Carpal Support Device

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Introduction

Spastic Cerebral Palsy (CP) is the most common form of CP and affects **13.6 million** people worldwide.[1] Spasticity causes **muscle stiffness and tightness.**[2]

Current treatment options are **orthopaedic surgery or physical therapy** which is costly. Other hand orthopaedic devices limit normal hand function & are bulky & costly.

Needs Statement

A way to safely **reduce involuntary movements and provide support** in the arms of children with cerebral palsy that **increases their independence**, by facilitating the **easier performance of daily tasks,** such as eating and writing.

Criteria

Our device will:

- Allow CP patients to use their hand more effectively.
- Allow more patient independence.
- Counteract clenching of the hand and wrist, while allowing normal hand functions.
- Be adjustable using only the opposite hand.

Solution

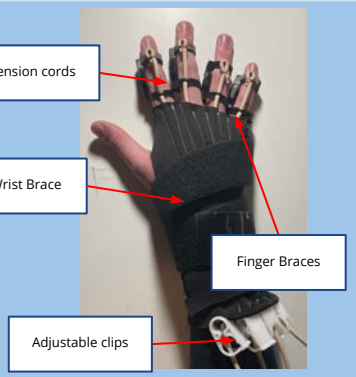
The carpal support was designed to strengthen hand and wrist muscles of children with cerebral palsy.

Our device has three functional components:

- Finger Braces
- Tension Cords
- Wrist Brace

Model of Finger brace:

Finger Braces:
The finger braces use the spring forces to keep the fingers open and flexed. Each brace is custom fit to ensure security and proper functionality.



Tension Cords:
The tension cords pull each finger back, keeping the palm open and fingers out of their desired curled position. We are using TheraBand rubber for the tension cords.

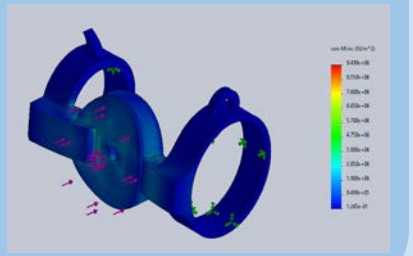
Wrist Brace:
The wrist brace keeps the wrist and thumb open and extended. It is manufactured out of neoprene and cotton to ensure comfort and durability.

Evaluation and Testing

Strength Simulation Testing
Applying a load of 15 lbs to the joint with the rings fixed in place shows a maximum of 670 psi. Tensile strength of PLA is around 5200 psi[3], this would be strong enough to withstand the forces of a child using the device.

Future Testing:
Russian Stimulation Testing
Evaluate device's ability to open fingers safely

Testing the Device on CP patients
Testing for comfort and efficacy when performing everyday tasks.



Conclusion

How the device satisfies our needs criterion:

- ***Versatile:*** One size fits all wrist brace & scaleable finger braces
- ***Comfortable:*** Soft breathable wrist brace materials
- ***Safe:*** No sharp edges in design
- ***Stable:*** Tension cords provide force (2 lbf/finger) to keep fingers open
- ***Durable:*** Materials withstand daily wear & tear
- ***Innovative:*** Our device is less costly (<$100) and more discreet than competitors

References

[1]: Cerebral Palsy Alliance. Causes of Cerebral Palsy. 2018. 9 October 2020.
[2]: World Cerebral Palsy Day 2020. What is CP – Infographic Poster – English (USA). 6 October 2020. 15 October 2020.
[3]: http://2015.igem.org/wiki/images/2/24/CamJIC-Specs-Strength.pdf

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