

An assistive device for zipper engagement

Hari Koornala (CEO), Rohan Sarikonda (CIO), Daniel Shi (CTO), Dylan Whiting (CMO)

Advisor: Dr. Kevin Crowthers, Ph. D.

Acknowledgements: Director Steven Kessler, Ms. Areeba Khan, Dr. Doreen Grossman, Ms. Cathi Joseph, Seven Hills Foundation

Problem Statement

Individuals with medical conditions that impair motor function such as Rubinstein-Taybi Syndrome struggle with using zippers. Using a zipper requires great precision, which is problematic when the client's medical condition causes them to lose control in their hand, affecting strength and accuracy.

Requirements



The device shall enable users to start the zipper more easily.



The device shall be usable by those with limited dexterity, decreased grip strength, and other physical impairments.

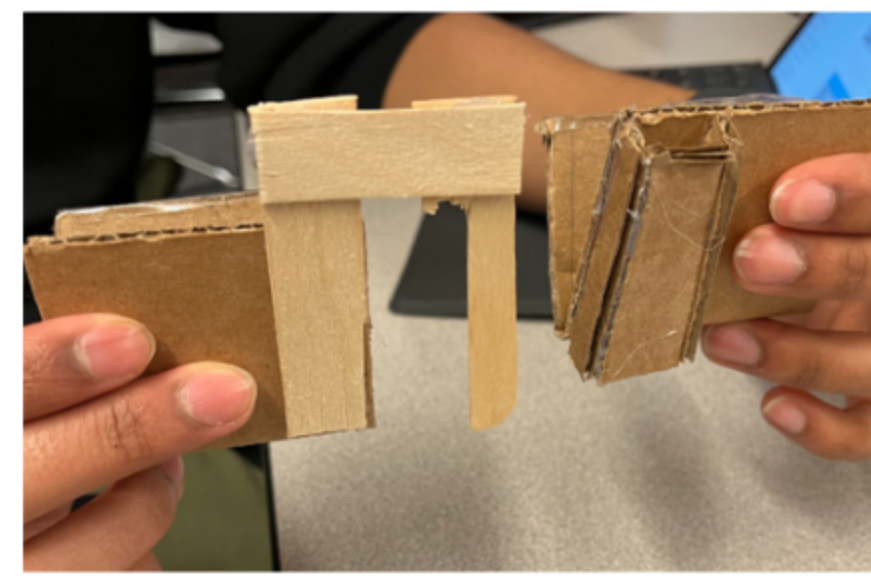


The device shall enable other medical devices (like pacemakers) of the user.

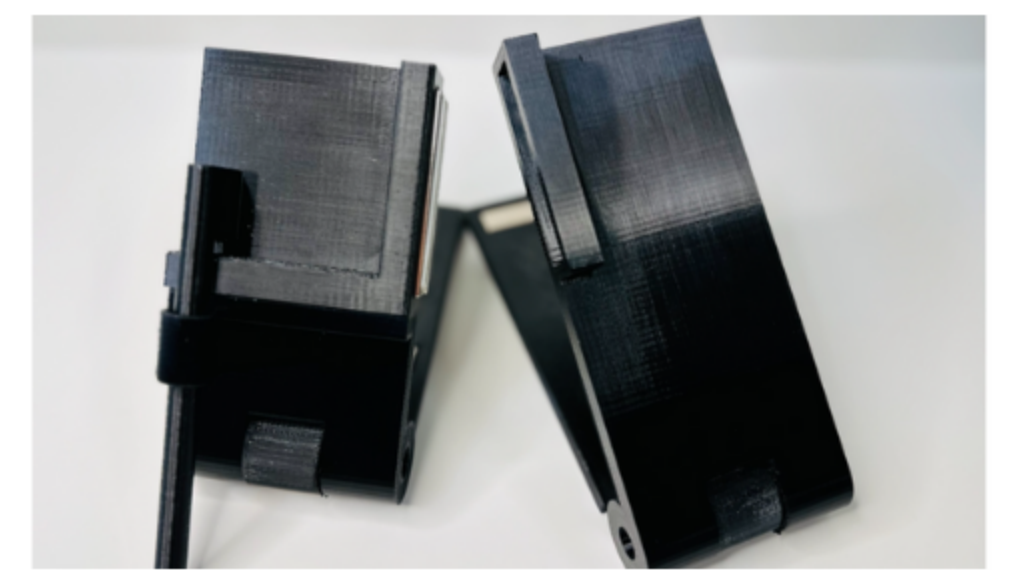


The device shall weigh less than 300 grams.

