

Universal Exercise Unit (Spider Cage)



Client: Matt Jahnke

Advisor: Dr. Joseph Towles

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Overview

- Introduction
 - Client
 - Problem Statement
- Impacts
- Accomplishments of Semester 1
- Goals for Semester 2
- Budget
- Acknowledgements
- References

Client

Matt Jahnke



- Adult program director for United Cerebral Palsy (UCP) of Greater Dane County
- Supportive services for children and adults with disabilities
- Spider cage will be used at the Continuum Therapy facility in Madison.

Problem Statement

- Spider cages provide a form of physical therapy for persons with Cerebral Palsy.
- Supports varying amounts of weight and must be structurally sound.
- Current designs are expensive (~\$4,000) and difficult to transport.

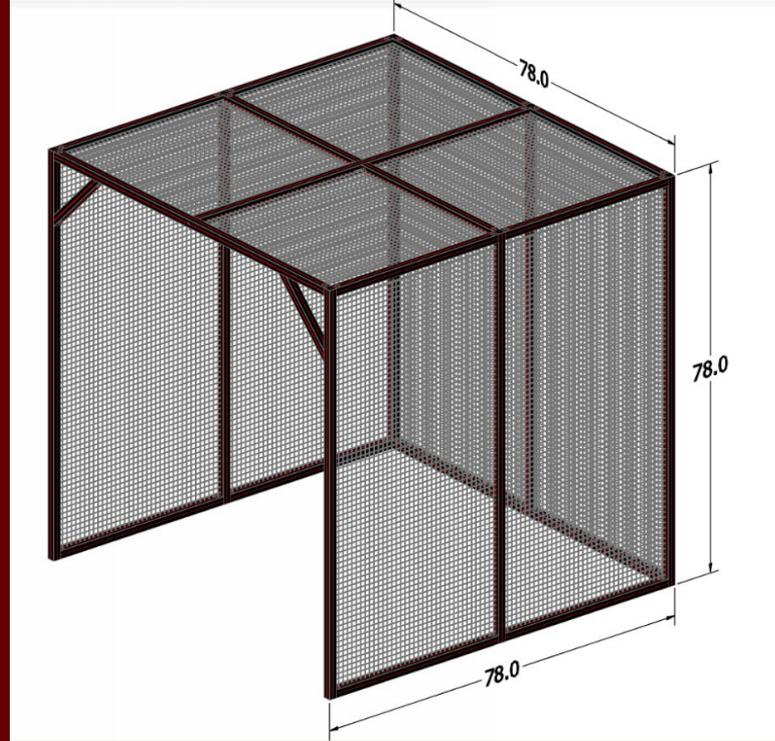
Design Constraints

- Must be transportable
- Able to support patients of any size and weight
- Lower cost than commercially available Spider Cage
- Same level of functionality

Impact of the Spider Cage

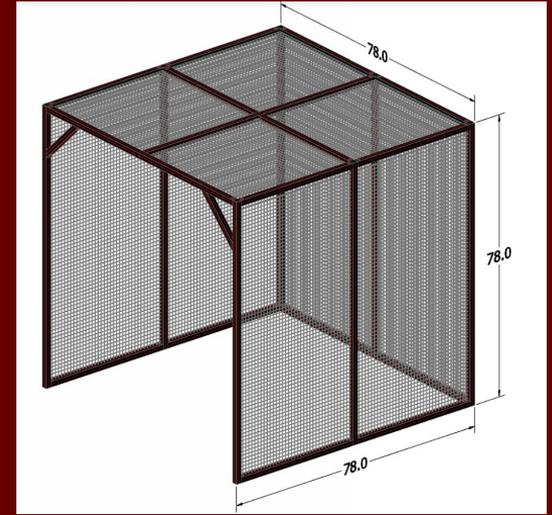
- Continuum Therapy (Madison) has interest from many current patients
 - 20-30 participants to use to the Spider Cage
- Individuals outside of Madison have expressed interest
- Blueprint to create affordable spider cages for therapy-
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Semester 1 - Final Design



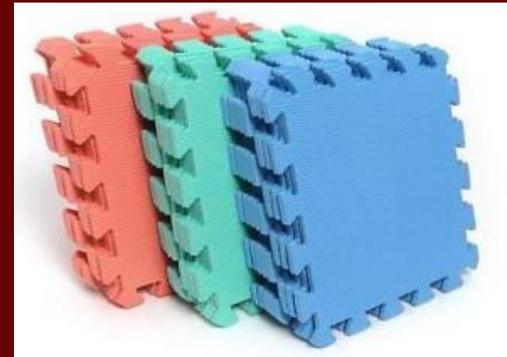
Semester 1 - Evaluation

- Racking and Splaying Effect
 - Add base to stabilize
- Assembly of top
 - Rearrange members for easier process
- Stability of top members
 - Add additional set of 45 degree members



Semester 2 - Fabrication

- Reposition vertical and horizontal members of top frame
 - Mill new hole in long member for anchor fastener
 - Tap small member for internal fastener
- Base Support
 - Fasten base of cage to $\frac{1}{2}$ in. thick plywood
 - Cover with rubber flooring



Rubber foam mats [3]

Semester 2 - Testing

- Mesh and beam deflection
 - Therapy exercises
 - Slip test
- Analysis
 - Predicted beam deflection of 0.4” for 300 lb. point load
 - Recommended beam deflection of less than 1”

Assembly Instructions

- Materials came as single pieces
 - Each piece fits together (like K'NEX)



- The cage is built in sections for easy assembly
 - Each section fits into another



Budget

- Semester 1
 - No budget provided by the client
 - ME and BME departments supplied budget
 - Spent \$1,702.75 on 80/20 material
- Semester 2
 - Approved budget from ME and BME department
 - Plywood
 - Rubber flooring
 - Miscellaneous expenses

Acknowledgements



Client:
Matt Jahnke

Occupational Therapist:
Amanda Miller



Advisor:
Dr. Joseph Towles



Dr. Michael Cheadle



TA:
Travis Dick

References

- [1] UCP, 'UCP of Greater Dane County', 2015. [Online]. Available: www.upcdane.org. [Accessed: 8- Feb- 2017].
- [2] "Technical Datasheets for 80/20, Aluminum Extrusions and Modular Framing," *Steven Engineering*. [Online]. Available: https://stevenengineering.com/tech_support/8020.htm. [Accessed: 15-Feb-2017].
- [3] "Durable safe Rose EVA Foam 9 pcs Interlocking Mat Kids Children Play Mat Puzzle Eco Foam Practical shipping", *AliExpress*. [Online]. Available: <https://www.aliexpress.com/item/Durable-safe-Rose-EVA-Foam-9-pcs-Interlocking-Mat-Kids-Children-Play-Mat-Puzzle-Eco-Foam/32524021401.html?spm=2114.40010508.4.125.pRoeGc> [Accessed: 16-Feb-2017]

Questions?