Project Statement

Wheelchair for Abby Miller

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Client Information

Names: Scott, Julie and Abby Miller
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Statement of Need

Abby Miller is a 17 year old girl from Clinton, Illinois that was born with Cerebral Palsy and is in need of a more comfortable wheelchair. Cerebral Palsy is a condition characterized by disorders involving the nervous system and can affect functions such as movement and posture. Some symptoms include tight muscles, muscle weakness and an abnormal gait. It is caused by abnormal development or damage to the part of the brain responsible for control of muscle tone and motor activities. Abby’s condition limits her use of her hands and arms. She has the ability to stand but needs supportive assistance because she lacks the ability to balance herself.

The purpose of this project is to provide Abby with a customized wheelchair that better suits her and her family’s needs. Abby’s parents would like a wheelchair that allows Abby to sit more comfortably, but also incorporates features they enjoy on Abby’s current wheelchair including a tilt-in-space option that allows her parents to lean her backwards to help get her in and out of the chair. The Miller’s would also like to have the option to interchange the tires to better handle the terrain and weather conditions, as the chair is intended for indoor and outdoor use.

Introduction and Overview

The goal of the project is to provide Abby with a wheelchair that is more comfortable than her present chair but still maintains the functionality that she and her family enjoy. Her new wheelchair will be portable, thus, it is necessary that the wheelchair have removable padding so the structure of the wheelchair can be collapsed easily. The wheels will be replaced with either all terrain tires for year round use, or, the structure will be designed to accommodate several types of tires to allow for interchangeability as desired. The wheels on Abby’s current chair have a large diameter with thin rubber, and will be exchanged for a much smaller, more compact tire.

Due to Abby’s need to neck support, the head rest will have extra padding not only for the back of her head but for the sides. The head rest will be fitted on an adjustable bar so that a comfortable height can be selected. A similar support will be created for her lower legs. In addition to neck support, it is important that Abby is secured into the wheelchair at all times; therefore it is desirable that there be several seatbelts. The straps for the new wheelchair will be gel-padded for ultimate comfort, and will have the option for easy adjustments. These straps will be attached to the seat of the wheelchair.

It is also important the wheelchair is easy for the Millers to operate. The chair will be equipped with a horizontal handle bar for more comfort in addition to the traditional wheel chair handles. It is desired that there be an option for the brakes on the wheelchair to be operated by means of lifting the handle
bar. This option will be a second way for the wheelchair to remain stationary in addition to traditional wheelchair brakes. An additional safety feature that will be added to the wheelchair will be a wheel attached to a bar that will act as a support when the chair is leaned backwards. This will prevent the chair from falling backwards when the chair is tilted. A basket for personal belongings will also be incorporated into the design on the back of the chair.

One of the features that the Miller’s enjoy most is the ability of Abby’s seat to tilt backwards. This feature makes it easier for them to help Abby out of her chair. This will be incorporated into the new wheelchair. The tilting ability of the chair will also enhance Abby’s comfort because it will allow her to lean backwards into a more relaxing position if she so desires.

The arm rests on Abby’s chair will be raised to a position more fit for her body height and will have the option of adjustable height. The arm rests will also have a tilting ability so that they can be moved out of the way when not in use. This will also allow the Millers to more easily help Abby in and out of her chair.

Overall, Abby’s chair will be designed for comfort, safety and functionality by adjusting a typical wheelchair to fit her and her family’s needs.

Realistic Constraints

When designing any medical device, there are many variables that may affect the design or outcome of the project. One of the largest constraints for the project is Abby’s medical condition, cerebral palsy. The purpose of creating a new wheelchair for Abby is to cater to her specific limitations and address each issue in order to develop a more comfortable and functional design. Her physical limitations reduce the flexibility of the design and require certain devices such as head and neck supports, seatbelts and braces. An economic constraint of the project is the allotted budget because the amount of money has not yet been designated. An environmental constraint is that the wheelchair must be able to be used indoors and in a varying climate outdoors. A few manufacturability constraints include the fact that there currently does not exist a wheelchair that suits the Miller’s needs. In addition, at age 17, Abby may still undergo growth and development, thus, sustainability of the chair is a constraint because it is being designed for her current body type. As she becomes older, she may outgrow some of the features of the device. A social constraint of the project is the physical distance between the design team and the client. There is no way that the client and the team can meet to discuss the design concepts. The only means of communication can occur through Skype, email or telephone. There are no ethical or political issues that will affect the design of Abby’s wheelchair.

Other Data

The Miller family is located in Clinton, Illinois and heard about the Biomedical Engineering Senior Design program at the University of Connecticut in an article in Exceptional Parent Magazine. The family also requested the construction of a bicycle for Abby, which is being conducted by Team 12.

Questions

What is our budget?
When will we be able to meet with our client?

What is the width of the doorways and hallways in the client’s home?

Does the wheelchair they currently have the ability to fold? Or is it necessary to disassemble the chair in order to transport it?

Where should we purchase our materials?

Is it best to have a more lightweight material for portability or a heavier material for structural support?

Are there any additional safety features we should consider in the design?

What is uncomfortable about Abby’s current chair?