Specifications

Comfort Head and Neck Support Device and Multi-Use Table

Team #1
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Project for Client: Annalee Hughes

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Operational Specifications

The design team divided the project into two portions, each with its own operational and technical specifications.

The first portion of the project will involve the design of a head and neck position and support system. This device will be attached to the back of the client’s current power chair so that it can be used with or without a headrest. The system must be adjustable in height and position to accommodate different chair angles and seating positions. It must also be designed to provide extra support without being too restrictive, especially for Annalee’s head, which tends to drop forward while she is sitting. The positioning system will be ergonomically fitted to the client’s body, and must be comfortable while it is performing its intended function to pull the head and shoulders back and keep the chin tucked. Therefore, an adjustable biomechanical feedback system will be incorporated into the head and neck support system. When Annalee is sitting in the correct anatomical position, a component of the device will be triggered and will activate a positive feedback loop. The positive feedback will be based on Annalee’s particular likes and on her parents’ input. This biomechanical feedback design should ultimately encourage correct positioning, strengthen the proper muscle groups over time, and promote a behavioral change that will help Annalee maintain the correct head and neck position while requiring less force or restraint from a head rest as time progresses. Annalee’s parents or her physical therapist will fit the head and neck positioning system originally, although regular adjustments will be required as Annalee grows older.

The second portion of the project will involve the design of an adjustable lap desk that will be attached to the client’s power chair. The desk will provide Annalee with a secure and easily accessible space for all of her school, entertainment, and living materials. The multifunction table will facilitate Annalee’s ability to read books, use her laptop computer, eat food, complete homework, listen to music, and perform art projects. The multifunction table will be designed to allow Annalee to adjust the position and angle of the table through the use of buttons, screws tightened by hand, and levers. The table will have a range of motion that will permit Annalee to tilt the table forward or backward, to shift the table up or down, and to move the table out of the way for entering and exiting the power chair. Access to buttons, knobs, and levers will be properly positioned according to the extension angle of Annalee’s arms. According to her physical therapy reports, Annalee has greater movement in her right arm versus her left arm, although both of her arms operate at less than 100% efficiency. In addition, the multifunction table must be sturdy enough to provide a place for Annalee to support herself and allow her to reposition herself in the correct anatomical position. Finally, the multifunction table must be able to hold personal items, school supplies, and items that are needed for everyday tasks.
Technical Specifications

Head and Neck Supportive Device

**Physical:** Lightweight metal or plastic internal frame surrounded by foam or gel padding with a variety of straps or tubes

**Mechanical:**

Size: Based on arm length, chest dimensions, and neck dimensions of Annalee

Weight: No greater than 25 pounds in overall weight

**Electrical:** A circuit containing a switch that supplies positive feedback when the correct anatomical position is maintained.

**Environmental:**

Storage Temperature: -20°F - 120°F

Operating Temperature: -20°F - 120°F

Operating Environment: Indoors, Outdoors

**Safety:**

Easy to remove in case of an emergency (choking)

Maintain desired position throughout any rapid or cyclic movements

Biofeedback system able to be turned off when not in use

Padding on all surfaces in contact with the body to prevent abrasions

Use non-allergenic fabrics to prevent rashes

**Maintenance:**

Machine washable as needed

Adjustments to positioning as needed

Replace batteries as needed

Multifunction Table

**Physical:** Lightweight metallic frame with a durable plastic tabletop and surround

**Mechanical:**

Size: Large enough in size to correctly support books, a laptop, or a dinner plate and glass

Weight: Light enough in weight so that it can be moved easily by caregivers or Annalee

No greater than 35 pounds in overall weight
Environmental:
Storage Temperature: -20°F - 120°F
Operating Temperature: -20°F - 120°F
Operating Environment: Indoors, Outdoors

Safety:
Possible danger from moving parts
Easy to remove in case of an emergency
Rounded corners or padded edges to prevent cuts to the skin

Maintenance:
Replace batteries as needed
Clean with household disinfectants as needed
Moving parts or tracks must be lubricated as needed