

Water Resistant Boot for Walking Cast

Tong Competition Executive Summary

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Background

Muscle contracture occurs in illnesses such as Cerebral palsy, muscular dystrophy, and Parkinson's. Contracture is a condition where muscle becomes inelastic resulting in a permanent flexed state at the joint. The most common therapeutic treatment, serial casting, involves fitting the patient with a series of casts (changed on a weekly basis) to stretch the affected muscle.

Problem and Existing Products

While water will not harm the cast it can get inside and cause tissue degeneration; thus, it is vital to keep the casts dry. Current commercial products such as water resistant shower bags or cast covering socks are available for underwater activities; however, these products offer no solid support and thus cannot be used during activity. Therefore, the design team's goal was to create a cast cover that can easily change both shape and size (to accommodate for weekly cast changes), create a water resistant covering, and allow for a moderate level of outdoor activity.

Design

The design consists of winter boot bottom and a strip along the back, which provide traction and support respectively. A waterproof, bi-layered, adjustable sleeve made of Gore-Tex is attached to the interior of the remaining boot. The sleeve is loose to ensure that the cast can easily be put inside without the need for force or contortion. Straps across the foot, ankle, and lower leg secure the boot to the cast. The use of the adjustable, waterproof sleeve in a boot design is unlike anything currently on the market.

Prototype Testing

The prototype was tested to ensure that it is both water resistant and will not adversely impact a patient's range of motion. To ensure water resistance, the ability of the Gore-tex to resist water leakage and absorbance was tested by covering the material with water and observing both qualities. Further, a gait analysis using motion capture was used to verify that the prototype did not alter a patient's normal walking gait. In addition, the dynamic gait index was used to evaluate effects on balance. The prototype met all desired criteria.

Marketability

More than 750,000 individuals in the United States live with cerebral palsy and even more with muscular dystrophies. Because serial casting is one of the most common forms of treatment, a large market is present for a product that fulfills the above design specifications. In addition, because many patients are children it is likely a new device will be needed each year to accommodate growth (similar to the need for new tennis shoes each year), ensuring a continuous market. The prototype can be produced and marketed at a cost similar to current boots (\$90-110); therefore, a commercial opportunity exists.