Inconspicuous Ankle Foot Orthosis (AFO) for teen - BME 301

January 30th, 2026 - February 5th, 2026

Client: Debbie Eggleston

Advisor: Dr. Monica Ohnsorg

Team Members:
Alex Conover (Team Leader)
Avery Lyons (Communicator)
Sierra Loosen (BSAC)
Kalob Kimmel (BPAG, BWIG)

Problem Statement:

Ankle-foot orthoses (AFOs) are designed to support dorsiflexion during the swing phase of walking. They are commonly used in managing muscular dystrophies, and for this project, our focus is specifically on adolescents with Facioscapulohumeral Dystrophy (FSHD), the most prevalent form of muscular dystrophy [1]. Our goal is to create a brace that helps teens achieve safer walking by assisting ankle dorsiflexion, while remaining discreet, lightweight, and flexible enough to allow natural ankle motion. The main design priorities are to position the ankle in proper dorsiflexion, keep the brace slim and unobtrusive, and provide enough flexibility to reduce movement restrictions. This project has been ongoing throughout three semesters, and this semester, spring 2026, will be the final semester of the project; the team is hoping to create a device that fulfills all requests, as well as displays significant data.

Status Update:

The team spent much of this week updating the Product Design Specifications (PDS), and have a thorough, complete document for the specifications of the project. This document has been "living" since Fall 2024, and many of the sources were updated this semester to ensure quality and longevity of the PDS. The team met Monday to discuss what we wanted to ask Ms. Eggleston Tuesday morning, as well as discuss plans moving forward.

Summary of Weekly Team Member Design Accomplishments (Include time spent):

<u>Alex:</u>

- Attended and participated in BME 301 lecture, reviewing resumes! (50 min)
- Met with client 2/3/2026 to receive an update on the project (40 min)
- Deliberated and reviewed documents from last semester, adding to entries (2 hours)
- Met with the team Monday at 1pm to discuss questions and concerns for Tuesday's meeting (1 hour)

- Weekly advisor meeting Fridays (30 min)

Avery:

- Attended and participated in BME 301 lecture (50 mins)
- Researched additional FSHD and AFO information (2 hours)
- Met with client on 2/3/26 to discuss the project status (40 mins)
- Worked on the Product Design Specifications (1 hour)
- Met with advisor on 1/30/26 (30 mins)
- Met with team for weekly team meeting on 2/2/26 (1 hour)

Sierra:

- Attended and participated in BME 301 lecture (50 mins)
- Researched global impact of AFOs and benefits of carbon fiber AFOs (3 hours)
- Met with client on 2/3/26 to discuss the project status (40 mins)
- Worked on the Product Design Specifications (1 hour)
- Met with advisor on 1/30/26 (30 mins)
- Attended Biomedical Student Advisory Committee meeting on 1/30/26 (50 mins)
- Met with team for weekly team meeting on 2/2/26 (1 hour)

Kalob:

- Attended and participated in BME 301 lecture (50 mins)
- Researched additional AFO, Materials, FSHD and ethics information (4 hours)
- Met with client on 2/3/26 to discuss the project status (40 mins)
- Worked on the Product Design Specifications (1.5 hour)
- Met with advisor on 1/30/26 (30 mins)
- Met with team for weekly team meeting on 2/2/26 (1 hour)

Weekly/Ongoing Difficulties

The team had hoped to receive a full update on how the device had been working with the patient, but we did not end up getting such an update. The fully completed device was delivered, but it's unknown if the patient was wearing it all this time. Thursday or Friday this week we hope to receive an update on the client and patient status.

We will also be reaching out to the University of Michigan professors, and maybe the niece of the client, to work them into this project, and get testing done with similar facilities as UW has.

Upcoming Team and Individual Goals

Team:

- Receive the update from the client and patient about the brace status
    - Brainstorm upgrades to the brace
- Continue to research the materials, maybe perform material testing
- Meet with our advisor 2/6/2026

Individual:

Alex:

- Get an update from the client on potential University of Michigan contacts
    - Figure out who to contact, talk to previous advisor Dr. Williams
- Continue to research Carbon fiber techniques and methods, as well as best way to attain the training for this
- Complete another training this week for BME 301 credit
- Meet with advisor 2/6/2026

Avery:

- Get an update from the client on potential University of Michigan contacts
- Continue researching
- Meet with advisor on 2/6/26

Sierra:

- Research more about carbon fiber AFOs
- Brainstorm new ideas to improve the AFO design based on user feedback
- Meet with advisor

Kalob:

- Meet with advisor
- Continue research specifically on material probabilities
- Look over past designs and brainstorm new alterations
- Get update on AFO usage from client

Project Timeline

Project Goal	**Deadline**	**Team Member Assigned**	**Progress**	**Completed**
Meet with Client	02/05/2026		100%	
→ email client with dates	01/27/2025	Avery	100%	
→ receive update from client	02/03/2026	All	100%	
→ write summary and put in notebook	02/03/2026	All	100%	
PDS Draft	02/05/2026		100%	
→ submit draft		Kalob		
Design Upgrades	02/12/2026		00%	
→ Medial/Lateral Design Changes		All		
→ Dorsiflexion Material Changes		All		
Preliminary Design Presentation	02/20/2026		00%	

