

Step by Step: A Comprehensive Approach to Stair Climbing Assistance

Date: 2/15/2024

Client: Dan Kutshera

Advisor: Dr. Russ Johnson

Team:

Margo Amatuzio

Gracie Kreissler

Delani Wille

Cameron Owens

Riley Toth

Problem statement

In the field of neuro-rehabilitation, physical therapists encounter a significant obstacle when assisting patients with weight-bearing restrictions to transition back to their homes. The primary challenge revolves around negotiating steps, which often proves to be an arduous task due to various constraints. Ramps, typically considered a solution, are frequently deemed impractical due to cost implications and compliance with rise-to-run criteria. As an alternative, patients are advised to use garden benches from hardware stores, which lack adjustability and medical design. This makeshift solution is frustrating for healthcare providers, as it is not purpose-built and poses issues with bench availability.

To address this gap in the next three months, there is a clear need for a specialized, medically designed bench tailored for step use, offering safety and adjustability to improve the mobility and independence of patients in neuro-rehabilitation.

Brief status update

This week, the team gave our preliminary presentation to our advisor to lay out the plans for the semester. We completed the fabrication of the adjustable column prototype, what remains is welding the column to the base which will be completed by next week. During this turnaround time, we will be researching and designing the base cushion for the final prototype. Riley has been moving forward with communication with Arrow, and he has a meeting scheduled for next week. We continue to move forward with patent research and plan to communicate with WARF.

Difficulties / advice requests

Current design

Materials and expenses

Item	Description	Manufacturer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost Each	Total	Link
Category 1										
CORNER BRACE	BRACE, CORNER_2"_GALV_4PK		030699 152674						\$6.97	
BRACE, CORNER_5"_ZINC	BRACE, CORNER_5"_ZINC		030699 152124						\$5.94	
Category 2										
CLEVIS PIN	TOWSMART 3/8" CLEVIS PIN		849278 012038						\$5.38	
SQ TB1.25	PUNCHED SQ TUBE ZP 1-1/4X36		887480 030471						\$22.93	
SQUARE TUBE	TUBE SQUARE ALUM 48X1X1/16		887480 013078						\$28.47	
8 IN SHIMS	8" COMPOSITE SHIM (12 PC BDL)		852981 002098						\$2.28	
								TOTAL:	\$71.970	

Major team goals for the next week

1. Send ARROW document to be reviewed

Next week's individual goals

- Riley Toth
 - Finish writing the trial procedures to submit to arrow
 - Meeting with arrow on monday to Finish the submission
- Delani Wille
 - Summarize market and freedom to operate for this device
 - Attend Arrow meeting
- Gracie Kreissler
 - Write experimental setup for stair climbing gait metrics measurement
- Margo Amatuzio
 - Bench cushion design and research for prototype
 - Begin submission to WARF and invention disclosure
- Cam Owens
 - Finish outreach outline
 - Research materials and testing methods

Timeline

Task	Jan	Feb				March					April				May	
	26	2	9	16	23	1	8	15	22	29	5	12	19	26	3	10
Project R&D																
Empathize	x	x	x													
Background...																
Prototyping																
Testings																
Deliverables																
Progress Reports	x	x	x													
Prelim presentation			x													
Final Poster																
Meetings																
Client	x															
Advisor	x	x	x													
Website																
Update																

Filled boxes = projected timeline

X = task was worked on or completed

Previous week's goals and accomplishments

- Riley Toth
 - Helped fabricate the adjustability of the base and overall height

- Called arrow to work through the submission process
- Continued to fill out the Arrow form on my own
- Delani Wille
 - Helped fabricate the leg support and handle
 - Completed preliminary presentation
 - Continued market research and analysis
- Gracie Kreissler
 - Worked on CAD for the adjustable design
 - Fabricated the adjustable design
 - Worked with biomechanics professors to establish testing plan
- Margo Amatuzio
 - Helped fabricate the leg support and handle
 - Draft experimental plan for testing and comparison to iWalk
- Cameron Owens
 - Helped fabricate the adjustable base.
 - Spent time designing and calculating values needed for spring loaded base design.
 - Worked on BME outreach project.

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Riley Toth	2/9/2024 2/12/2024 2/13/2024 2/14/2024	Fabrication Presentation Arrow call Arrow forms	1.5 1 1 0.5	4	8.5
Delani Wille	2/9/2024 2/12/2024 2/13/2024	Fabrication Presentation Market research	1.5 1 1	3.5	9
Gracie Kreissler	2/9/2024 2/12/2024 2/14/2024	Fabrication Presentation CAD	1.5 1 1	3.5	8.5
Margo Amatuzio	2/9/2024 2/12/2024 2/13/2024	Fabrication Presentation Experimental design research	1.5 1 0.5	3	7.5
Cameron Owens	2/9/2024 2/13/2024 2/14/2024	Fabrication of bench support Spring loaded base design BME outreach	1.5 1 1	3.5	8