

Spider Cage to Support Cerebral Palsy Patient

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

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

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Date: February 22nd - February 28th, 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

- Test OSB with resin coating
- Buy and coat base board
- Buy and attach T-nuts to base board

Summary of Team Role Accomplishments

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

- *Communicator* - Asked Matt to order foam flooring
- *BPAG* - Organized expenses

Summary of Accomplishments:

This week Kevin was able to purchase the base and the attachments for the base (brackets, screws, T-nuts). Holes were drilled into the base board and the corner T-nuts were attached underneath. The screws on the retainers of the cage were switched to ensure that all the screws were accounted for and in the right places. Steve and Breanna were able to destructively test the one square inch sample of mesh and found that the mesh deflected less than expected for a 110 lb point load.

Activities

Date	Person	Task	Time (hrs)	Weekly Total	Semester Total
	Team				5
2/24/17	Kevin	Went to Home Depot, bought and cut OSB board and delivered to ME building	1.5		13
2/28/17		Adjust screws on top of the cage and measure/help drill screw placement on plyboard	2.5	4	
2/28/17	Darcy	Adjust screws on top of the cage and measure/help drill screw placement on plyboard	2.5	2.5	11.5
2/28/17	Sheetal	Adjust screws on top of the cage and measure/help drill screw placement on plyboard	2	2	11

2/27/17	Breanna	Exercise attachment point research	0.5		
2/28/17		Mesh deflection test and data formatting	3	3.5	15.5
2/28/17	Stephen	Mesh deflection setup & testing	2.5	2.5	13

Team Goals

- Coat the base with epoxy resin
- Put top of cage back on
- Begin testing protocol

Individual Goals

- *Kevin*: Install the rest of the T-nuts, attach to cage.
- *Darcy*: Coat a test OSB with resin
- *Sheetal*: look into testing exercises and procedures
- *Breanna*: continue formulating exercise testing procedures
- *Stephen*: create a spreadsheet that will outline the forces experienced on the cage for specific attachment schemes while varying patient weight and height, coat and test OSB with resin

Project Timeline

Task	January	February	March	April	May							
	19	26	2	9	16	23	30	6	13	20	27	4
Project R&D												
Base Support	X	X										
Harnesses and Bands		X	X	X								
Padding												
Assembly Tools												
Fabrication												
Order Materials				X	X	X						
Create Fastener Hole		X										
Base Support												
Padding												
Assembly Tools												
Testing												
Exercise Simulation												
Deflection Calculations												
Assembly Directions												
Redesign												
Deliverables												
Progress Report	X	X	X	X	X	X						
Individual Presentation				X	X							
Preliminary Presentation				X	X							
Preliminary Deliverables				X	X							
Poster												
Final Deliverables												
Meetings												
Advisor	X		X									
Client			X									
Team	X	X	X	X	X	X						
Website												
Update	X	X	X	X	X	X						
Colored Cells: Projected Timeline												
X: Completed Tasks												

Expenses

- Fall 2016: Total cost of materials: \$1,702.75
- Spring 2017: \$32.94 (University funded expenses)
 - Harness - \$75.86 (bought by Matt)
 - Resistance bands - \$83.88 (bought by Matt)
 - Flooring - \$32.94
 - 19/32 4x8 OSB (2) @ \$14.17 each
 - Tee Nut Zinc 5/16-18 x 3/8" (2) @ \$.98 each
 - Hex Bolt 5/16 x 3/4 (8) @ \$.16 each
 - Hex Bolt 5/16 x 1 (8) @ \$.17 each

ME Technical Section

The OSB flooring has been attached to the cage at the four corners of the cage. More attachments may be made later once more nuts, screws, and brackets are obtained; four attachment points should be sufficient for testing for now. An image of a bracket attached to the front left corner of the cage is shown in Figure 1. The bracket is secured onto the outside of the cage with one 80/20 screw and nut that attaches to the cage, and one bolt that screws into a hammered in T-nut underneath the base flooring.



Figure 1: The front left corner bracket attached to the cage and the base flooring.

T-nuts were hammered into the bottom of the base to make them as flush as possible with the board. This attachment method will allow a smoother assembly process for the client because fewer fasteners will need to be accounted for when screwing in the brackets to the board and because the bolt will screw in straight. An image of the back of the board where the T-nut attaches can be seen in Figure 2.



Figure 2: View from underneath the base flooring: a bolt screwed into a hammered in T- nut.

Now that the flooring and the cage are attached, the team can start to test the cage using the harnesses and exercise bands. Depending on the testing results, more bolts may be added in the future if the team feels they are needed to make the cage more secure for the patients. The testing results will be used to determine what, if any, changes should be made to the cage to make it safer for the patients when in use.

Written by: Darcy Davis

Reviewed by: Sheetal Gowda