Goals: Post documentation for the purchase placed for Grainger

Content:

See attachments below

Conclusions/action items:

This gives us a good documentation and confirmation that the needed purchases have arrived as then should have. They have all been put to good use for the construction of the prototype.

TIMOTHY MANDLER - Dec 08, 2024, 4:17 PM CST

Outlook

Fw: GRAINGER PO Acknowledgement for PO #: MSN0622850

From: John Puccinelli <john.puccinelli@wisc.edu>
Date: Tue 10/22/2024 9:05 AM
To: TIMOTHY JAMES MANDLER <tmandler@wisc.edu>

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Connect with BME on Facebook!

"Better health by design"

From: GIS_EBusiness_Ops@grainger.com <GIS_EBusiness_Ops@grainger.com>
Sent: Tuesday, October 22, 2024 8:59 AM
To: John Puccinelli <john.puccinelli@wisc.edu>
Subject: GRAINGER PO Acknowledgement for PO #: MSN0622850

Subject: GRAINGER PO Acknowledgement for PO #: MSN0622850
To: JOHN.PUCCINELLI@WISC.EDU
gis_odl@notes.grainger.com

Date: 10/22/2024 08:59

DO NOT RESPOND DIRECTLY TO THIS EMAIL
IF YOU HAVE ANY QUESTIONS REGARDING YOUR ORDER
PLEASE CALL US TOLL-FREE AT 1-877-202-2592, M-F 7AM - 5PM CST
OR EMAIL US BY ACCESSING THE (HELP->EMAIL US) OPTION
VIA YOUR PUNCH-OUT OR

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Grainger_Order_-_Mail_-_TIMOTHY_JAMES_MANDLER_-_Outlook.pdf (159 kB)

TIMOTHY MANDLER - Dec 08, 2024, 4:17 PM CST

Download

Fw__GRAINGER_PO_Acknowledgement_for_PO___MSN0622850.eml (30.4 kB)

2014/11/03-Entry guidelines

John Puccinelli - Sep 05, 2016, 1:18 PM CDT

Use this as a guide for every entry

- Every text entry of your notebook should have the **bold titles** below.
- Every page/entry should be **named starting with the date** of the entry's first creation/activity. subsequent material from future dates can be added later.

You can create a copy of the blank template by first opening the desired folder, clicking on "New", selecting "Copy Existing Page...", and then select "2014/11/03-Template")

Title: Descriptive title (i.e. Client Meeting)

Date: 9/5/2016

Content by: The one person who wrote the content

Present: Names of those present if more than just you (not necessary for individual work)

Goals: Establish clear goals for all text entries (meetings, individual work, etc.).

Content:

Contains clear and organized notes (also includes any references used)

Conclusions/action items:

Recap only the most significant findings and/or action items resulting from the entry.

2014/11/03-Template

John Puccinelli - Nov 03, 2014, 3:20 PM CST

Title:

Date:

Content by:

Present:

Goals:

Content:

Conclusions/action items: