

Opening the Hand

Prototyping to improve hand function after neurologic injury

Challenge: Individuals who have had a stroke or neurologic injury commonly lose the ability to open their hand. Physical and occupational therapy are the most common treatments and can lead to improvements in hand function with prolonged, focused practice. Exoskeletons and other robotic technology has been introduced, but these systems are typically expensive, bulky, and can only be used in the clinical environment. *In this prototyping challenge, you will build and test low-resolution prototypes to explore how we might safely, comfortable, and affordably help to open the hand for individuals with neurologic disorders.*

WHAT is prototyping?

Prototyping is getting ideas and explorations out of your head and into the physical world. A prototype can be *anything* that takes a physical form. Prototypes are most successful when people (the design team, the user, and others) can experience and interact with them. What you learn from those interactions can help drive deeper empathy as well as shape successful solutions.

WHY prototype?

Traditionally prototyping is thought of as a way to test functionality. But prototyping is used for many reasons including:

- **Gaining Empathy:** Prototyping is a tool to deepen your understanding of the design space and user
- **Exploration:** Build to think. Develop multiple solution options.
- **Testing:** Create prototypes (and develop the context) to test and refine solutions with users
- **Inspiration:** Inspire others (teammates, clients, customers) by showing your vision



1 Explore

Before our prototyping challenge next week, please complete the following background activities to understand more about hand function after neurologic injury and start your ideation process.

Read: Read a news or journal article on hand function in stroke or cerebral palsy (bring it with you).

Watch on YouTube:

Watch a few videos of hand function in stroke, cerebral palsy, or hemispherectomy.

What did you observe and learn?

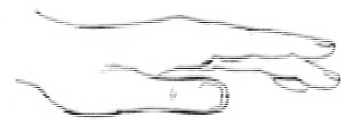
Favorite video:

2 Ideate

Sketch three ideas for how we might open a finger, a set of fingers, or the whole hand. We will focus specifically on how we might connect to the fingers in a comfortable manner while still allowing the user to perform activities of daily life. This may include rings, kinematic linkages, elastics, cloth or many other options for connecting to the fingers. Here are a few **design constraints**:

constraints:

- The design should be **cable driven**. Assume that we are pulling with a cable, rope, actuator, body-harness, etc.
- The user should be able to touch and feel while wearing the device.
- The finger joints should not hyperextend.
- Comfort and safety for long-term use are key.



Large empty rounded rectangular box for sketching ideas.

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You will be provided with tape, wire, paper, and other materials next week. Remember the goal is to create low-resolution prototypes that people can interact with and learn from!

3 Share your ideas & capture feedback

Discuss each of your sketches with your design partner.

Notes:

4 Build your prototype

Make something your partner can test and interact with!

[not here]

5 Share your solution and get feedback.

+ What worked ...

- What could be improved ...

? Questions...

! Ideas...

6 Iterate based on feedback

Make new prototypes your partner can test and interact with!

[not here]

7 Share your solution with the group!

+ What worked ...

- What could be improved ...

? Questions...

! Ideas...