

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

November 8th - November 15th, 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 met over zoom to buy fabric glue to secure the cord lock and epoxy resin to make a mold out of the cast. The team reprinted the SolidWorks design as a thin rectangle with Grace's updated dimensions and is going to reprint one more prototype for a more snug fit. In addition, the team sewed fabric over the bungee cord and glued the lock laces to the straps for a current prototype. Final fabrication and testing of this prototype will be done Friday.

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

### Anya:

- Learned how to use runeasi for testing with Grace (20 min)
- Researched best mold release agent and different mold filling options (45 mins)
- Met with the team to discuss plans for final materials and timeline for the rest of the project (30 mins)
- Updated lab notebook for preliminary check (90 mins)

### Lucy:

- Learned how to use raneasi for testing (20 mins)
- Met with team over zoom to discuss plans to order glue and export for making a mold (30 mins)
- 3D printed the 3 prototype (20 mins)

Presley:

- Met with Alex to sew and glue prototype (1 hour)
- Continued communication with advisor and client (15 minutes)
- Met with team over zoom to discuss plans to order glue and epoxy for making a mold (30 minutes)

Alex:

- Met with the team over zoom to discuss week plans and order epoxy (30 minutes)
- Manufactured the prototype with Presley (1 hour)
- Updated lab notebook for preliminary check (30 minutes)
- Updated the finance spreadsheet (20 minutes)

Grace:

- Met with team over zoom to discuss timeline and fabrication plans (30 minutes)
- Picked up 3D printed supports and assessed each one (30 minutes)
- Created a new solidworks design for the rigid support (30 minutes)
- Updated fabrication notes in notebook for recent fabrication of the rigid supports (45 minutes)

**Weekly/Ongoing Difficulties**

The Solidworks part with Grace's updated dimensions had some bumps that could be minimized to fit Grace's foot more accurately. The team is going to reprint this part again with updated dimensions in hopes of a more snug fit. In addition, materials have been taking a while to come in which makes it difficult to make prototypes and test quickly.

**Upcoming Team and Individual Goals**

**Team:**

- Reprint Solidworks part
- Finish assembling prototype
- Conduct runeasi testing on Grace using final prototype adhered to Grace's dimensions
- Make mold with epoxy resin and cast
- Order final brace

**Individual:**

Anya:

- Conduct testing on Grace using runeasi
- Create mold of the cast with the team
- Update final prototype as needed after testing

- Find final foot brace and order
- Reprint carbon fiber part with Grace's measurements
- Split up responsibilities for final deliverables

Lucy:

- Add/edit preliminary notebook
- Conduct testing on Grace
- Create mold of the cast with team
- Meet with team to adjust final prototype and discuss brace options

Presley:

- Once the Solidworks part is solidified, stress testing will be done in Solidworks
- Continue communication with client and advisor
- Work on mold of cast with team
- Update final prototype as needed after testing

Alex:

- Work on the mold of cast with the team
- Order final footbrace
- Keep materials and finances up to date

Grace:

- Conduct runeasi testing
- Work on mold for the cast

**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		100%	
→ 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	Manufa cturer	Mft Pt#	Vend or	Vendo r Cat#	Date	QT Y	Cost Each	Total	Lin k
<b>Ankle Brace - Component 1</b>										
Ankle Brace	Cloth brace	<b>Abiram</b>		Amaz on		10/1 0/20 24	1	\$14. 88	\$14. 88	<a href="#">Lin k</a>
Gel padding	medical grade padding	<b>Shechek in</b>		Amaz on		10/1 0/20 24	1	\$15. 81	\$15. 81	<a href="#">Lin k</a>
Gel sock	Compressive sock to support the carbon fiber	<b>KEMFO RD</b>		Amaz on		10/1 0/20 24	1	\$15. 95	\$15. 95	<a href="#">Lin k</a>
Plastic cord locks	End of the bungee	<b>Heado US</b>		Amaz on		10/1 0/20 24	1	\$3.9 8	\$4.2 0	<a href="#">Lin k</a>
Nylon Fabric	fabric/cloth to sew carbon fiber	<b>MYURE N</b>		Amaz on		11/6 /202	1	\$12. 61	\$12. 61	<a href="#">Lin k</a>

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Bungee pt 2	stronger bungee to support better dorsiflexion	LuckyStraps		Amazon		10/23/2024	1	18.99	\$20.03	<a href="#">Link</a>
Bungee	thinner bungee	Huouuo		Amazon		10/25/2024	1	\$6.32	\$6.32	<a href="#">Link</a>
Mini caribener	small sized caribener to hold bungee	REI		REI		11/4/2024	1	\$6.00	\$6.00	In-store
Shock cord	thinner and stronger bungee	REI		REI		11/4/2024	1	\$5.95	\$6.61	In-store
Lock laces	lock laces to fix the slipping problem of the plastic cord lock	Lock Laces		Amazon		11/4/2024	1	\$12.65	\$12.65	<a href="#">Link</a>
Fabric Glue	glue to attach the cord locks to the fabric	E6000		Amazon		11/08/2024	1	\$8.14	\$8.14	<a href="#">Link</a>
<b>Carbon Fiber piece - Component 2</b>										
3D printing prototype	3D printing of back support	Bambu printer		Maker space		11/8/2024	1	1.4	\$1.40	*covered by our given \$50 per team
3D printing prototype - 3 variants	3D printing of back support	Bambu printer		Maker space		11/12/2024	1	3.8	\$3.80	*covered by our given \$50 per team

3D printing prototype	3D printing of back support	Bambu printer	Maker space			11/13/2024	1	1.71	\$1.71	*covered by our given \$50 per team	\$6.91
<b>Epoxy Mold - Component 3</b>											
Epoxy	Take cast of the leg	Easy Pour Epoxy	Amazon			11/14/2024	1		\$39.97	\$39.97	<a href="#">Link</a>
									<b>TOTAL:</b>	<b>\$170.08</b>	