Multifunction Table and HANSS with Biofeedback

Team #1

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Client: Annalee Hughes
Introduction

- Client Information
- Purpose
- Final Design
  - Multifunction Table
  - Head and Neck Shoulder Support (HANSS)
  - Biofeedback System
- Budget
- Conclusion
- Acknowledgements
Client Information

- **Client:** Annalee Hughes
  - 10 years old with Cerebral Palsy

- Cerebral Palsy is a broad classification of abnormal muscle tone, reflexes, motor skills development, and fine coordination

- Unable to stand or sit without external assistance

- Confined to a power chair for a majority of the day
Purpose

- Goal: Design and implement two devices for each of Annalee’s specific needs
- A multifunction table for Annalee for completion of homework, using her laptop, and reading
- HANSS with biofeedback to position the head, stabilize the neck and shoulders, and provide positive reinforcement to client for correct positioning
Multifunction Table

- Linear actuator raises and lowers table top with simple toggle switch
- Storage compartment
- Flip up ledge and paper holder
- Table top tilts forwards
Multifunction Table Continued

- Attachment arms
  - 3 arms fit onto support plugs bolted to chair
  - Pipe section allows for horizontal adjustment

- Upright support clamps
  - 1 central clamp with 4 screws
  - 2 strap clamps prevent movement
Multifunction Table Continued

- Inner and outer upright supports
- Two-piece, telescoping system powered by Firgelli Mini Linear actuator
- Delrin spacers prevent binding

- Top swivel cap
- Hand knob clamps support rod
- Small swivel screw prevents rotation
Multifunction Table Continued

- Table top and frame
  - Welded frame provides support for the storage compartment
- Flip up book ledge

- Electrical controller
  - Toggle switch activates vertical table motion
  - 2 9V batteries power linear actuator
HANSS

- Provide head, neck, and shoulder support when seated in wheelchair
- Stainless steel frame with high density and neoprene foam padding
- Custom fit to client
- Features biofeedback system
HANSS continued

- Comfortable and well-liked by client
- Can be used at home
- Adjustable gooseneck attachment
- Machine washable cover
- Optional chin support
Biofeedback System

- Provide Positive Stimulus when the correct anatomical position and Negative Stimulus if not
  - Positive Stimulus – Relay input Audio Signal from iPod/Audio Device to Headphones
  - Negative Stimulus – Stop relay of Audio Signal and provide mental reminder of anatomical position by vibrating

- Two Devices
  - RF Transmitter
  - RF Receiver
Biofeedback System Continued

- RF Transmitter Function
  - Provides interface for Input and Output of the Audio Signal
  - Two 3.5mm double pole, stereo headphone jacks
- Correct Anatomical Position – Relay signal from Input Audio Jack to Output Audio Jack
- Incorrect Anatomical Position – Sends RF Signal to RF Receiver
- Collects Information from Biofeedback Switches
  - Switches located in the HANSS
Biofeedback System Continued

- **RF Receiver Function**
  - Incorrect Anatomical Position – Receives RF signal from RF Transmitter
  - Vibrating Motors stimulate sense of touch, reminding the user to correct body position
- **Wrist Strap**
  - Wearable on the Wrist or Arm, Place in a pocket, or Attached to the Shoulder Support
Budget

- Total Funds Granted to the Project: $1000.00
- Multifunction Table: $363.32
- HANSS: $193.92
- Biofeedback System: $187.88
- Total Budget Spent: $754.12
Conclusion

- For our Senior Design Project we created two distinct devices, the Multifunction Table and HANSS with Biofeedback
  - Multifunction Table
    - Tilting Table Top and Linear actuator allows the user to place reading material at the correct angle and height
    - Table Top contains a storage compartment for school supplies
  - HANSS with Biofeedback
    - Supports the Head, Neck, and Upper Torso
    - Biofeedback helps the user increase muscle strength and correct anatomical position by positive and negative reward
    - Modular Design allows the HANSS to fit on a variety of power chairs
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