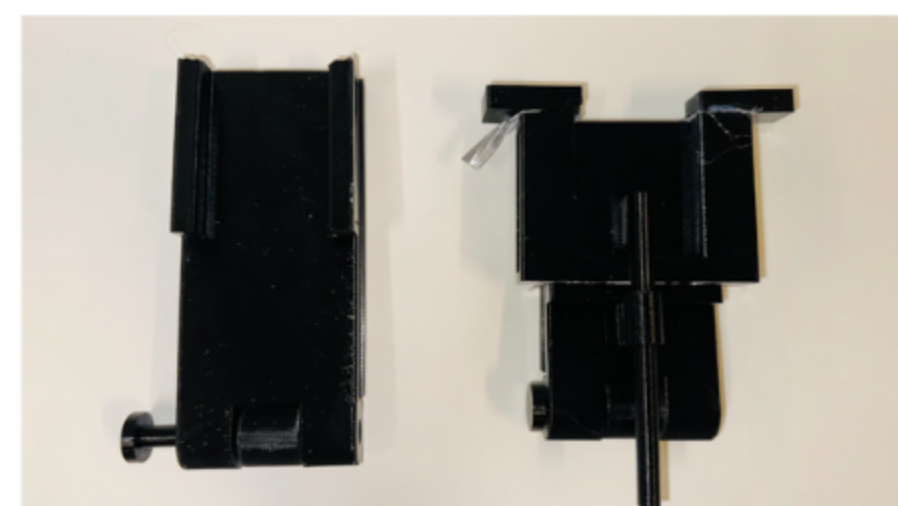
Preliminary Designs



Design 1: Enlarged hole and peg clamping system



Design 2: Magnet alignment clamping system



Design 3: Magnet alignment clamping system V2

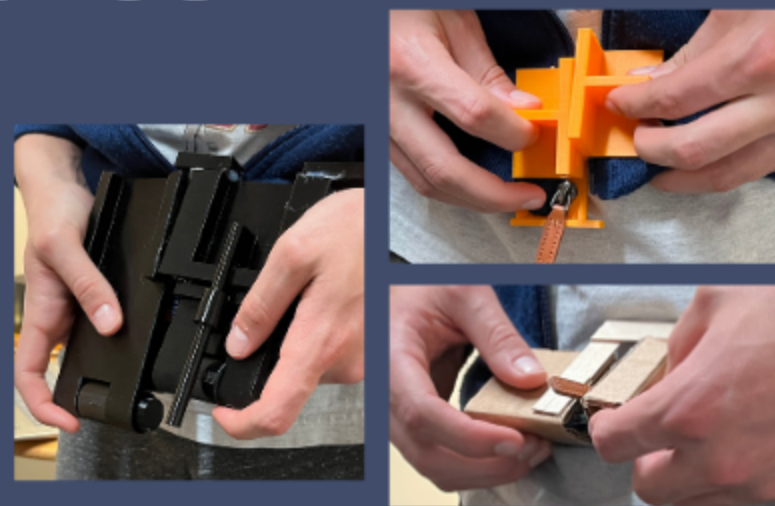


Design 4: Locking slider mechanism

Design Studies

1 Prototype Testing

Different proof of concepts were tested to see which had the shortest time when engaging the zipper.



2 Adaptability Testing

Multiple different coats were tested with the device to test flexibility of the device.

