



# emBrace: Single Joint Tunable Elbow Brace

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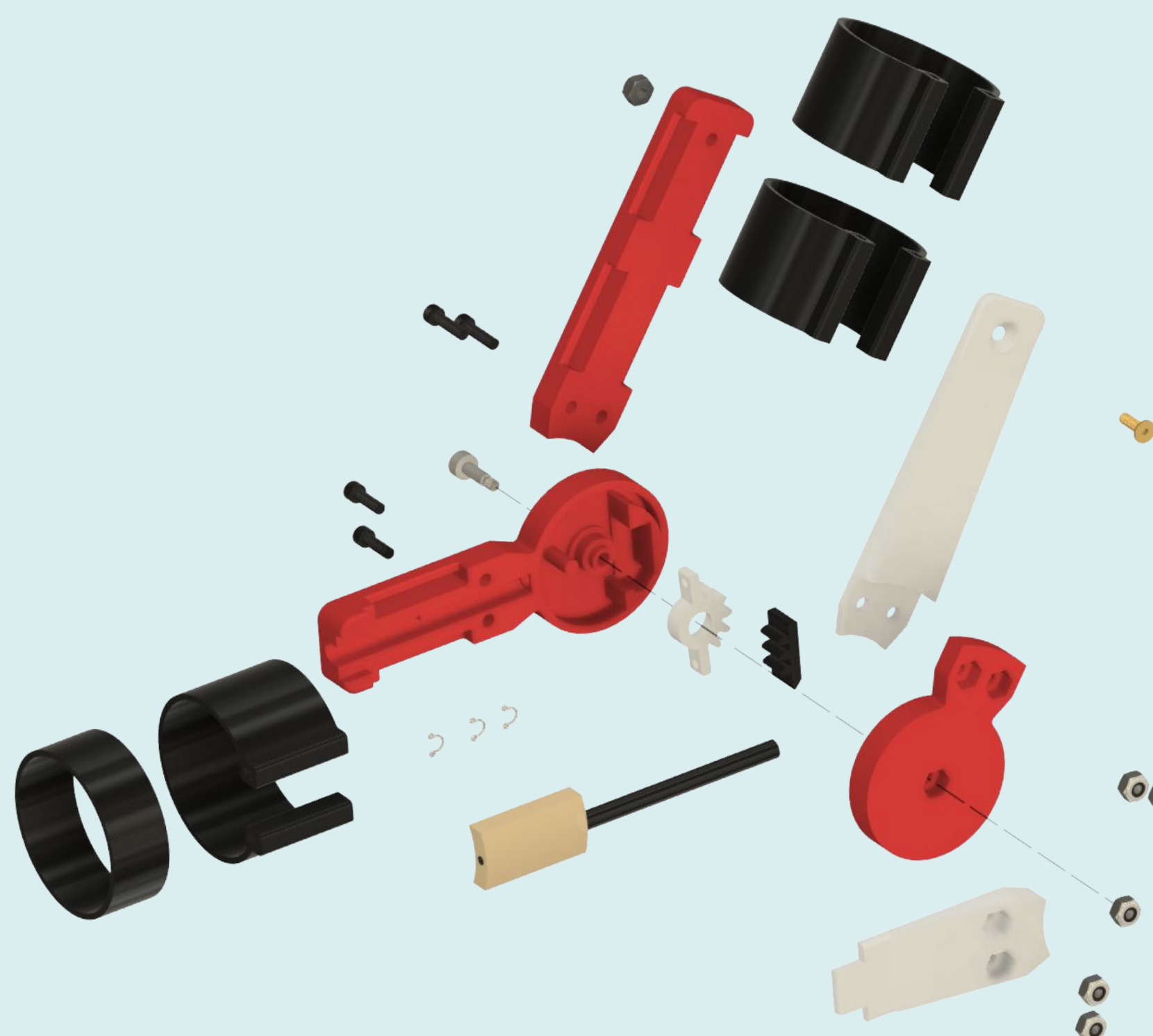
## Background

For this project we are working to help support toddler-aged patients who have mobility issues, specifically with muscle control. This can appear as stiffness or floppiness in the arms, limiting movement, balance, and posture. These challenges can prevent them from crawling, which is a critical stage for building strength, developing motor skills, and learning to explore independently.

