

# User-Centered Design to Inform a Prototype Hand Brace for Stroke Survivors

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## Introduction

Abandonment of an assistive device affects up to 70% of users<sup>1,4</sup>. Device abandonment is often attributed to mismatches between device design and the user's needs, preferences, and environment<sup>3,6</sup>.

User-centered design (UCD) emphasizes user involvement during the earliest stages of device development<sup>5</sup>. However, implementation of UCD is not well described.

For this study, our goal is to demonstrate UCD in the context of a prototype finger-extension-assist brace for individuals with history of stroke (Figure 1).

## Design

Observational study with 2 stroke survivors

- Participant A: 68 Year Old Male, Ambidextrous, Time Since Stroke 8.75yrs, moderate LUE impairment
- Participant B: 65 Year Old Male, Right Hand Dominant, Time Since Stroke 7.5yrs, severe LUE impairment

Video-recorded brace donning / doffing (Figure 2)

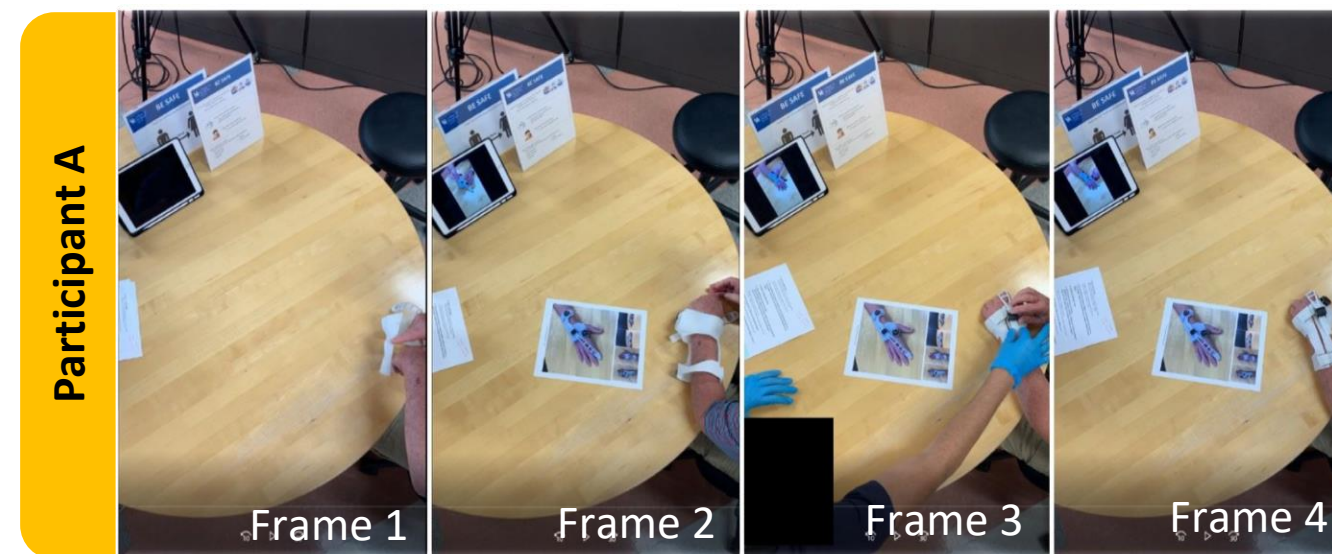
- Photograph-only instructional reference
- If needed, instructional video ± direct assist

Post-session usability questionnaire (Figure 3)

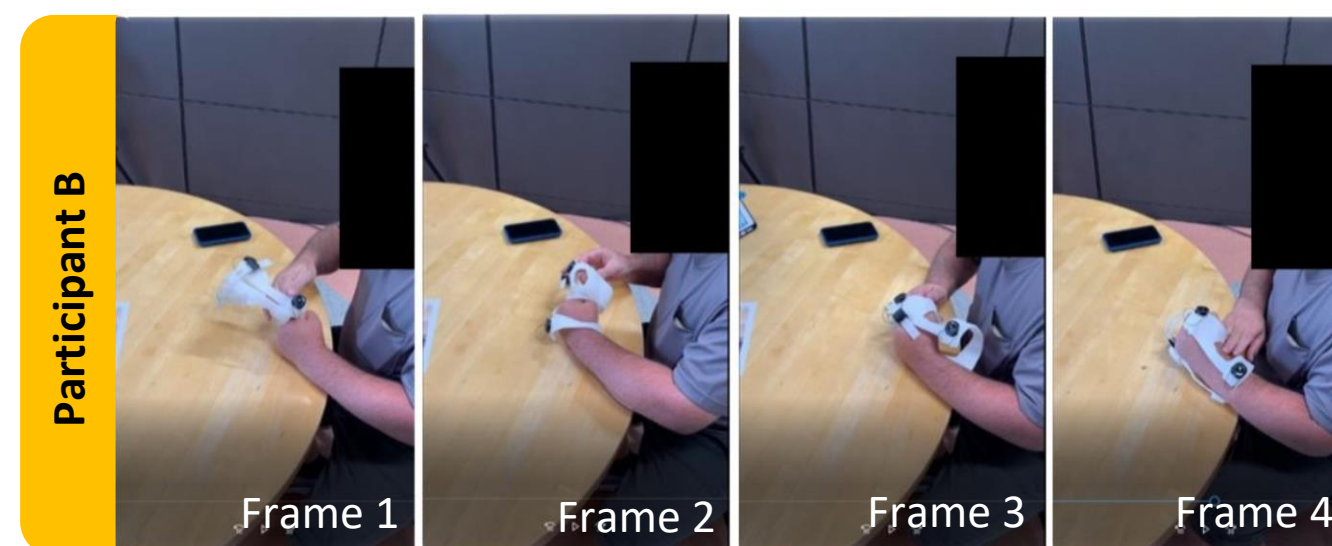
- 7 Likert scale questions
- 2 open-ended questions