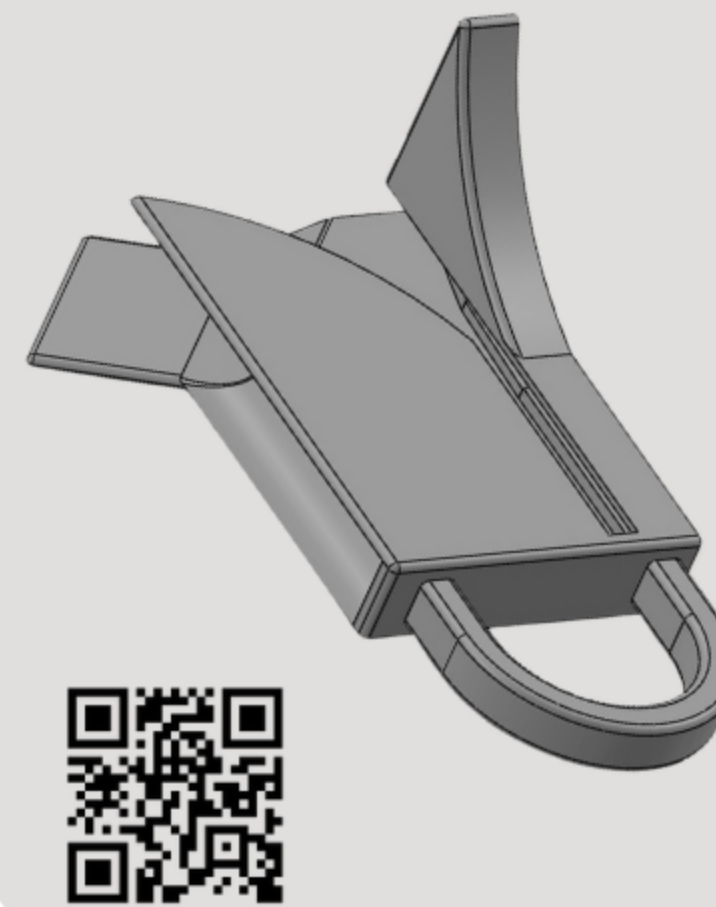


3 Client Testing

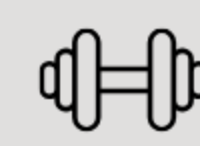
The time that the participants took to engage the zipper and the number of attempts required with and without the device were measured.



Final Design



The device allows users to more easily use zippers.



The device is lightweight and easy to carry.