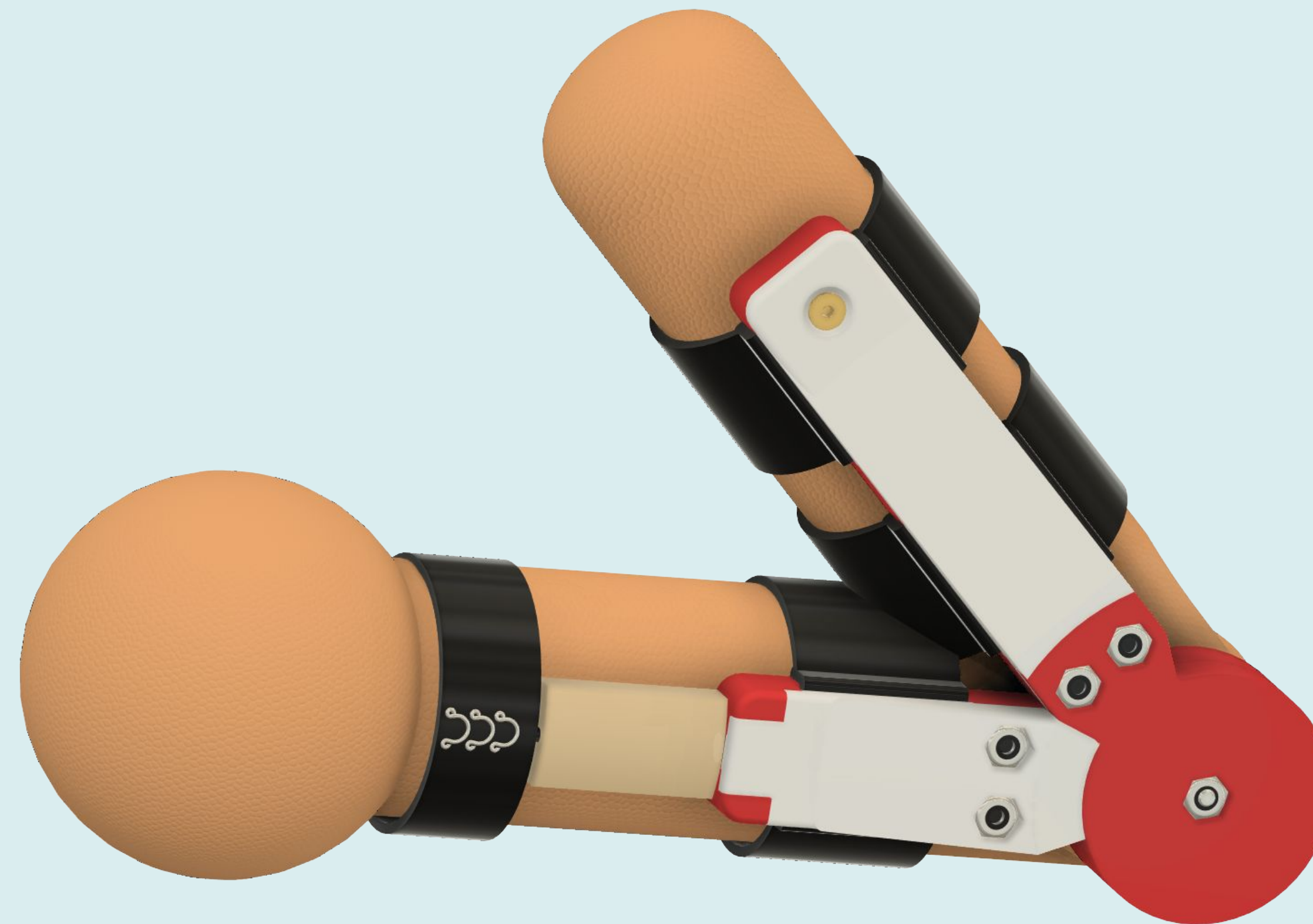
Our project, **emBrace**, aims to support toddlers with mobility impairments between the ages of 12 to 18 months during their therapy sessions. The device is a fully mechanical, patient-activated mechanism designed to be comfortable, adjustable, and easy to wear. emBrace takes advantage of the natural arm rotation that occurs when a child begins to crawl, allowing them to intuitively engage a latching mechanism at the elbow. This added supports gives them the autonomy to crawl while having the freedom to do anything else when they want.

Needs	Ideal Specification	Actual Specification
Elbow range of motion	30 - 180°	44 - 180°
Withstand weight of user when crawling	10 - 15 lbs	17.2 lbs
Locking system size	1 - 2 inches	1.5 inches
Locking activation	50°	60°
Width adjustability	3 - 6 inches	3.5 - 6 inches

## Exploded View



## Final Product



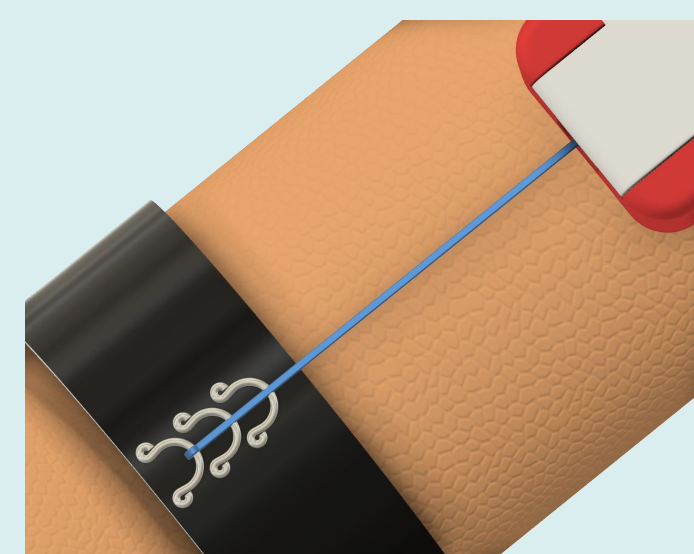
Rendering of the brace on a child sized modeled arm

## Key Components



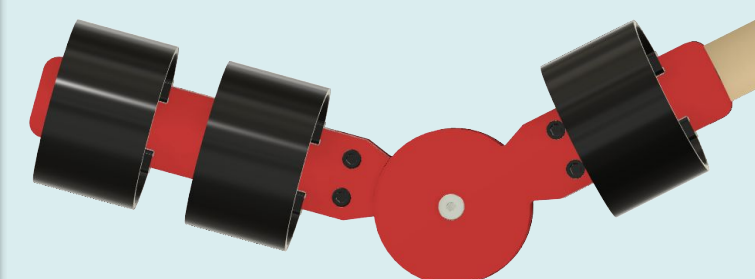
### Locking Mechanism

Allows the brace to move into a locked or unlocked state depending on user action. Activated by cable actuation.



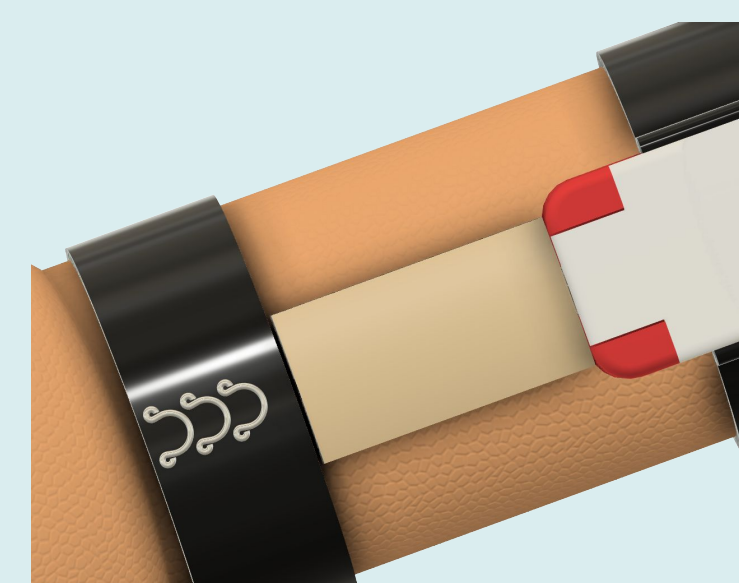
### Cable Tensioning

Retains tension to allow the mechanism to work, controlled by attaching fishing line hooked to an eye



