Alternative Design 1

Team 13 – Beach Walker/Beach Wheelchair

Maya Alfonso
Matt Ellis
Danielle LaPointe
Kyle O’Brein

Project for Matthew and Jack Davies
Contact: Thomas and Kathleen Davies, 14 Chesterwood Court Cheshire, CT 06410
(203) 250-7508
Alternative Design 1

This design involves purchasing a prefabricated walker, such as the Nimbo Lightweight Posterior Posture Walker, and making adjustments so it would be appropriate for the client and his specific requests. This type of posterior walker would provide the client with excellent trunk support and would help improve his balance. The purchased walker would be made from a lightweight aluminum frame and would be collapsible, making it convenient to transport.

Providing our client with a posterior walker would be beneficial to him in several ways. First, the oxygen consumption rate with a posterior walker was found to be much lower than that for an anterior walker. Also, flexion angles of the trunk, hip and knee are generally lower on a posterior walker. When tested for children with spastic diplegic cerebral palsy, gait analysis data and oxygen consumption measurements showed that the posterior walker offered the user better upright positioning and energy conservation. A study published in the Developmental Medicine & Child Neurology journal confirms this, with results indicating substantial improvements in postural alignment and gait characteristics for children when using a posterior walker rather than an anterior one.

The walker would be modified to have large polyurethane balloon wheels, to allow for use on the beach. Junior size rollators usually work well for users between 4’8” and 5’2”. The Nimbo walker has an adjustable handle bar height, but handlebar extensions would be added to customize the walker to the client, who is expected to grow to be around 6’ tall. A padded seat would be fabricated and attached to the walker to allow the user to sit whenever necessary. The seat would be hinged to allow for the walker to be folded and stored.

One drawback to this design is that the designers will not have a choice in the dimensions or weight of the walker since it will be purchased commercially.
Figure 1. Nimbo Lightweight Posterior Walker

Figure 2. 49 cm Polyurethane Balloon Wheel
Alternative Design 2

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Maya Alfonso
Matt Ellis
Danielle LaPointe
Kyle O’Brein

Project for Matthew and Jack Davies
Contact: Thomas and Kathleen Davies, 14 Chesterwood Court Cheshire, CT 06410
(203) 250-7508
Alternative Design 2

This design involves providing a four-wheel, anterior walker to our client. There have been several studies regarding the advantages and weaknesses of posterior walkers versus anterior walker for young adults with cerebral palsy. While many studies have shown that posterior walkers are more suitable for children with cerebral palsy, there are some interesting facts that suggest that an anterior walker for our client would be more desirable. Studies show that there is no difference between energy expenditure of the cerebral palsy patients when using posterior walkers versus anterior walkers. It was also found that posterior walkers promote faster walking speeds and longer step lengths. When considering that the client will be using this walker mainly on the beach, it must be taken into account that the client should be walking slowly and with smaller steps because the sandy terrain makes it difficult to have a normal gait.

An anterior walker frame would be purchased from an outside vendor. The Strider Walker supplied by the Cerebral Palsy League would be an ideal anterior walker to purchase and use for its frame. The frame is made of lightweight aluminum and folds easily for transport and storage. The frame is completely adjustable, allowing for the client to use the walker for many years as he grows into an adult. The walker has a wide base, which provides stability, safety and balance. The handles adjust without tools to an infinite number of positions to provide stability and posture.

The walker will need four wheels, so the back legs will have to be removed and two wheels will be put in. Four polyurethane wheels will be added so that the client will be able to maneuver over sand and other difficult terrain. Polyurethane wheels can be commercially purchased in sizes of 24, 30, 42, and 49 cm in diameter. The front two wheels will be smaller than the back two in order to provide optimal stability and safety. Disc brakes will be added to the walker so that the client can brake and keep the walker stable whenever necessary. The brakes will be a locking loop system with handgrips underneath the handles of the walker that can be used to slow down or fully engaged to disallow movement of the front two wheels. A seat will be added to the front of the walker so that the client can engage the brakes and sit down, providing rest and comfort whenever the client needs it. The seat will lift upwards, which still allows the walker to fold for greater portability.
Figure 3. Strider Walker

Figure 4. Anterior walker with brakes and a seat
Alternative Design 3

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Maya Alfonso
Matt Ellis
Danielle LaPointe
Kyle O’Brein

Project for Matthew and Jack Davies
Contact: Thomas and Kathleen Davies, 14 Chesterwood Court Cheshire, CT 06410
(203) 250-7508
Alternative Design 3

The third alternative design consists of a posterior walker which would be completely fabricated by the design team. Posterior walkers are widely acknowledged as more suitable for children and young adults with spastic cerebral palsy. Studies have shown that posterior walkers promote better posture among the user by decreasing flexion angles of the trunk, hip and knee. The most obvious advantage to this design is that the walker can be entirely customized to meet the client’s individual needs, and can have a unique style specific to the client. This design would also be less expensive than one that involves purchasing a prefabricated walker.

The walker would be made from lightweight aluminum rods. The width between the handlebars and the range of the handlebar height adjustability would be tailored to the client’s specific requirements. The weight capacity of the device would also be specific to the needs of the client. The handlebars will be produced to have sufficient grip and flanged ends for optimal safety. The walker has to be easily transported to and from the beach, so it must be collapsible to be able to fit in the trunk along with the many other beach supplies of the client and his family.

The walker would use the same polyurethane balloon wheels mentioned in Alternative Designs 1 and 2. The front two polyurethane wheels will be larger than the back two wheels. A pelvic stabilizer will be fabricated and attached to the back of the walker. There will be a locking/braking mechanism that easily switches the two front wheels from swivel to non-swivel. An anti-reverse override bracket will be installed to disengage the one directional rear wheels and allow forward & reverse mobility.

Pelvic stabilizers are recommended for users who have an asymmetrical posture when standing or walking and, therefore, cannot stay centered in the posterior walker. The pelvic stabilizer will be adjustable in width to accommodate the client as he grows. The pelvic stabilizer will also feature a support belt and pads that will offer lateral support for the client's hips to keep them at midline. Forearm platforms can be manufactured and added to the walker per the client’s request.
Figure 5. Accessories available for posterior walkers