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## Empowering Stroke Recovery: Harnessing the Power of Healthcare Technology & Wearables

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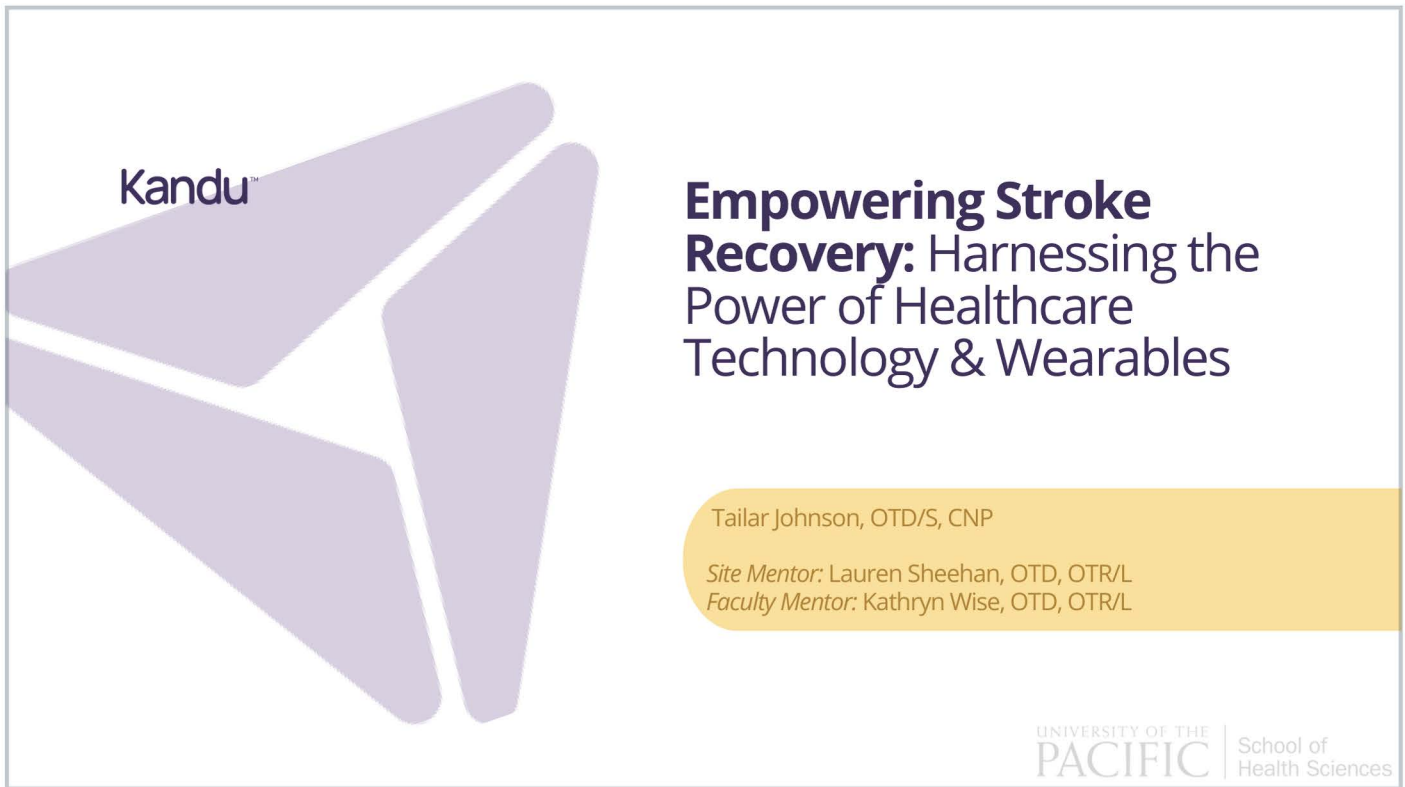
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My name is Tailar Johnson and my Capstone project is empowering stroke recovery, harnessing the power of healthcare technology and wearable devices.

To let you know why wearable technology was an interest to me, I want to tell you a quick story.