### Arm Straps

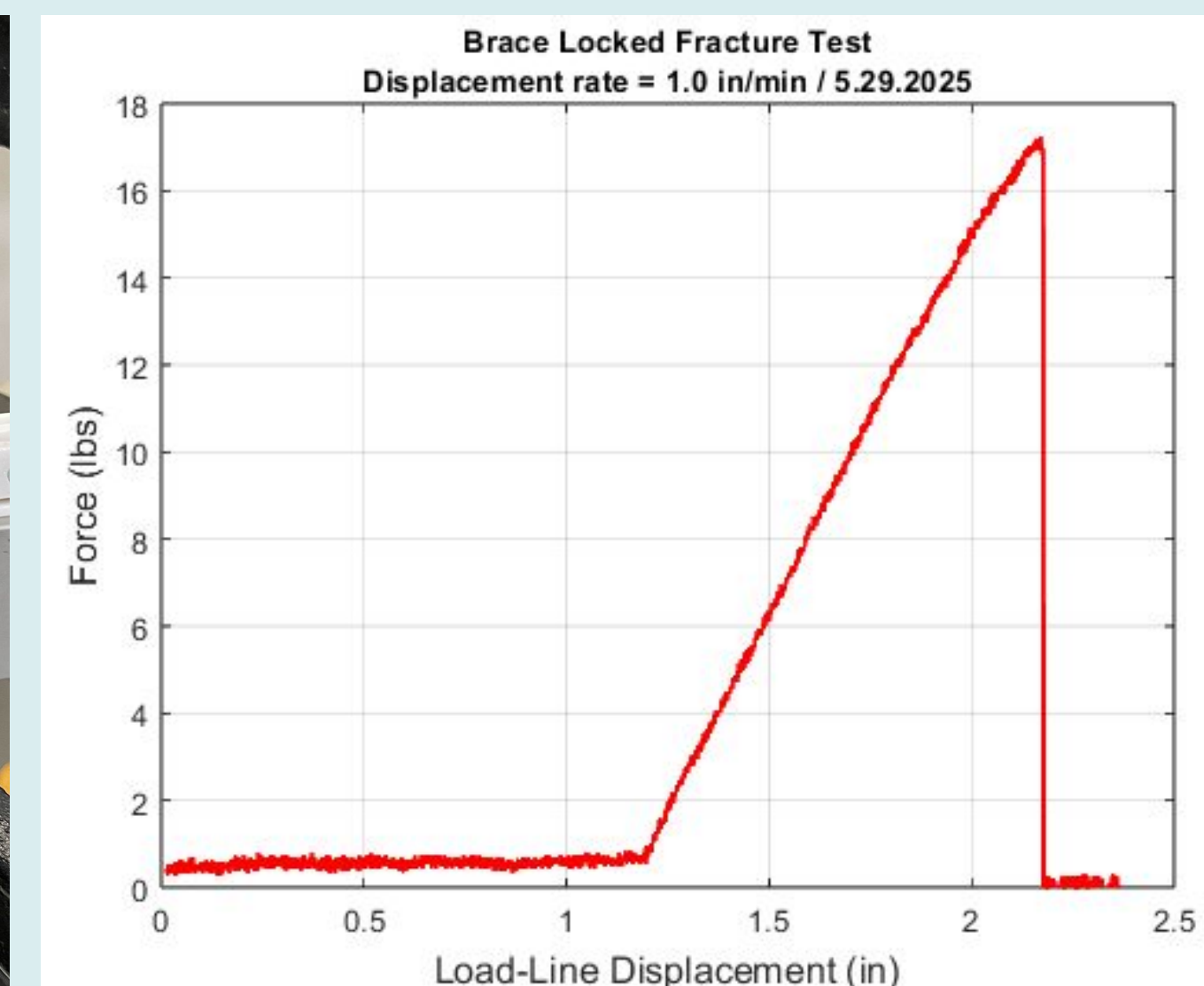
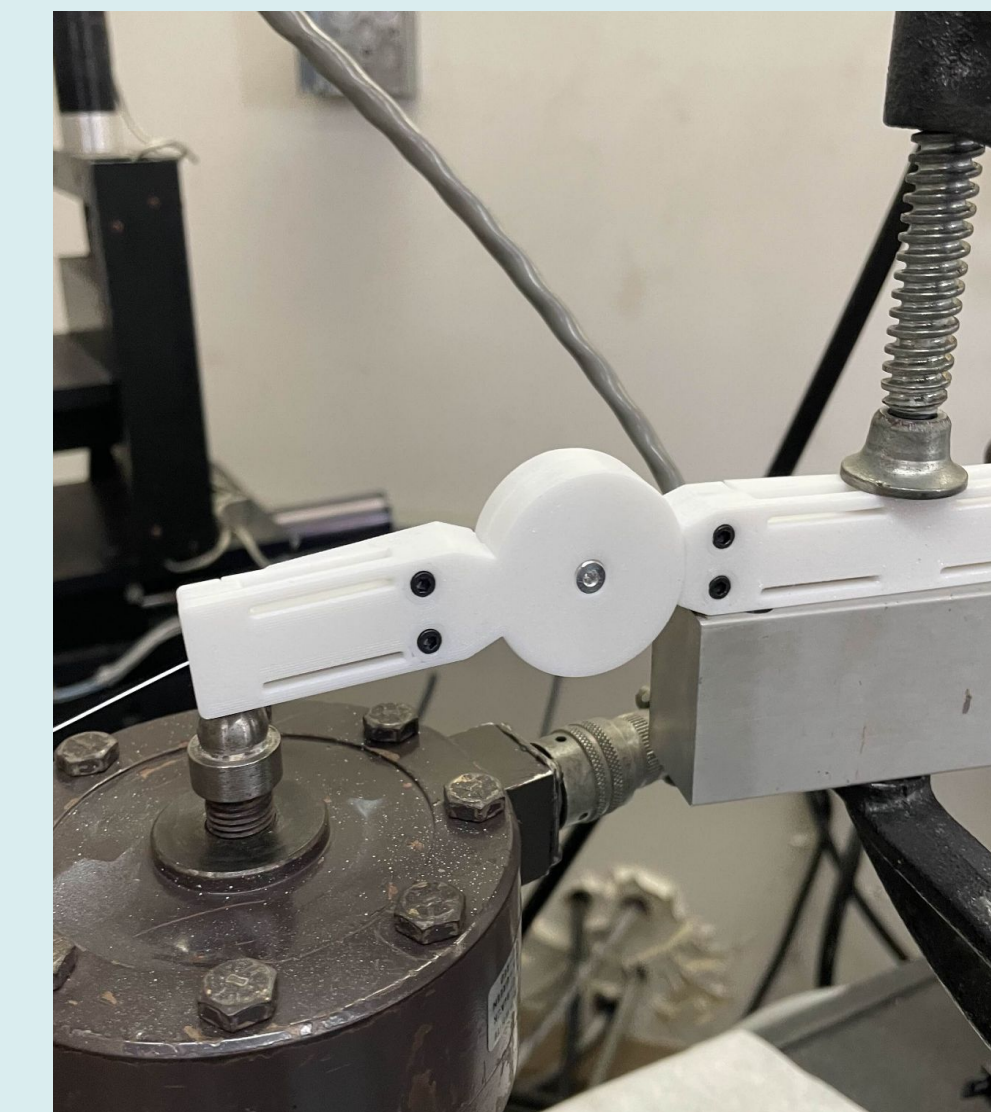
Nylon straps allow for adjustability over a wide range of patient arm widths. 3 total straps along brace body.