→ upload to website		Kalob		
Preliminary Deliverables	02/27/2026		00%	
→ email report and notebook		Avery		
→ upload report to website		Kalob		
→ peer/self evaluations		All		
Decide on Final Design	03/06/2026		00%	
→ get feedback from client on design		All		
Show and Tell	03/20/2026		00%	
→ create an initial prototype		All		
Final Poster Presentation	04/27/2026		0%	
→ invite client		Avery		
→ post on website		Kalob		
Final Deliverables	04/29/2026		0%	
→ submit final notebook and report		Avery and Kalob		
→ submit peer/self and client evaluations		All		

Full Expense Report

Item	Description	Manufacturer	Date	QTY	Cost Each	Total
Fall 2024						
Ankle Brace - Component 1						
Ankle Brace	Cloth brace	**Abiram**	10/10/2024	1	$14.88	$14.88
Gel padding	medical grade padding	**Shechekin**	10/10/2024	1	$15.81	$15.81
Gel sock	Compressive sock to support the carbon fiber	**KEMFORD**	10/10/2024	1	$15.95	$15.95
Plastic cord locks	End of the bungee	**Heado US**	10/10/2024	1	$3.98	$4.20
Nylon Fabric	fabric/cloth to sew carbon fiber	**MYUREN**	11/6/2024	1	$12.61	$12.61
Bungee pt 2	stronger bungee to	**LuckyStraps**	10/23/2024	1	18.99	$20.03

	support better dorsiflexion					
Bungee	thinner bungee	**Huouoo**	10/25/2024	1	$6.32	$6.32
Mini caribener	small sized caribener to hold bungee	**REI**	11/4/2024	1	$6.00	$6.00
Shock cord	thinner and stronger bungee	**REI**	11/4/2024	1	$5.95	$6.61
Lock laces	lock laces to fix the slipping problem of the plastic cord lock	**Lock Laces**	11/4/2024	1	$12.65	$12.65
Fabric Glue	glue to attach the cord locks to the fabric	**E6000**	11/08/2024	**1**	$8.14	$8.14
Needles and Thread	Stronger needles and thread to attatch various fabrics	**Basic Home**	12/03/2024	**1**	$8.43	$8.43
Carbon Fiber piece - Component 2						
3D printing prototype	3D printing of back support	**Bambu printer**	11/8/2024	1	1.4	$1.40
3D printing prototype - 3 variants	3D printing of back support	**Bambu printer**	11/12/2024	1	3.8	$3.80
3D printing prototype	3D printing of back support	**Bambu printer**	11/13/2024	1	1.71	$1.71
Lock lace piece	3D printing the lock lace piece	**Bambu printer**	11/18/2024	1	0.23	$0.23
3D Printing Final Prototype	3D printing of back support	**Shen Printer**	12/3/2024	1	1.57	$1.57
Epoxy Mold - Component 3						
Epoxy	Take cast of the leg	**Easy Pour Epoxy**	11/14/2024	1	$39.97	$39.97
Mold release Agent	PVA release agent - Prevent bonding to the cast	**Mrealeazy**	11/14/2024	1	0	$0.00
					TOTAL:	**$189.02**

Spring 2025						
Category 1 - Rigid Support						
CF-PLA	Carbon Fiber PLA 3D Print	Shen Printer	2/28/2025	1	$0.86	$0.86
CF-PLA	Carbon Fiber PLA 3D Print	Shen Printer	3/5/2025	1	$2.42	$2.42
CF-PLA	Carbon Fiber PLA 3D Print	Shen Printer	3/14/2025	1	$3.66	$3.66
CF-PLA (red)	Carbon Fiber PLA 3D Print	Shen Printer	4/4/2025	1	$3.92	$3.92
CF-PLA	Carbon Fiber PLA 3D Print	Shen Printer	4/4/2025	1	$1.94	$1.94
Category 2 - Straps and Padding						
Carpet Tape		Capitol	4/2/2025	1	$7.36	$7.36
Mesh Padding	3D Air Sponge Mesh Fabric	Tong Gu	3/7/2025	1	$16.99	$16.99
Velcro	Velcro pieces		2/28/2025	2	$0.40	$0.80
Fall 2025						
Category 1 - Rigid Support						
CF-PLA	3D printing for testing	Design Innovation Lab	10/27/2025	$2.00	$2.25	$4.50
CF-PLA	3D printed for testing of mediolateral support	Design Innovation Lab	10/27/2025	2	$2.25	$4.50
CF-PLA	3D printing for final product	Design Innovation Lab	11/17/2025	$1.00	$1.90	$1.90
CF-PLA	3D printing for final product	Design Innovation Lab	11/17/2025	1	$2.18	$2.18
CF-PLA	3D printing to send to client	Design Innovation Lab	11/19/2025	1	$2.17	$2.17
CF-PLA	3D printing to send to client	Design Innovation Lab	11/19/2025	1	$2.50	$2.50
Category 2 - Straps and Padding						
Elastic Strap	1 inch wide Polyester and Rubber blend. 10 yd in length	Cisone	10/10/2025	1	$7.99	$7.99
TPU	TPU Test Strip for testing apparatus	Makerspace	10/22/2025	1	$0.39	$0.39
Padding	Air Sponge Mesh Fabric	Tong Gu	10/24/2025	1	$16.99	$16.99

Superglue	Superglue for fabrication	Makerspace	11/4/2025	1	$1.15	$1.15
Superglue	Superglue for fabrication	Makerspace	11/5/2025	1	$1.15	$1.15
Nylon Fabric	Fabric used for straps and padding	Xtreme Sight Line	11/20/2025	1	$0.00	$0.00
Velcro	Velcro pieces	Myuren	11/20/2024	1	$0.00	$0.00
					TOTAL:	**$45.42**
					TOTAL:	**$272.39**