I have a loved one that had a condition called pericarditis (inflammation around the heart), which causes arrhythmia (or weird heart rhythm) a dangerous condition that can lead to stroke and other heart related emergencies. This loved one found out he was in arrhythmia for over a month from his fitbit. He sent the information to his doctor who said - talk me when you get an apple watch.

This experience and some research left me convinced that we do not know how to adequately or appropriately utilize wearable technology in a healthcare setting. My mission with this capstone project was to explore how we could change this

# Background

- Kandu Health in Campbell, California
- Digital health startup filling the gap in stroke recovery
- Provides free virtual services to stroke survivors & care partners
- Research grade wearable device in process of finding product market fit



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I did my Capstone project with Kandu health, a digital health startup which aims to fill the gap in stroke recovery. Currently, stroke survivors

# Objectives

1. Investigate the role of occupational therapy in a healthcare technology setting
2. Conduct qualitative research to improve research aggregation, synthesis, and dissemination skills



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# Roles & Responsibilities

## Clinical Services

- **Kandu focus groups**
- **Outreach liaison testing**
- Navigator training collateral
- 22 Navigator Summaries on various subjects



## Qualitative Research

- Recruitment & communication with participants
- IRB changes
- 30- 60 minute interviews
- Data storage & organization
- Coding, theming, & analysis

## Discovery

- **Quantitative data collection**
- 10 Literature Reviews on:
  - Acute post-stroke changes
  - Blood pressure
  - Sepsis
  - Urinary tract infections
  - Core temperature
  - Meds & Vital signs

# Guiding Theories



Diffusion of  
Innovation (DOI)  
Theory



Unified Theory  
of Acceptance &  
Use of  
Technology  
Model



Theory of  
Reasoned Action  
(TRA)

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Diffuse of innovation theory gets at this idea that technological adoption happens on a curve - very few people adopt a technology early on, which increases and then drops back off

UTAUT is the idea that actual use of technology is determined by behavioural intention. The likelihood of adopting the technology is dependent on the direct effect of four key constructs, namely performance expectancy, effort expectancy, social influence, and facilitating conditions

Theory of reasoned action is the idea that norms and attitudes shape behavior

# Stroke Recovery - Literature Review

- Stroke = leading cause of death & long-term disability worldwide (Bernaldo de Quiros et al., 2022).
- Burden of stroke on individual & societal level have led to interest in **quantifying** stroke risk, occurrence, and recovery (Bernaldo de Quiros et al., 2022).
- Most survivors stop receiving all rehab services **~6 months post stroke** and consider services inadequate (Choudhary et al., 2020; Kim et al., 2019).
- Wearable devices can support the recovery process for increased **motor relearning** & improved function in **performing activities of daily living** (Kim et al., 2019).

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80% survival rate with an impact on QOL especially physically, cognitively, emotionally, and socially (De Quiros et al., 2022).

# Barriers to Wearables in Stroke Recovery - Literature Review

## Healthcare Clinicians

- 80% of therapists not using wearable devices in practice recognize the value (Braakhuis et al., 2021; Signal et al., 2020).
- Lack of clinically applicable evidence contributes to a lag time in implementation (Braakhuis et al., 2021; Signal et al., 2020).

## Stroke Survivors

- Limited data on wearable usability for stroke survivors (Rast & Labruyère, 2020).
- Lack of involvement in the design process leads to a lack of relevance and potential for device misuse (Poogondi et al., 2020).

## Care partners - limited to no literature

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# Needs Assessment

Semi-structured  
interview

+

Environmental Scan



# Gap Analysis

Identify interests of key  
stakeholders to help  
determine wearable  
device product market fit

## Research Question

- What types of **wearable devices** would be useful to support better outcomes in stroke rehabilitation?