### Comfortable Design

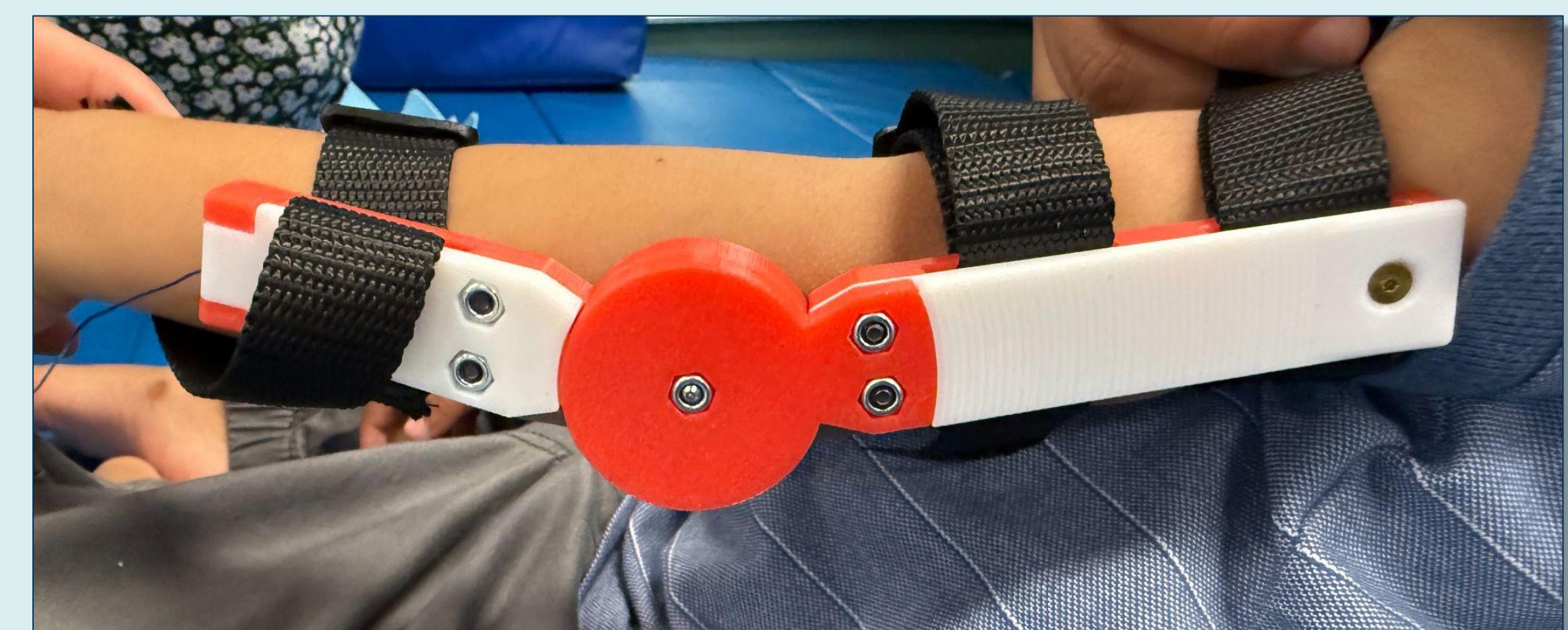
Nylon foam padding and thermoplastic section for comfortability and to prevent tampering of mechanism

## Maximum Allowable Load



Our brace was able to sustain a maximum load of 17.2 lbs, allowing it to be safely used by a toddler.

## Live Test



Testing was performed at the California Children Services Center on one of their patients, where fitment was checked and the mechanism was actuated. The child loved the bright colors and was excited to have it on him, and the brace was able to provide support.



## Acknowledgements:

Geoff Tsai, Kirk Fields, Jane Harpster, California Children Services, Alen Iqbal, Justin Fisher, All-Star Adrian

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