Carpal Support Device

Sean Cooke, Josh LaDuca, Chinasa Onyenkpa, Carl Young
Department of Biomedical Engineering, Carnegie Mellon University
Mechanical Engineering, Civil & Environmental Engineering

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.

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

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

Special thanks to Dr. Zapanta, Nick Lee, Holly Stewart, Dr. Regina Harbourne, and Michele Lobo for their support throughout this process.