

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: January 17th - January 24th, 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.

Summary of Team Role Accomplishments

- *Leader* - Set up team notebook
- *BWIG* - Set up and updated website
- *BSAC* - No tasks
- *Communicator* - E-mailed advisor, client, and OT students
- *BPAG* - Submitted pricing request to ME

Summary of Accomplishments:

This week the team focused on researching materials to diminish the racking effects of the cage. It was decided that a plywood flooring with a rubber mat covering would be a

beneficial addition to help stabilize the cage. The plywood researched is 15/32 inches thick and comes in sheets of 4ft x 8ft. The rubber flooring is 1/2 inch thick and will act as a cushion to cover the exposed plywood. Going forth, the team needs to finalize a budget with the BME and ME departments before obtaining materials. A meeting with Matt Jahnke has been set for Wednesday January 25th to discuss the outlook for the Spring semester and possible testing procedures. The team will also be meeting with an OT student Wednesday evening to discuss resistant bands.

Activities

Date	Person	Task	Time (hrs)	Weekly Total	Semester Total
1/19/17	Team	Created prioritized list of goals for optimizing the cage	1		
1/20/17		Advisor Meeting	0.5		
1/24/17		Disassemble cage top	1.0	2.5	2.5
1/23/17	Kevin	Brainstormed ideas for testing hypothesis and went over overview of the semester.	1.5	1.5	1.5
1/23/17	Darcy	Brainstormed ideas for testing hypothesis and went over overview of the semester.	1.5	1.5	1.5
1/23/17	Sheetal	Brainstormed ideas for testing hypothesis and went over overview of the semester.	1.5	1.5	1.5
1/20/17	Breanna	Created Gantt Chart	0.5		

1/23/17		Brainstormed and wrote out a hypothesis and researched journal articles	1.5	2.0	2.0
1/23/17	Stephen	Brainstormed ideas for testing hypothesis and went over overview of the semester.	1.5	1.5	1.5

Team Goals

- Talk with Matt Jahnke about possible experiments/testing for the cage
- Solidify budget and obtain materials from Home Depot

Individual Goals

- *Kevin*: Develop testing hypothesis
- *Darcy*: Adjust mesh and meet with OT students
- *Sheetal*: Look into review journals to publish in
- *Breanna*: Further develop testing procedure and meet with OT students
- *Stephen*: Finalize testing hypothesis

Project Timeline

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

Expenses

- Fall 2016: Total cost of materials: \$1,702.75
- Spring 2017: No expenses at this time

ME Technical Section

Upon receiving the cage, the group realized there was a minor miscommunication between the engineer at Price Engineering and the group. The miscommunication was in the orientation of the framing for the top of the cage. The group was under the impression that the front and middle cross-members connecting the left and right sides of the cage would be 75" long and the two 36.75" members would connect the middle cross-member to the front and back of the cage. Instead of this connection scheme, Price Engineering designed the cage to connect so that there is a 75" cross-member in front and another 75" cross-member that connects it to the back of the cage. The 36.75" members then connect each side of the cage to the middle 75" cross-member that runs from the front to the back. This layout can be seen in figure 1. Since the dimensions of the top section of the cage are square, group can fix the problem by rotating the top of the cage 90 degrees in either direction.



Figure 1: The current layout for the top of the cage (the left side of the cage is on the lower left side of the image and the back side of the cage in the lower right).

In order to have the originally intended layout, the group must machine a few of the extrusions. The 75" member only has one end where an anchor fastener can connect, so a 13/16" diameter bore must be drilled so that each end can connect to a side of the cage. One of the 36.75" members must be tapped with 5/16-18 threads so that it can connect to the front cross member using an internal fastener. Machining will be done in the student shop. The group should be able to reassemble the top of the cage to the intended layout with no wasted materials once machining is complete.

Written: Steve Kindem

Reviewed: Kevin Collins