Motum: Mobile Arm Support

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Introduction

Problem Objective
An outpatient, pediatric physical therapy product to assist in the rehabilitation of upper arm function for children with cerebral palsy or other conditions presenting with arm weakness.

Clinical Need
Weakness.

SAEBO MAS

Current Products

JAECO MAS

Disadvantages
Uses rubber bands to adjust support

Difficult to set up

Trough is too long and too wide for children

Bulky and cumbersome

Lacks wrist support

SAEBO MAS

Disadvantages

Expensive (range from $1000-2000)

No wheelchair attachment

Only attaches to a table

Lacks wrist support

FEA Analysis and Load Testing

Spring load testing

Loaded Prototypes 2 with various weights to evaluate assembly performance

Observed major problems with inner acrylic pieces

Opted for aluminum for proximal pieces to prevent extreme bending and twisting

Results:

Large torsional forces with minimal loading call for redesign

Device Weight

Expected device weight: 10 lbs

Finet Element Analysis (FEA)

Assembly material: 6061 aluminum

Expected maximum load of 10 lbs on the arm trough

Used free-body diagram to deduce loads on individual pieces

Factor of safety 5.6

Results:

The device can withstand 5.6 times the expected loading

The device weights more than the ideal value, potentially affecting wheelchair function

Design

Using iterative physical prototyping and testing with potential users, we anticipate the Motum will drastically reduce the cost of rehabilitation and allow users to participate more fully in activities of daily living.

Mobile Arm Support (MAS) Need Criteria

Current mobile arm support products lack wrist support, only attach to a table, and are expensive (range from $1000-2000). They are bulky and cumbersome, and difficult to set up. The device must be lightweight, user-friendly, and adjustable to accommodate a range of users. The ideal arm support is pediatric-sized, user-friendly, enables adjustable support, and affordable.

Market

There is a major market gap in mobile arm supports that are effective and cost-effective. The Motum will be made of aluminum and PBA and will be manufactured utilizing metal machining and injection molding. The device in total will cost $1000.

Conclusion and Future Work

The Motum has a comparable mechanism to the Saebo. However, the Motum is similar to that of the Saebo. As such, coordination with Saebo to pursue a licensing agreement may be the best way to achieve a path to market.

Future work could include pursuing more novel mechanisms of support, iterative physical prototyping, and testing with potential users.

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References


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