

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

November 15th - November 22th, 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 successfully conducted testing on Grace using Runeasi software and the first prototype. To address the issue of the cord lock detaching during testing, the team designed, fabricated, and 3D-printed a custom piece to resolve the problem. Final dimensions for the carbon fiber component were also determined. Additionally, the team organized roles for the final deliverables and developed a clear plan for final fabrication.

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

### Anya:

- Conducted testing using Runeasi (1 hour)
- Updated lab archives (1 hour)
- Met with the team to plan final fabrication (45 mins)
- Conducted testing using Runeasi on the updated final prototype (1 hour)

### Lucy:

- Conducted testing using Runeasi (1 hour)
- Collected and organized data from Runeasi testing (1 hour and 30 mins)
- Updated lab archives (30 minutes)
- Created and 3D printed cord lock holder (2 hours)
- Met with team over zoom to discuss week plans (30 mins)
- Conducted Runeasi testing part 2 (1 hour and 30 mins)

Presley:

- Tested PLA 3D printed part in Solidworks (1 hour)
- Continued communication with advisor and client (15 minutes)
- Met with team over zoom to discuss plans for the week (30 minutes)

Alex:

- Met with team over zoom to discuss plans (30 minutes)
- Fabricated the cord lock together - sewing and gluing (1 hour)
- Updated lab archives (45 minutes)
- Communicated with Dr. P about purchasing epoxy (15 minutes)

Grace:

- Met with team over zoom (30 mins)
- Conducted runeasi testing part 2 (1 hour 30 mins)
- Updated lab archived for fabrication (30 mins)

**Weekly/Ongoing Difficulties**

The team has finalized the design; however, a decision is still pending on whether to order a final brace. The team also needs to reprint the carbon fiber piece to match Maggie's dimensions. This weekend, the team will create a mold of the cast, and we are hopeful that no issues will arise during the process.

**Upcoming Team and Individual Goals**

**Team:**

- Make mold with epoxy resin and cast (Saturday)
- Work on final deliverables
- Update final prototype as needed after testing

**Individual:**

Anya:

- Work on final deliverables
- Update final prototype as needed after testing
- Continue updating labArchives

Lucy:

- Work on final deliverables
- Met with team to mold cast

- Analyze final testing data (part two)

Presley:

- Work on portion of final deliverables
- Continue communication with client and advisor
- Work on mold of cast with team over the weekend
- Update final prototype as needed after testing

Alex:

- Work on portion of final deliverables
- Work on the mold of the cast saturday
- Catch up on testing results
- Keep finances up to date

Grace:

- Work on the mold
- Update final prototype
- Work on final deliverables

**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		Grace		
→ submit peer/self and client evaluations		All		

## Expenses

Item	Description	Manufacturer	Mft Pt#	Vendor	Vendor Cat#	Date	QTY	Cost Each	Total	Link
<b>Ankle Brace - Component 1</b>										
Ankle Brace	Cloth brace	Abiram		Amazon		10/10/2024	1	\$14.88	\$14.88	<a href="#">Link</a>
Gel padding	medical grade padding	Shechekin		Amazon		10/10/2024	1	\$15.81	\$15.81	<a href="#">Link</a>
Gel sock	Compressive sock to support the carbon fiber	KEMFORD		Amazon		10/10/2024	1	\$15.95	\$15.95	<a href="#">Link</a>
Plastic cord locks	End of the bungee	HeadoUS		Amazon		10/10/2024	1	\$3.98	\$4.20	<a href="#">Link</a>
Nylon Fabric	fabric/cloth to sew carbon fiber	MYUREN		Amazon		11/6/2024	1	\$12.61	\$12.61	<a href="#">Link</a>
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	Huouoo		Amazon		10/2	1	\$6.3	\$6.3	<a href="#">Link</a>

				on		5/20 24		2	2	<a href="#">k</a>	
Mini caribener	small sized caribener to hold bungee	<b>REI</b>		REI		11/4 /202 4	1	\$6.0 0	\$6.0 0	<b>In-s tor e</b>	
Shock cord	thinner and stronger bungee	<b>REI</b>		REI		11/4 /202 4	1	\$5.9 5	\$6.6 1	<b>In-s tor e</b>	
Lock laces	lock laces to fix the slipping problem of the plastic cord lock	<b>Lock Laces</b>		Amaz on		11/4 /202 4	1	\$12. 65	\$12. 65	<a href="#">Lin k</a>	
Fabric Glue	glue to attach the cord locks to the fabric	<b>E6000</b>		Amaz on		11/0 8/20 24	1	\$8.1 4	\$8.1 4	<a href="#">Lin k</a>	

**Carbon Fiber piece - Component 2**

3D printing prototype	3D printing of back support	<b>Bambu printer</b>		Maker space		11/8 /202 4	1	1.4	\$1.4 0	<b>*co vere d by our give n \$50 per tea m</b>	
3D printing prototype - 3 variants	3D printing of back support	<b>Bambu printer</b>		Maker space		11/1 2/20 24	1	3.8	\$3.8 0	<b>*co vere d by our give n \$50 per tea m</b>	
3D printing prototype	3D printing of back support	<b>Bambu printer</b>		Maker space		11/1 3/20 24	1	1.71	\$1.7 1	<b>*co ver ed by our giv ing</b>	<b>\$6. 91</b>

											en \$50 per tea m
<b>Epoxy Mold - Component 3</b>											
Epoxy	Take cast of the leg	<b>Easy Pour Epoxy</b>		Amaz on		11/1 4/20 24	1	\$39. 97	\$39. 97	<a href="#">Link</a>	
								<b>TOTAL:</b>	<b>\$170</b>		<b>.08</b>