

Therapeutic Exercise Cage for Muscle Development

Client: Mr. Matt Jahnke - mattjahnke@ucpdane.org

Advisor: Joseph Towles - towles@wisc.edu

Team: Kevin Collins - kdcollins2@wisc.edu (Team Leader)

Darcy Davis - darcy.davis@wisc.edu (Communicator)

Sheetal Gowda - sjgowda@wisc.edu (BSAC)

Breanna Hagerty - bhagerty@wisc.edu (BWIG)

Stephen Kindem - kindem@wisc.edu (BPAG)

Date: April 12th - 18th, 2017

Problem Statement:

A spider cage is a device used by therapists to work with individuals (usually children) who have cerebral palsy. The cage supports the patient's weight with the use of bungee cords that are connected to a custom suit that allows the patient to work on building leg and arm strength. This product is available commercially but it is quite expensive. The client is looking for a design that is relatively inexpensive, transportable via trailer, able to fit through a standard doorway, and customized to meet the needs of one particular person.

Last Week's Goals

- Address issues noted by client
- Coat wood flooring
- Work on assembly instructions

Summary of Team Role Accomplishments

- *Leader* - Send progress report to client, TA, and adviser.
- *BWIG* - Uploaded progress report
- *BSAC* - No meetings attended

- *Communicator* - Sent rough draft of BME Excellence award to Dr. Towles
- *BPAG* - No additional expenses

Summary of Accomplishments:

This week the team was able to disassemble the cage. While disassembling the cage, the group took pictures and began thinking through the best way to disassemble/assemble. The group has begun working on the disassembly/assembly instructions that will be used by the client with those considerations in mind. Also, the group was able to research substitute carabiners, test a new mesh coating, and paint the base flooring.

Activities

Date	Person	Task	Time (hrs)	Weekly Total	Semester Total
4/14/17	Team	Advisor Meeting	0.5	0.5	18.5
4/13/17	Kevin	Cage disassembly	2		
4/17/17		Paint base	1.5		
4/18/17		Home depot for supplies/research	1	4	22.5
4/13/17	Darcy	Cage Disassembly	2		
4/18/17		Assembly instructions draft and graphics	2	4	22.5
4/18/17	Sheetal	Small parts inventory/allocation and outline/edits on final report and poster	1.5	1.5	20

4/13/17	Breanna	Statistical analysis	1		
4/18/17		Paint base and edit Executive Summary	1.5	2.5	25.5
4/13/17	Stephen	Cage disassembly	2	3.5	23
4/18/17		Rubber coating testing, DIY improvements	1.5		

Team Goals

- Finish coating wood flooring
- Finish assembly instructions
- Final report and poster

Individual Goals

- *Kevin*: Fix current issue with the cage and work on the report, finish painting the base board
- *Darcy*: Finish assembly instructions before the cage is re-assembled so we can try them out
- *Sheetal*: Begin final report/presentation
- *Breanna*: Finish coating base and work on report and poster
- *Stephen*: Fix current issue with the cage and work on the report

Project Timeline

Task	January	February	March	April	May
Project R&D					
Base Support	X	X			
Harnesses and Bands		X	X	X	
Padding			X	X	
Fabrication					
Order Materials			X	X	X
Create Fastener Hole		X			
Base Support			X	X	X
Padding				X	X
Assembly Tools				X	X
Testing					
Slip Test			X	X	X
Deflection Calculations			X	X	X
Assembly Directions					X
Deliverables					
Progress Report	X	X	X	X	X
Individual Presentation			X	X	
Preliminary Presentation			X	X	
Preliminary Deliverables			X	X	
Poster					X
Final Deliverables					X
Meetings					
Advisor	X	X		X	X
Client		X		X	
Team	X	X	X	X	X
Website					
Update	X	X	X	X	X

Colored Cells: Projected Timeline
X: Completed Tasks

Expenses

Fall 2016: University Funded Expenses: \$1,702.75

Description	Supplier	Part/Model #	Link to Part	QTY	Date	Price	Total
Price Engineering Cage Materials & Shipping (Itemized BOM in separate file)	Price Engineering	N/A	N/A	1	1/1/2017	\$1,702.75	\$1,702.75
						Total	\$1,702.75

Spring 2017: University Funded Expenses: \$32.94

Description	Supplier	Part/Model #	Link to Part	QTY	Date	Price	Total
19/32 4'x8' OSB	Home Depot (IN STORE)	0000-339-696 5/8 OSB SQ	N/A	2	2/24/2017	\$14.75	\$29.50
TEE NUT ZINC 5/16-18 x 3/8"	Home Depot (IN STORE)	887480023114 TEE NUT	N/A	2	2/24/2017	\$0.98	\$1.96
HEX BOLT 5/16-18 x 3/4"	Home Depot (IN STORE)	AEE 5/16X3/4HBLT	N/A	8	2/24/2017	\$0.16	\$1.28
HEX BOLT 5/16-18 x 1"	Home Depot (IN STORE)	AFE 5/16X1HXBOLT	N/A	8	2/24/2017	\$0.17	\$1.36
						Total	\$34.10

Spring 2017: Client Funded Expenses: \$159.74

Description	Supplier	Part/Model #	Link to Part	QTY	Date	Price	Total
Harnesses	Zoro	Zoro #: G1320821 Mfr #: 1191209	https://www.zoro.com/protecta-full-body-harness-ml-420-lb-redgray-1191209/i/G1320821/?gclid=CON-5on-NECFR61wAodtbMCKg	1	2/9/2017	\$75.86	\$75.86
Resistance Bands	Fitness Insanity	Unsure	https://www.amazon.com/gp/product/B01GCA4BJC?ref=sr_1_7&qid=1486677502&sr=8-7&keywords=Fitness%20Resistant%20Bands&pldnSite=1	4	2/9/2017	\$20.97	\$83.88

						Total	\$159.74
--	--	--	--	--	--	-------	----------

Total UW - Expenses: \$1735.69
Total Client Expenses: \$159.74
Total Expenses: \$1895.43

Technical Section

The group has begun to address some of the issues with the cage that were mentioned in the previous progress report. The issues mentioned previously was padding for the interior face of the framing, friction between the carabiners and resistance bands, and wear on the mesh from carabiner openings.

The issue that has been focused on primarily is the wear on the mesh from the carabiners. Team members has begun researching possible replacement carabiners that do not have the same sharp edges as the current ones. Also, if the group can find larger carabiners, some of the other problems may positively affected. Larger carabiners would make it easier to hook them into the mesh and reduce the contact friction (resulting in mesh wear) when placing them. Additionally, larger carabiners may make it easier to address the problem with friction between the bands and carabiners since there will be more room to add a bearing or slip-surface. Some of the carabiners considered are shown below in figure. The group has also been thinking of ways to reinforce the coating on the mesh to help prevent wear in addition to changing carabiners. A material called Liquid Roof which is a EPDM hardenable liquid rubber was applied to a portion of the sample mesh. Before application, the mesh was scarred to mimic the effect of removing/applying the carabiners. After the material has cured, the group will be testing its resistance to wear compared to that of the default mesh coating. If the material proves to be more effective at resisting wear, it will be applied to the frequently used portions of the mesh (likely all corners).



Figure 1: Possible replacement carabiner.

Written by: Steve Kindem
Reviewed by: Kevin Collins