Safe Shower Solution for Below-the-Knee Amputee
Progress Report 8

October 25, 2026 – November 1, 2026

Client: Mike DeGrave

Advisor: Prof. Murphy

Team:n
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Problem Statement

Below-the-knee amputees are unable to wear their prosthetic in the shower, as most prosthetic legs are not waterproof and are prone to corrosion and slippage. This forces individuals to either remove their prosthetic and shower while seated, or attempt to stand on one leg using unsafe workarounds - both of which carry significant fall risk. The objective of this project is to design a device that gives below-the-knee amputees the autonomy to safely enter, stand, and bathe in the shower without their prosthetic, restoring independence and reducing injury risk during a daily activity. This project is being developed in partnership with Mike DeGrave, a below-the-knee amputee whose personal experience with this challenge is the driving inspiration behind the work.

Brief Status Update

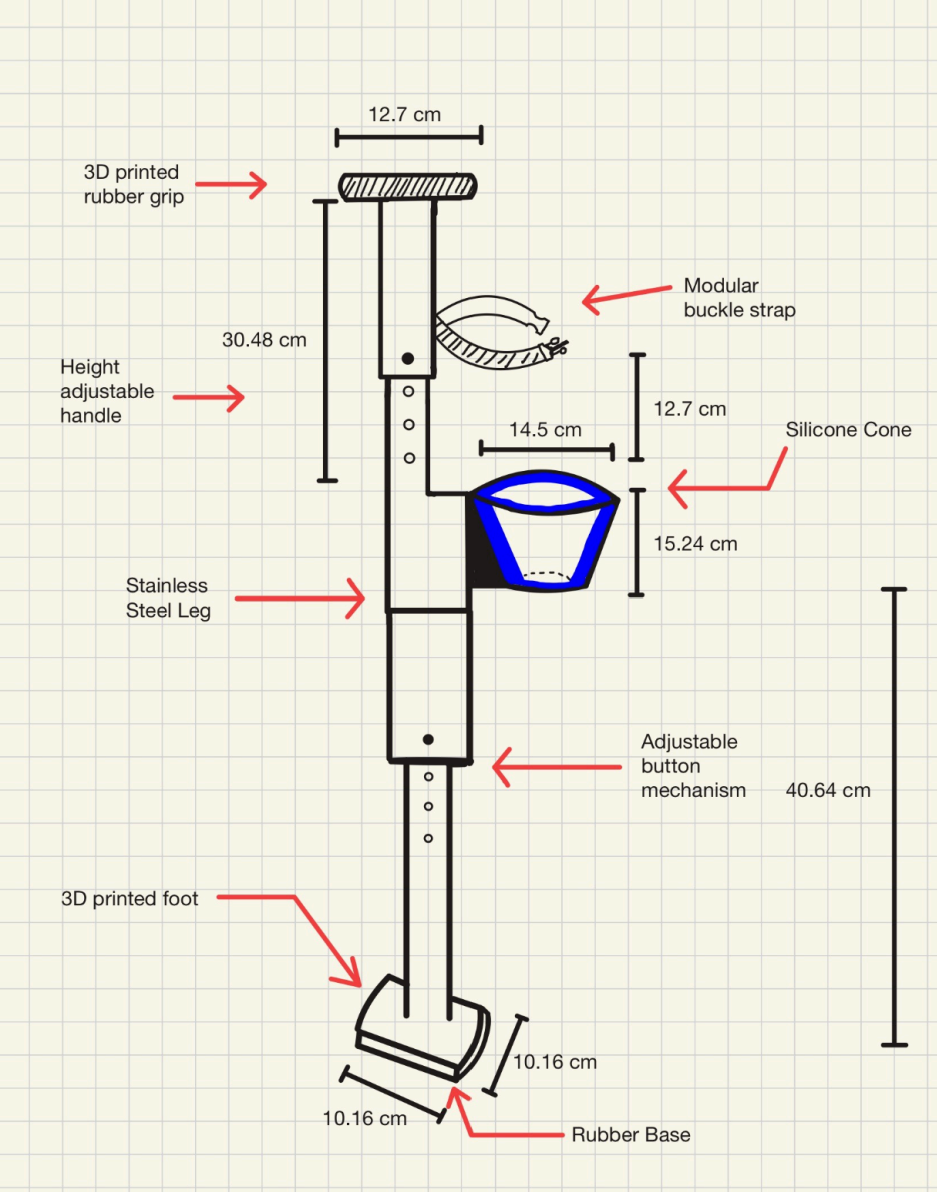
This week the team met with the Dr. Adamczyk team to discuss our current design and ask some questions about fabrication and general assistive device questions. We have also prepped for the show and tell by starting to fabricate the crutch, as well as 3D printing some small and unscaled parts (cone and foot).

Difficulties / Advice Requests

N/A

Current Design

Modified Air Jordan:



Materials and Expenses

Item	Description	Manufac-turer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost Each	Total	Link
Preliminary										
Drive Air-Crutches with	Anodized Aluminum Crutches	Drive DeVilbiss Healthcare	MD10300BK	DME Superstore	MD10300BK	10/19/2026	1	$109.99	$109.99	Crutches

Airgonomic Underarm Cushions - Onyx										
									$0.00	
Category 2										
									$0.00	
									$0.00	
								TOTAL:	**$109.99**	

Goals

Major team goals for the next week

1. Begin creating fabrication protocols for machining the foot and printing the cone with strong material.
2. Use the feedback given from other students and translate that feedback into revised protocols

