PERSPECTIVES OF INDIVIDUALS WITH C6-C7 SPINAL CORD INJURY ON THE DESIGN OF A NOVEL ROBOTIC HAND BRACE

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INTRODUCTION —

Individuals with C6-C7 spinal cord injury (SCI) can form a grasp with their hands by extending the wrist (tenodesis) but have difficulty performing daily activities due to reduced strength and fine motor

Wearable robotic hand orthoses have the potential to improve functional grasps for individuals with SCI but little is known about the needs and priorities of this population for such a device.

OBJECTIVES -

OBJECTIVE 1:

Explore the perspectives of individuals with reduced hand function due to C6-C7 SCI on the design of a novel wearable robotic hand brace.

OBJECTIVE 2:

Learn about the perceived realworld usage of such a device during the daily life activities of this population.

METHODOLOGY -

We held two 90-minute focus groups (3 participants per group, 6 total). Participants were adults with complete or incomplete C6-C7 SCI living in the community.

Recordings were transcribed by an online transcription service and verified by LW. Qualitative analysis using NVivo software was conducted by 3 occupational therapists using a deductive coding approach in which initial codes were collaboratively developed.

Transcriptions were independently coded by 2 raters according to the initial codes. The codes were then collaboratively revised, and a Code Book was created. Transcripts were then recoded by 2 independent raters according to the Code Book Raters then met to discuss, revise, and finalize the Code Book.

PRELIMINARY RESULTS ————

Qualitative analysis revealed 3 overarching themes and 17 subthemes. While SCI survivors reported diverse levels of hand function and different goals for use of a robotic hand brace, some common themes emerged:

- · Participants prioritized grip strength and fine motor ability during meaningful activities
- pragmatic aspects of everyday device use (e.g. donning and doffing the brace easily)
- · Participants often noted a costbenefit tradeoff with design aspects (e.g. tolerating inconvenience if the device enabled them to perform meaningful occupations)

THEMATIC ANALYSIS —

I've used a U cuff... When I apply pressure, it moves, so it doesn't accomplish what I need it to do... It's not a natural grip in the hand, so there's very little that I use in terms of assistive technologies for the hand.

What's most difficult is fine motor skills, like holding small objects or gripping objects hard.

If it gets too heavy, that slips through my hands because even with the Tenodesis, the grip isn't that great.

I really would love to write with my hand and draw... That requires being able to hold something tightly enough to apply pressure with the writing or drawing.

I mean, we all can say it with spinal cord injuries, it's the tiny things that can be absolutely frustrating that people just take for granted each and every day.

I would expect the same thing from a robotic arm to be as sleek as possible, as light as possible, as less cumbersome as possible, as cool as possible, just like all the other gadgets that are coming out in 2021.

So I was thinking if it's a bit heavy, even though I could grasp things and do stuff, my arms might weaken very quickly and not be able to do stuff.

Current **Function**

Task Performance

Motor Skills

Caregiver Assistance

Assistive Technology

Yes, we want rehabilitation... But besides the

rehabilitation, we're still stuck with everyday

life. So I think that everyday life is what's there,

what's now, what's needs to be done and not have

to wait for something to come back anymore.

Use of the Design Device

Meaningful Occupations

Amount of Time

Types of Tasks

Rehabilitation

Assistance

One or Both Arms

Specifications

Aesthetics

Bulkiness

Don/Doff

Maintenance

Control Mechanisms

Materials

Cost

Toileting. That's difficult. No... for

wiping, for bowel care, I wouldn't

want to use a robotic hand for that

activity and things like-- yeah. I can't

feel there anyway.

I couldn't see that it would be so difficult not to be able to have a prototype or something that we would be able to put on and off ourselves to eliminate people from helping us. I think that would be really important.

So if I'm going to wash my hands, I'm either going to take it off and put it back on maybe two, three times a day, or if I was going to leave it on, try to wash around it. So, yeah. Having it waterproofed would come in very handy.

Having something on your hand is going to be a little cumbersome. But I think that's just going to be a matter of trial and error... But daily personal things, I think what people want to be able to do themselves the most.

· Participants focused on the

Stakeholder feedback on the use and design of robotic devices can challenge researcher assumptions potential end users. End user

Future work will involve the creation of an advisory panel of stakeholders to provide feedback on the device design and the research process. This project highlights the importance of obtaining stakeholder feedback when developing rehabilitative technologies to ensure they are useful and relevant for the intended population.

CONCLUSIONS

and help direct the research process to focus more on the experience of perspectives should be incorporated early in the design process in order to drive device development.

Prototype