## Methods

- **3 groups:** stroke survivors, care partners, healthcare clinicians
- Conveniently sampled
- Semi-structured interviews to understand:
  - Stroke recovery
  - Resource accessibility
  - Technological use patterns
  - Useful technology for post-acute stroke
- May 2023 - July 2023 via **Zoom** or by **phone**

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# Outcomes

## Top Priorities for Recovery

- Stroke survivors:  
*Independence*
- Care partners:  
*Health & Exercise*
- Healthcare Clinicians:  
*Quality of Life*  
*"Participation"*

## Top Barriers to Recovery

- #1 Barrier for all groups:  
*Support (Mental Health)*
- Healthcare clinicians:  
*SDOH (transportation)*
- Stroke survivors + care partners:  
*Access to Health Services*

## Preferred Device Features

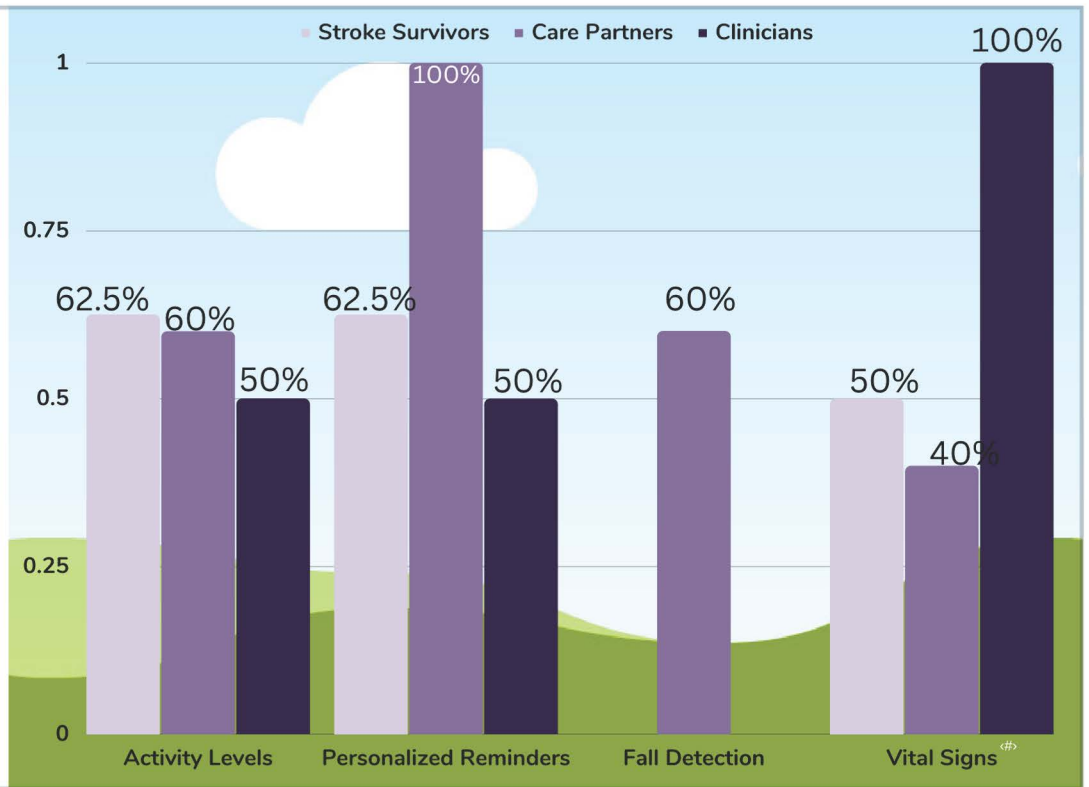
- Personalized Reminders
  - Medication Management
  - Perform Exercises
- Vital Signs
  - Blood Pressure
- Activity Tracking
- Connected with a HEP

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## Preferred Device Features



# Discussion

- **Tech Knowledge Gap**

- 1/2 of clinicians never thought about integrating with current practice
- Lack of awareness in all groups of pre-existing device features
- High interest in using/ accessing technology if set up

- **Independence versus participation - important or semantic difference?**

- **Potential Biases**

- Female skew
- Age
- Technological literacy & state relationship

- **Areas for Future Research**

- Preferred design and feature usability

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# Impact on the Organization

### Smartwatch Features Post-Stroke: Apple Watch

#### Reminders

Good for appointments, to do's, taking medication, and anything else you want to be reminded about!

