

# **Inconspicuous Ankle Foot Orthosis (AFO) for teen**

October 11<sup>th</sup> - October 18<sup>th</sup>, 2024

Client: Debbie Eggleston

Advisor: Dr. Brandon Coventry

Team Members:

Anya Hadim (Team Leader)

Lucy Hockerman (BSAC)

Presley Hansen (Communicator)

Alex Conover (BPAG)

Grace Neuville (BWIG)

## **Problem Statement:**

Ankle foot orthoses (AFOs) are designed to provide dorsiflexion support during the swing phase of walking. These devices are primarily used to treat muscular dystrophies. For this project, we are focusing on young individuals diagnosed with Facioscapulohumeral Dystrophy (FSHD), the most common type of muscular dystrophy. The team aims to design a brace for teens that assists with ankle dorsiflexion, promoting safer walking while remaining easily concealable and flexible enough to allow for functional ankle movement. The brace will be tailored specifically for the client, Maggie Eggleston. Key objectives for the device include positioning the ankle in adequate dorsiflexion, maintaining a slim, discreet design, and ensuring sufficient flexibility to minimize movement restriction.

## **Status Update:**

The team completed the preliminary report, which includes testing, fabrication methods, and updated product design specifications for the final design. In addition, the team conducted bungee cord strength testing. They discussed the prototype's fabrication, purchased and received all necessary materials, and began constructing the first prototype.

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

### Anya:

- Purchased all of the materials for the first prototype (30 mins)
- Met with the team to discuss and choose all of the materials for the first prototype (60 mins)
- Conducted patent research to see what already exists for AFOs (60 mins)
- Completed fabrication and materials section of the preliminary report (2 hours)
- Researched materials for bungee cord, carbon fiber temporary replacement, and ankle brace (90 mins)

- Met with the team to conduct bungee cord strength testing (60 mins)

Lucy:

- Met with team to discuss and choose all the materials for the first prototype (1 hour)
- Conducted bungee cord testing to determine the correct bungee cord strength
- Updated notebook specifically on testing research (2 hours)
- Completed and edited the preliminary report (3 hours)

Presley:

- Met with team to discuss materials for first prototype (1 hour)
- Completed section of the preliminary report (1.5 hours)
- Met with team to conduct bungee cord strength testing (1 hour)
- Continued communication with advisor and client (15 minutes)

Alex:

- Started HIPPA certification (15 minutes)
- Met with the team to discuss materials and order materials for initial prototype (60 minutes)
- Researched materials/price and type of carbon fiber, neoprene, etc (45 minutes)
- Updated expenses portion of reports and notebook (30 minutes)

Grace:

- Met with team to discuss materials for first prototype (1 hour)
- Researched different materials we could use for the brace (15 minutes)
- Met with team to test the strength of various bungee cords (1 hour)
- Completed discussion and edits for the preliminary report (1 hour)

**Weekly/Ongoing Difficulties**

The team is still deciding how exactly the carbon fiber piece will be attached to the brace, as well as the bungee cord and plastic lock clip. Additionally, the team is still finalizing the carbon fiber piece on Solidworks and is seeking help to be able to design it on 2 different planes together so that it can print all in one piece.

**Upcoming Team and Individual Goals**

**Team:**

- Attach the bungee cord and plastic lock to the foot sleeve brace
- Finish solidworks design and complete strength testing on Solidworks
- Print first 3D part of carbon fiber attachment

**Individual:**

Anya:

- Complete Solidworks design
- Print 3D solidworks part
- Conduct testing on Solidworks

- Meet with team to fabricate first prototype together

Lucy:

- Meet with team to create a plan and fabricate the prototype (all parts excluding the rigid support)
- Complete Solidworks (including adding correct directions tailors to a group member) design and 3D print
- Conduct initial testing with prototype with team member

Presley:

- Work with team to 3D print solidworks part
- Meet with team to fabricate first prototype
- Continue communication with client and advisor

Alex:

- Continue to update expenses spreadsheet
- Fabricate initial prototype with team
- Conduct initial testing with prototype

Grace:

- Meet with team to create a fabrication plan and begin to fabricate the prototype
- Help with solidworks and 3D printing as needed
- Continue to update the team's webpage
- Brainstorm testing methods for our prototype

**Project Timeline**

Project Goal	Deadline	Team Member Assigned	Progress	Completed
Meet with Client	9/17/2023		100%	
→ email client with dates		Presley	100%	
→ create question list		All	100%	
→ write summary and put in notebook		All	100%	
PDS Draft	9/22/2023		100%	
→ submit draft		Anya	100%	
Design Ideas and Matrix	9/29/2023		100%	
→ create design 1		All	100%	
→ create design 2		All	100%	
→ create design 3		All	100%	
→ compare designs in matrix		All	100%	
Preliminary Design Presentation	10/06/2023		100%	

→ upload to website		Grace	100%	
Preliminary Deliverables	10/13/2023		100%	
→ email report and notebook		Presley		
→ upload report to website		Grace		
→ peer/self evaluations		All		
Decide on Final Design	10/13/2023		100%	
→ get feedback from client on design		All		
Show and Tell	10/27/2023		0%	
→ create an initial prototype		All		
Final Poster Presentation	12/08/2023		0%	
→ invite client		Presley		
→ post on website		Grace		
Final Deliverables	12/13/2023		0%	
→ submit final notebook and report		Presley		
→ submit peer/self and client evaluations		All		

## Expenses

Item	Description	Manufacturer	Mft Pt#	Vendor	Vendor Cat#	Date	QTY	Cost Each	Total	
<b>Ankle Brace - Component 1</b>										
Ankle Brace	Cloth brace			Amazon		10/10/2024	1	\$11.90	\$11.90	
Strong glue	medical grade glue								\$0.00	
Gel padding	medical grade padding			Amazon		10/10/2024	1	\$14.99	\$14.99	
Gel sock	Compressive sock to support the carbon fiber			Amazon		10/10/2024	1		\$0.00	
Plastic	End of			Amazon		10/10/2024	1	\$3.98	\$3.98	

cord locks	the bungee			n		024				
Fabric	fabric/cloth to sew carbon fiber								\$0.00	
Bungee	Bungee to support dorsiflexion - use what we have			Amazon		n/a (already had)	2	n/a	\$0.00	
<b>Carbon Fiber piece - Component 2</b>										
Carbon Fiber (N/A)									\$0.00	
Metal for prototype	Fabrication of back support								\$0.00	
3D printing prototype	3D printing of back support								\$0.00	
<b>Category 3</b>										
									\$0.00	
									\$0.00	
								<b>TOTAL</b>	<b>: \$30.87</b>	