**Figure 1: User-centered design applied to this finger-extension-assist brace.**



**Figure 2: Video session time lapsed.** Participant A inverted the brace (Frame 2) and required assist (Frame 3). Participant B unable to thread thumb opening due to spasticity (Frame 3 & 4)



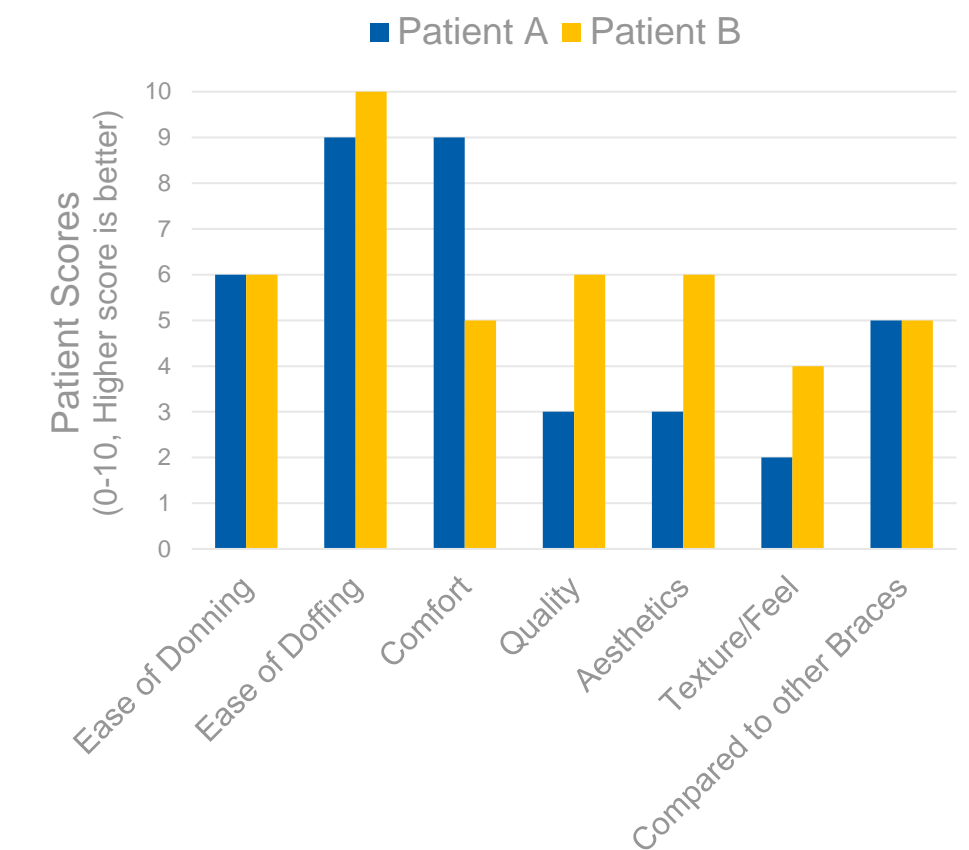
## Results

Participant A:

- Inverted brace during first attempt (brace orientation not intuitive)
- Reported ratchet fastener was intuitive but ratchet operation seemed reversed
- Referenced the relatively extensive time needed in applying past rigid braces (advantage of the non-rigid prototype)

Participant B:

- Severe thumb spasticity prevented full application (prototype undersized)
- Referenced methods of machinists to round material edges for comfort (advice based on his past profession)



**Figure 3: Participant survey responses.**

## Conclusion

By implementing UCD to a prototype hand brace, early feedback from the users can guide future design iterations. Of note, user background impacted user perceptions of the brace.

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