1. Open Reminders app on your Apple Watch.
2. Tap a dot to open it.
3. Tap the empty circle on the left side of an item to edit it or tap the top right to add a new reminder. Then tap Mark as Completed.
4. Tap on the top-left corner to return to your list view.
5. To see the completed reminders, tap Show Completed.
6. To see all completed reminders, tap the All tab. Tap View Options, then tap Show Completed.

Learn more about reminders here!

#### Activity Tracking

Activity app on your Apple Watch keeps track of your movement throughout the day. It encourages you to meet your fitness goals.

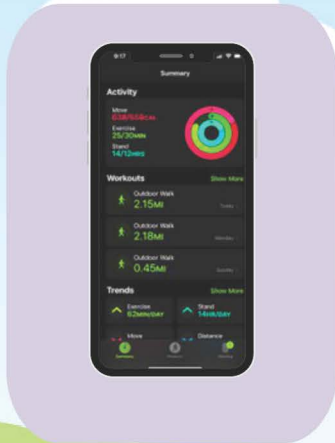
Red = Active calories burned  
Green = Min. of brisk activity  
Blue = Stand time moved  
Grey = Time spent asleep

Set up:

1. Open the Activity app on your Apple Watch.
2. Swipe left to read the Move, Exercise, & Stand descriptions, then tap Get Started.
3. Use the Digital Crown to set your min, max, height, weight, and whether you use a wheelchair.
4. Choose an activity level and start moving!

Learn more about Activity Tracking here!

**Education on Smartwatch Features**



**Step Count**



**Fitness Goals**

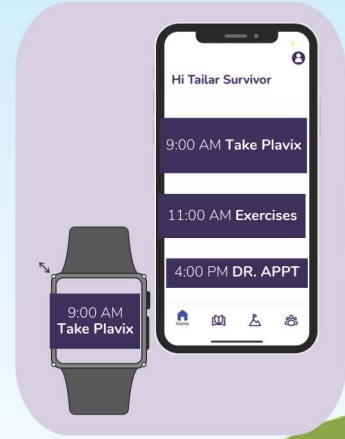
# Impact on the Organization



**Continuous Blood Pressure Device**



**Home Exercise Program Integration**



**Personalized Reminders Integration**

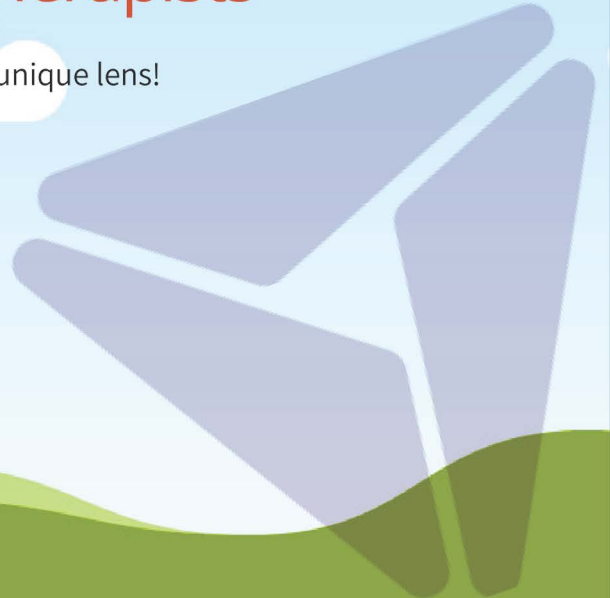
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# Impact on Occupational Therapists

- OT's add to the healthcare technology team with a unique lens!
- Tech roles that OT's would be a good fit in:
  - Clinical Research
  - Product Management
  - Hospital Liaison/ Outreach Liaison
  - Customer Success
  - User Experience/ User Interface (UX/ UI)
  - Human Resources



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Product management - works between engineers, the needs of the end user, and the business team to drive the direction of the product



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