Next week's individual goals

- Sam Dudek
    - Fabricate and start thinking about the foot fabrication plan
    - Research material options for 3D printing of the cone, material for the inside of the cone, and material for the foot
- Ben Willihnganz
    - Fabricate and initialize the beginning of the prototyping phase
    - Research more material options for 3D prints and other materials that can be machined
- Claire Matthai
    - Help source materials for the foot and create a fabrication plan
    - Communicate with Mike and family to find a time to meet before Thanksgiving
    - Finalize a material for the cone based on our research and input from show and tell
- Katelyn Williams
    - Utilize FEA on a CAD model to determine if component can withstand proper weight
    - Consider feedback from show and tell to drive new research or future steps on the design
    - Begin fabricating any components that are ready for the prototype
- Kimberly Jarrard
    - Look over the 3D printed small prototypes and make adjustments as needed
    - Continue to work on the crutch and start fabricating parts to test attached to the crutch
    - Take suggestions from the Show and Tell to improve our design
- Marcus Wentzel
    - Determine the exact dimensions of the prosthetics based on the measurements taken of the client's leg

- 3D print scaled down designs of the prosthetic components and the client's residual limb to observe how they interact with each other.
- Implement any feedback from show and tell into our project

Timeline

Task	September				October					November				Dec	
	4	11	18	25	2	9	16	23	30	6	13	20	27	4	11
Project R&D															
Brainstorm	X	X	X	X											
Research		X	X	X	X	X	X	X	X						
Prototyping & Fabrication								X	X						
Testing & Validation								X	X						
Deliverables															
Progress Reports		X	X	X	X	X	X	X	X						
PDS			X												
Design/Decision Matrix Criteria				X											
Prelim Presentation					X										
Show and Tell									X						
Final Poster															
Meetings															
Client			X	X	X										
Advisor	X	X	X			X	X	X	X						
Website															
Update	X	X	X	X	X	X	X	X	X						

Filled boxes = projected timeline
X = task was worked on or completed

Detailed Accomplishments

We met with Professor Adamczyk to discuss assistive devices and considerations the team should take in order to make the device as successful as possible. We started to think about how to fabricate this device, both the cone and the foot.

Previous Week's Goals and Accomplishments

- Sam Dudek
  - Begin fabrication process of the cone and foot portion and cutting the crutch to size
  - Continue to research and look into fabrication methods for our foot and cone while making sure to document these well

    - Prepare a show and tell script with questions for other groups regarding our project
- Ben Willihnganz
    - Begin the fabrication process by cutting the crutch down to size
    - Prepare for Show and Tell by fabricating and creating an elevator pitch for problems thus far
    - Look into design considerations from Jesse and the DI Lab
- Claire Matthai
    - Assist team with any initial fabrication steps (e.g. machining the crutch, sourcing materials, etc.)
    - Lock in cone attachment and foot piece concepts based on the meeting with Jesse
    - Prepare for Show and Tell by creating a list of specific parts of the project we would like peer input on
    - Complete human subjects training
- Katelyn Williams
    - Utilize CAD to make a 3D model of the cone to crutch interface
    - Continue to research filaments and materials for the cone to crutch interface that meet design requirements
    - Work with team to develop an initial prototype for Show and Tell and list of challenges
- Kimberly Jarrard
    - Test ideas discussed with Jesse on the crutch we just bought
    - Prepare for Show and Tell by fabricating a preliminary model and a short speech
    - Get 3D printing parts ready to start printing
- Marcus Wentzel
    - Begin the fabrication of the prosthetic by cutting the crutch to eliminate the top handle portion
    - Finalize the materials using the information Jesse provided us with and the information Professor Adamczyk will provide to us
    - Determine the initial prototype we will be able to construct for the Show and Tell on Friday.

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Sam Dudek		Create the show and tell document and add the background and initial questions Create 3D prints for show and tell, and print them for proof of concept (foot and cone) Brainstormed questions for Dr. Adamczyk and communicated with him about the project	.5 2.5 1	4	30

Ben Willihnganz	10/27 10/29	Review the Show and Tell Document and add helpful questions Research the 3 3D materials recommended to the team by Jesse to ensure they are safe for the client to interact with in the shower specifically for the foot	1 2	3	28
Claire Matthai	10/26 10/28 10/29 10/29	Met with Dr. Adamczyk and the team to get additional input on our design and material choice. Researched the EVA foam recommended by Dr. Adamczyk, and looked into shower environment compatibility for the materials recommended by Jesse. Completed human subjects training. Prepared for Show and Tell.	1 1.5 2 0.5	5	29.5
Katelyn Williams	10/26 10/29 	Met with Dr. Adamczyk to ask questions about our current design and get recommendations on materials. Researched how to manipulate the direction of filament when 3D printing in order to align it in the direction of the gradient. Added helpful questions to the show and tell document. Researched adhesives that work well with EVA foam to allow for a higher friction interior of the cone and stronger adhesion on the foot.	1 1 0.5 1	3.5	24.5
Kimberly Jarrard	10/24 10/26 10/28	Researched the HDPE material that Jesse suggested for the foot Met with Dr. Adamczyk to discuss prosthetics and materials that he recommends for our project Researched the EVA foam material	1 1 1	6	23.5

		that Dr. Adamczyk suggested for anti-slipping for the base			
	10/29	Researched and learned more about PETG and compared all plastic materials that the team has discussed so far.	1		
		Researched more on rectification in prosthetics.	1		
		Went over the Show and Tell script and brainstorm questions to ask on Show and Tell on Friday	1		
Marcus Wentzel	10/26	Met with Dr. Adamczyk to hear his experience with the DeGraves and any recommendations he had for our project	1	4	24.25
	10/29	Researched the EVA foam material recommended by Dr. Adaczyk for the bottom of the foot or the lining of the cone	1		
	10/25	Make a new sketch of the prosthetic following our meeting with Jesse	1		
	10/29	Reviewed the Show and Tell document and added questions that may be useful to ask	1		