Project Proposal

Team 13 – Beach Walker

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Project for Matthew and Jack Davies
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Executive Summary

This senior design project is to design and build a walker that can be used on the beach for an eleven year old child with cerebral palsy. The client is able to walk and is receptive, and he needs no neck or back support, but due to his condition he does require additional support from a walker or quad-canes to move around. The client’s current walker is not designed for use at the beach, and the client has requested a walker that is easy to maneuver on such terrain, and is water-proof.

In order to ensure maximum safety, the walker will have a braking mechanism that will prevent the client from falling backwards. The device will be a posterior walker, which means that it supports the client from behind, requiring him to stand in a more upright posture and promoting trunk extension. The walker’s height will be made adjustable to allow for many years of use, and will fold easily for convenient transporting. The walker will be designed and constructed to meet the needs and requests of the client. The final product will be a walker that is easy to use for the client to use at the beach and will provide the support he requires to move around.

1. Introduction

1.1 Background

The client, 12 year old Matthew Davies, has spastic cerebral palsy (CP) which restricts his mobility and requires that he use a walker and leg immobilizers to help him move around. Matthew is 57 inches tall, and weighs 98 pounds. Matthew’s family vacations at the Rhode Island beaches every summer, so the walker must be able to travel across the sand of the beach. To account for this, large polyurethane wheels will be used. The walker will be a posterior walker, which will give Matthew support from behind and promote trunk extension. Another feature of the walker will be its adjustable height to allow for many years of use. It will be made of light-weight aluminum and will have the ability to fold for easy transportation.

1.2 Purpose of the Project

The purpose of this project is to provide the client with a source of mobility for use on the beach. This will allow him to move about more freely and easily on uneven terrain such as sand. The device will be a posterior walker and will include a back harness for upper body posture, and a braking mechanism to prevent the device from rolling backwards, ensuring maximum safety for Matthew.

1.3 Previous Work Done by Others

1.3.1 Products
There are a few commercial products available that have been designed to serve the same purpose as the one in this project. Deming Designs Inc. manufactured a walker which was designed for use on the beach by persons with balance, walking, or lower extremity disabilities. The frame of the walker is made of powder-coated 316L stainless steel tubing. It has two front casters which rotate 360° and two back casters which are fixed. All four wheels are 30 cm Wheeleez wheels.

Deming Designs also has a lightweight aluminum walker for use on the beach. It has an adjustable height and uses four 22 cm Wheeleez wheels. It has front casters which rotate 360° and back casters which are fixed with push to lock brakes. This walker includes a seat and is able to fold for easier transportation.

### 1.3.2 Patent Search Results

There are currently a few patents for all-terrain walkers. The first is US patent #6,578,594 for a “mobile rehabilitative walker”. This walker supports the user in an upright position and has large wheels and a wide base to allow for navigation over irregular surfaces.

![Figure 1 US Patent #6,578,594 Mobile Rehabilitative Walker](image)

A second device, which has yet to be issued, is US patent application #11/164,129 for an “Assisted Walking Device”. This walker has four all-terrain wheels. The handles have an
actively set and a non-actively set brake. The non-actively set brake engages automatically if the user loses control over the device or releases the handle. The actively set brake allows the user to engage the brake manually.

Figure 2 US Patent Application #11/164,129 Assisted Walking Device

2. Project Description

2.1 Objective

The client has asked for a lightweight, four-wheel walker that can be used on multiple terrains, especially sand. All other walkers the client has tried does not allow for movement easily across the beach. The walker must fold up easily so that the Davies family can store it in the trunk along with their other beach supplies. The walker must also be adjustable to account for the client’s change in height as he grows older. There will be a seat attached to the rear of the walker, so that the client can sit and rest whenever necessary (with the brakes on for safety). The walker will have an umbrella and cup holder attached for convenience.

2.2 Methods

Frame
The walker will be a posterior walker (the most recommended type of walker for children with spastic cerebral palsy). The posterior walker’s safety roller supports the user from behind requiring them to procure a more upright posture, while also promoting trunk extension. The walker will have a lightweight aluminum frame. The lightweight frame will allow the client and his parents to easily lift and move the walker wherever necessary. The frame will have adjustable heights, so that the client will be able to change the height as he grows taller. The frame will also be collapsible, making it ideal for storage in a car’s trunk, along with other beach supplies. This lightweight aluminum frame is manufactured by NIMBO and will be purchased through a vendor. The NIMBO Lightweight Posterior Posture Walker being ordered is designed for young adults. The adjustable height of the frame will have to be altered. The client needs the posterior walker for many years, so his height will be projected and the height of the walker will be adjusted to encompass this broad range.

![NIMBO Lightweight Posterior Posture Walker](image)

**Figure 3 NIMBO Lightweight Posterior Posture Walker**

*Wheels*

For posterior walkers designed for children with cerebral palsy, it is common for the front two wheels to be larger than the back two wheels. Polyurethane wheels will be used. These balloon wheels have the ability to roll over multiple terrains, such as sand, dirt, snow, and rocks. The two front polyurethane wheels will have a larger diameter than the two polyurethane wheels located in the back. The wheels will be ordered separately from the walker, because the wheels of the NIMBO walker cannot move maneuver through sand easily. They will be attached to the walker so that the client will be able to maneuver through the sand found on the beach.

*Brakes*

The walker will use disc brakes to disallow movement of the front two wheels. This is very important in that it gives the client the ability to sit in the seat attached, while being assured
that the walker will not roll backwards. The brakes are present on the NIMBO posterior walker that will be ordered. These brakes will be evaluated and subsequently modified to ensure the client’s safety.

**Seat**

There will be a seat harness attached to the back end of the posterior walker. This will have a seat that folds down, allowing for the client to sit and rest whenever he needs to. The seat harness must be able to support at least 150 lbs. (taking into account the fact that the client will gain weight over the years). The seat and harness will be manufactured independently, which is a much cheaper alternative and will allow customization for the client, who is still growing.

### 3. Budget

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35% of Total 397.30

It is important to note that this budget is only preliminary, and may change as the design is refined. The budget accounts for purchasing of all parts, but in order to bring down the cost, the team hopes to find as many donations as possible. If this prototype cost the expected $1100, the production value, 35% of the prototype, would cost about $400. Walkers with the same function which are currently available on the market cost substantially more, meaning that our product could become an attractive alternative.

### 4. Conclusion

This project will offer the client a means of transportation on multiple terrains. This posterior walker will allow the client to maneuver easily over sand, and will promote an upright
posture and trunk extension. It will fold for easy transportation and storage, and the height will be adjustable to allow for many years of use.

The most important aspect of this project is the safety features. The walker will have a braking system, a back harness, and a seat. This walker is unlike other commercially available products because it is both a posterior walker and can move easily across sand and other uneven terrain. The design of the walker will allow for maximum safety and fun and will meet the desired specifications.
5. References