Easy to produce only using 3D printing

Results

Average Time Taken to Engage Zipper per Client

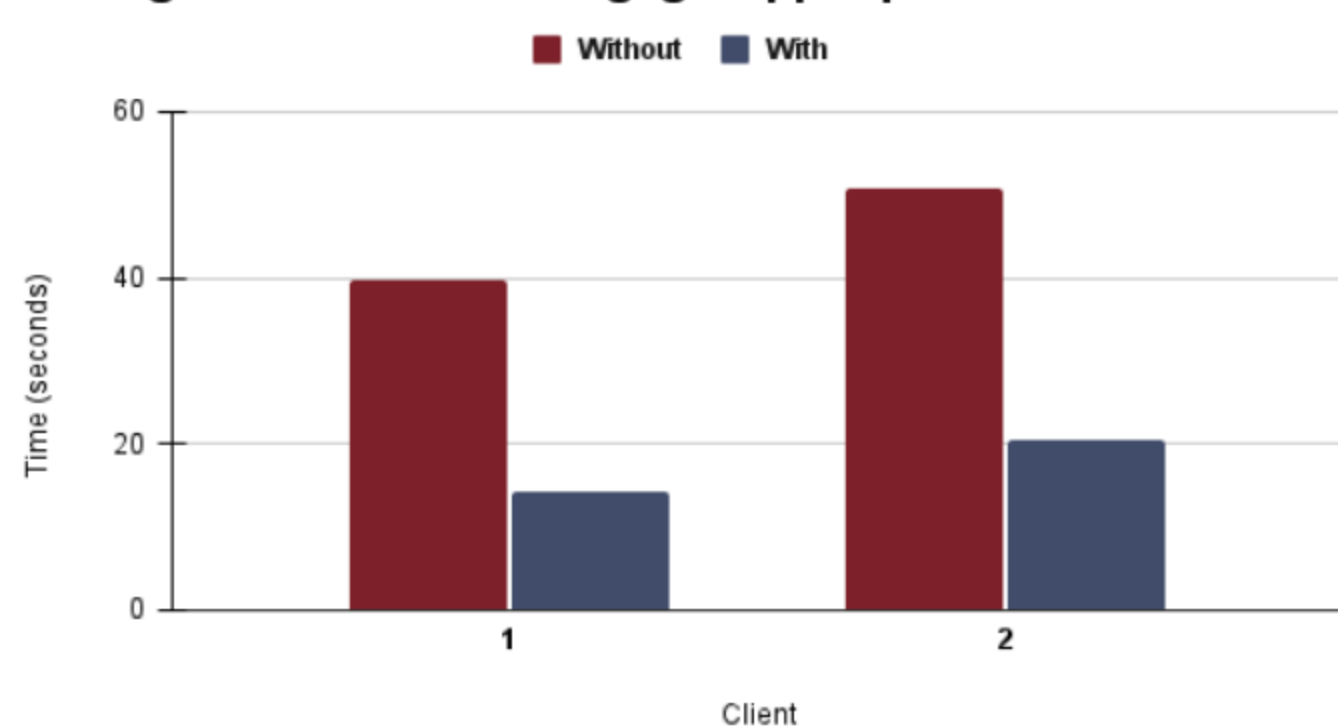
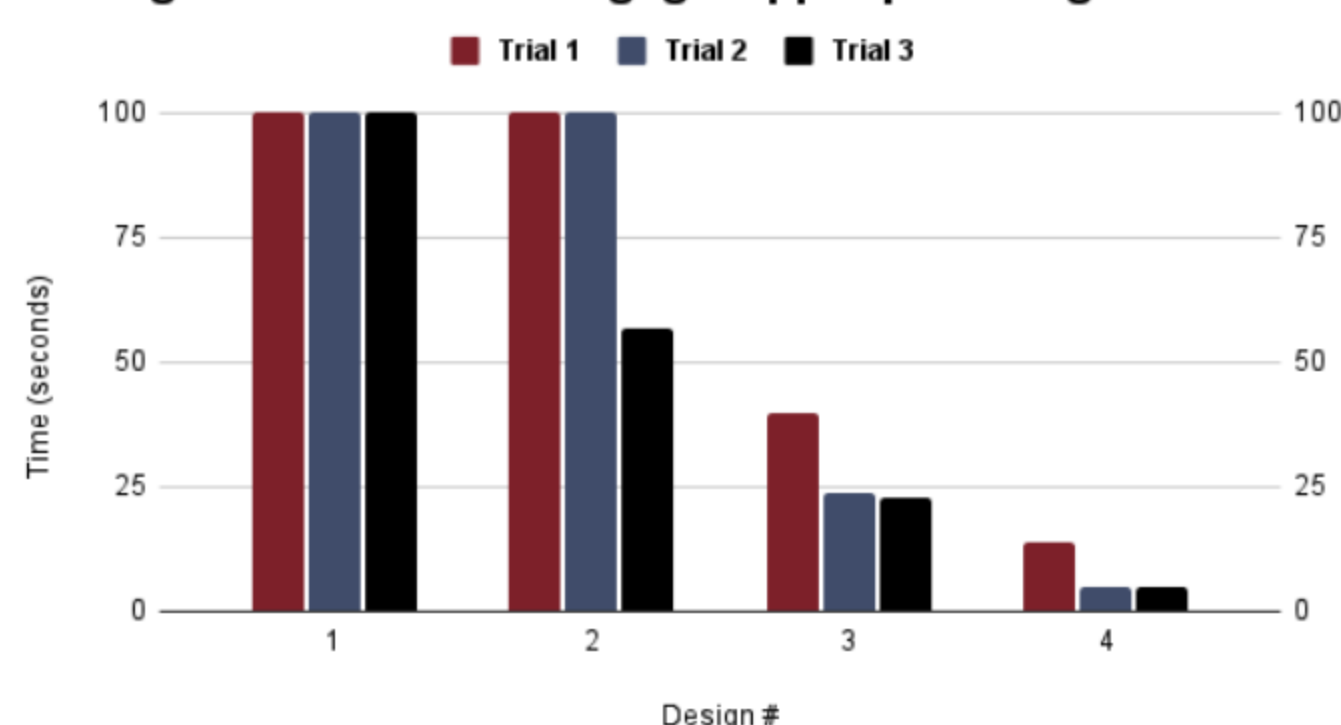


