Project Statement & Specifications

Assistive Jumping Device

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Project for NSF

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PROJECT STATEMENT

I. Statement of Need

Cerebral palsy is a neurological disorder that develops generally after a traumatic birth, rendering the newborn without oxygen and ultimately causing brain damage. People who suffer from cerebral palsy are faced with great challenges while performing everyday activities. Sean is a ten year old boy with a severe case of athetoid cerebral palsy. Sean is considered a quadriplegic since all four of his limbs are affected by his disorder, thus leaving him with a lack of balance and coordination. However, he has excellent eyesight and hearing which is uncommon for his affliction. He has the mental ability of a normal boy his age and is mainstreamed into his classes.

Sean’s family is dedicated to keeping him active. This is quite the challenge due to his physical limitations. He is able to go horseback riding, and walk with a specialized walker, or on a treadmill with extensive help. Sean’s desire to maintain a normal lifestyle is one of his top priorities. One desire of his would be to jump on a trampoline like his family and friends. Due to inactivity Sean’s hamstring length has decreased which requires him to stretch daily. Jumping on a trampoline would be beneficial to aid in his leg strengthening and stretching as well as in the retraining of his motor control centers. In order to do this, Sean needs a device to support him on the trampoline.

II. Introduction and Overview

The finished Assistive Jumping Device (AJD) will increase Sean’s independence and capability to participate in daily activities. The AJD will allow Sean to jump safely and independently with his friends and family.
The AJD presents an unusual and considerable challenge because Sean is considered a quadriplegic, and still wishes to jump on a trampoline. The previous designs for supportive trampolines are not sufficient for Sean’s condition. One model simply offers a metal bar for the user to hold, although, with Sean’s inability to sustain a grasp this would be of no use. Other designs employ a harness and dual bungee cord system to allow for movement forward and backward. These designs are intended for experienced or capable jumpers. Sean’s weak abdominals would make this type of design dangerous, and would make injury probable. The ADJ will be specifically designed for the use of disabled people, like Sean, and allow for simultaneous use on the trampoline by other people, unlike previous designs.

**III. Realistic Constraints**

The development of the assistive trampoline jumping device and car mount will be limited by many factors. Since this project is funded by the National Science Foundation Engineering Design Projects to Aid Persons with Disabilities (NSF) they will have to approve all budget appropriations. The family will be responsible for any future maintenance costs. The availability and costs of materials will affect the overall design. Aside from economic constraints, other restrictions in the design of both devices remain.

The AJD will require an adequate amount of space as well as flat and dry land. Since the AJD will be kept outdoors it needs to withstand the environmental conditions of New England. The AJD must hold up to repetitive use as to not compromise its safety. Sean’s weak abdominals and flared ribs make it difficult for him to stabilize his upper body. This presents a need for a device to reinforce his stability. While Sean is on the trampoline he must be able to safely wear his ankle and foot orthotics, so the AJD must accommodate for this. In addition to Sean’s safety the safety of any other users of the trampoline should be considered in the design.
In addition to these considerations, there lies political issues that must be addressed. The many misconceptions about Sean’s condition cause a stereotypical view of those with cerebral palsy. Certain doctors and most of the educational system have their own ideas of Sean’s abilities and possible improvements. The school system’s concern for their own legal liabilities causes them to limit Sean’s movement while he is in their custody. There are also some doctors that agree with this limited movement strategy claiming that there is no hope for improvement in Sean’s condition. On the other hand, there are doctors that agree with the family’s beliefs in keeping Sean active to increase his independent movements. Sean’s physical therapists, pediatricians, and family feel that devices, such as the AJD, would help Sean further develop his muscles. Devices, such as the AJD, would help to change the backward views concerning cerebral palsy.

IV. Other Data

Sean and his family are very active, and it will be difficult to schedule times to meet with them. Sean’s parents are full time workers, and Sean attends school during the day. Additionally, the family regularly travels around the country visiting cerebral palsy specialists.

Also, because this is an NSF funded project, budgets and designs may have to be discussed and approved prior to building. For additional information on the NSF organization, please visit http://nsf-pad.bme.uconn.edu/.

IV. Questions

ADJ

① What materials do other types of supportive trampolines use, and how much do they cost?
What types of patents for similar products exist?
How much motion and force can Sean physically handle?
Should Sean’s neck be supported in addition to his abdomen?
How will Sean get onto the trampoline?
What size trampoline will the AJD be designed for?
How will this device fit in the lab to work on?
What is the budget for the design?
How will the design accommodate for other users aside from Sean?
How will a testing environment be simulated, if there is not a trampoline to work with?
How much impact should the device withstand?
What is the balance between adequate support and functional use of the trampoline?

VI. Other Activities

Even though the AJD is not intended to be commercially manufactured, it is important to keep in mind the budget of the Stenglein family, because they will be required to pay for any maintenance fees. This will be a difficult product to market due to the limited targeted clientele. In order to successfully market the AJD it should be modified to accommodate a range of physical disabilities in addition to cerebral palsy.

Surveying patients with cerebral palsy and similar conditions and identifying their needs will help with the sales process. Their input could also affect possible design options, and direct future investigations.
SPECIFICATIONS

I. Operational Specifications

The AJD design must be able to stabilize and support Sean during his use on a trampoline.

The design should limit the movement of his upper body, but require the use of his legs during trampoline jumping.

II. Technical Specifications

Sean Bernstein Figures:

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