Projects for Elysa Carlson
BME 4900 Final Presentation

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Overview of Presentation

• Background on Elysa
• Purpose of Projects
• Individual Designs
• Budget
• Acknowledgements
• Questions
Background on Elysa

- Elysa was born prematurely, as a consequence her motor function has been impaired.
- She has weakened muscles as a result of the lack of use.
- She has trouble coordinating movements so simple tasks like walking are very difficult for her.
Purpose of Projects

- By creating several assistive devices we hope to help teach Elysa the motor coordination necessary to complete independent motions, as well as increase her strength.
  - Zip-Line Walker - Assistive Walking Device
  - Recumbent Bike – Coordination & Strength
  - Water Bike - Hydro-Physical Therapy
  - Adaptive Ski Device – Outdoor activity
  - Saddle Type Chair – Core Strengthening & Freedom of Motion
Zip-Line Walking Device

- Designed to help Elysa get around more freely
- Way to safely strengthen her muscles
- Wanted design to be lightweight and minimal support
Track System

- **Slotted Aluminum Strut Channel (8ft. long)**
  - Mounted on two of the entryways, one on each side of the room.

- **Trolley with Eyebolt**
  - Rolls inside channel to prevent wheels from falling off.
  - Zip line connects to eyebolt via carabiners, one on each end.
Zip Line

- Serves as guide line for pulley to roll across
- Spans width of the room (13’ ½”)
- Cable clamps and thimbles are used to tie off the excess cable
  - Traditional knots not possible
Harness and Structure

- Aluminum block with eyebolts provides structure and connections between harness and pulley
  - Connects with straps, bungee cords, and lanyards
    - Provides stability to prevent Elysa from tipping over
- Pulley with attached swivel gives rotating dynamic
- Harness provides minimal support for maximum mobility
Recumbent Bike

- Model A20 Swinn
- Wheels, light weight design
Work to be done

- Modify the chair with padding for comfort and head support
- Modify track to move seat closer to pedals
- Add support vest
- LED display: RGB LED sys
Work to be done

• Make attachment for safety vest to hold her in place while pedaling.
RGB LED Display

- Led placed in opaque cylinder to enhance display of color changes created
- Display lights up when pedaling
- Controlled by sensor on fly wheel.
- 12 V AC/DC transformer will be the power supply
Water Bike

• The family regularly takes trips to the local pool where Elysa enjoys floating in the water with the aid of her Personal Floatation Device.
• Elysa’s parents have expressed and interest in a device that can make this time in the pool productive with a form of Hydro-Physical Therapy.
• A design similar to the recumbent bike will be used to stimulate the same pedaling motion while partially submerged underwater.
SolidWorks Design

- A rigid body structure will be created from 1 ¼” PVC piping.
  - The frame itself will be submerged underwater
- 4” PVC tubes will be used on either side of the frame and will be relied on as the main source of support to keep the bike afloat.
  - A Pour-In-Place AeroMarine Polyurethane Foam will fill these tubes for added buoyance.
    - 1 sq. ft. of foam offers an additional 60 lbs. of support.
- The approximate dimensions of the bike will be 2 ½ft x 1 ¾ft x 1 ¾ft (lower 1 ft. will be submerged)
Seat & Pedals

- The seat was purchased from the NEAT Marketplace and is part of a refurbished bathing chair.
- The pedals will be taken from a home pedal exerciser and attached to the 1¼” inch PVC frame.
  - Pedals will be fitted with handles to allow Elysa’s parents to help regulate the pedaling motion.
  - Also will have supports with straps attached to Elysa’s lower legs to help guide the pedaling motion.
Adaptive Skiing Device

• **Purpose:**
  ▫ Elysa can enjoy skiing in their backyard with least amount of support

• **Design consists of:**
  ▫ Back support
  ▫ Arm rest
  ▫ A pair of ski

• **Main structure:**
  ▫ Aluminum 6061
  ▫ Good strength
  ▫ Better corrosion resistance
Back Support

- Similar design to the beach chair or outdoor chair
- Outdoor Canvas:
  - Sturdy, comfortable, water & cold resistance
Arm Rests

- Picked up from NEAT Market
  - Needs modification
    - Arm-resting area needed to be U-shaped with cushion
    - Need to be adjustable to different heights
Skis

- Holes will be drilled on the skis with standoffs inserted in them
- Perforated base studs will be attached to the skis
- Tube adapters are needed to connect aluminum tubes to the skis
Saddle Chair

• Similar to this design
• But our design will:
  ▫ Will be height adjustable
  ▫ For tables 28”-36”
  ▫ For use by Elysia
• Seat can lean forward or backward
Base

- 2” by 2” aluminum
- Seat post
- Telescoping tubing 2” by 2” outer tube 1 ½” by 1 ½” inner
- Machine holes insert pins to adjust height
- Locking caster wheels
Seat

- Same vest as Exercise Bike
  - Additional head support necessary
  - Attachment for vest
  - Additional pommel and padding will be added for comfort and looks
## Budget

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Cost so Far $718.82

Allotted Budget $2,000.00

Remaining Budget $1,281.18
Acknowledgements

• Elysa & the Carlson Family
• Dr. Enderle for advice and support
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Questions?