Figure 1: Average Time Taken to Engage Zipper per Client for two clients who tested the device

Average Time Taken to Engage Zipper per Design



Average Time Taken to Engage Zipper per Jacket

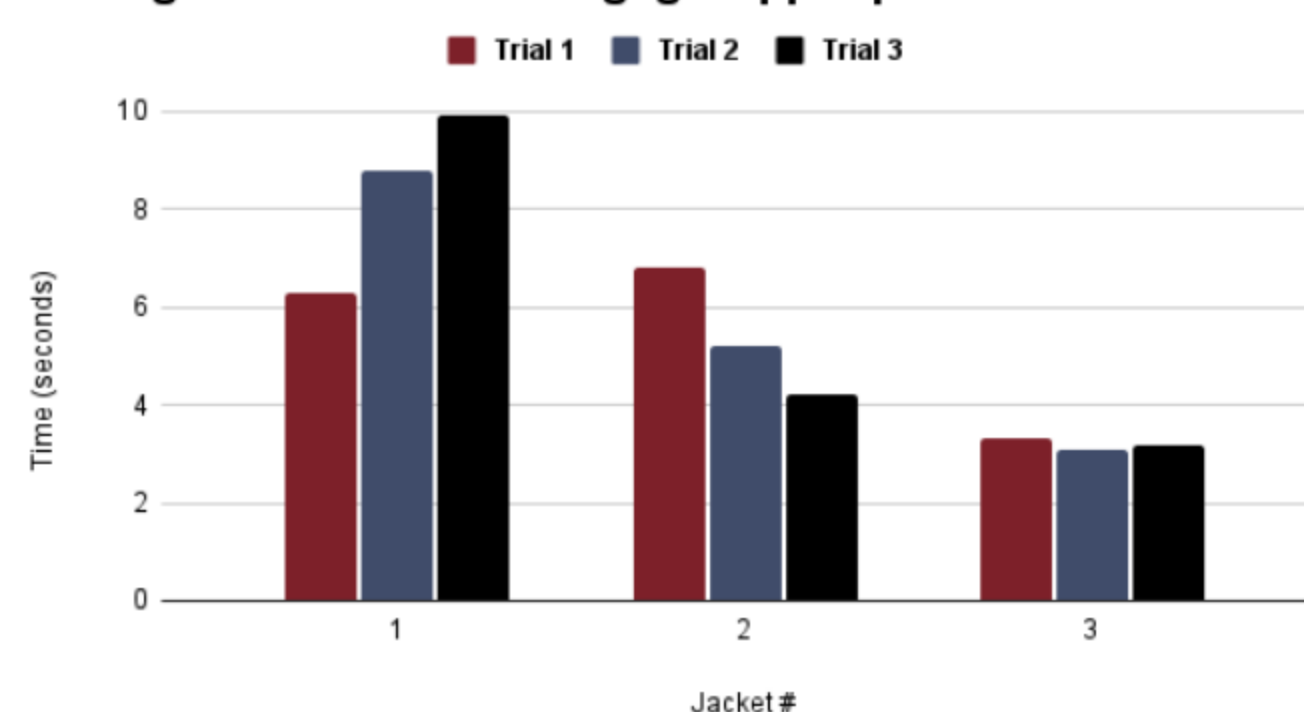


Figure 3: Average Time Taken to Engage Zipper per Jacket for three different jackets

Conclusion

The objective of this project was to make clothing more accessible by creating a device to assist the user in engaging a zipper. The prototype significantly reduced the time it took for the clients with impaired motor function to engage the zipper. Additionally, the device is compatible with multiple different types of zippers. This product will increase the independence of those with medical conditions that affect hand function.

Future Work

- Enable the device to work with the zipper on both sides.
- Increase the durability of the product while maintaining the lightweight nature.
- Further decrease precision needed for pin insertion