

A hand is shown holding a glowing lightbulb. The background is dark with colorful, abstract, flowing shapes in shades of red, orange, yellow, and teal. The lightbulb is the central focus, emitting a soft glow.

# INNOVATIVE ACCESS PROJECT: HAND DISABILITIES

Karen Mauk & Coleen Sallot

# ACCESSIBILITY CHALLENGE

According to the World Health Organization (Inclusive City Maker, 2019), disabilities affect over two billion people, or 37% of the world population. In the United States, three million people struggle with some type of hand or forearm disability, including hand deformities, missing fingers, carpal tunnel syndrome, psoriasis, arthritis, and other conditions (Delzell, 2019; Statistics, 2014).

Hand disabilities create difficulties in a variety of ways: writing, using utensils and tools, using zippers and buttons, opening doors, making fingerprints, typing on a keyboard, picking up objects, opening jars and cans, brushing hair and teeth, bathing and showering, playing a musical instrument, and so on. Besides facing physical barriers, people with hand disabilities struggle with attitudinal, social, and “internalized” barriers and may also experience communication and policy barriers.



# PRODUCT INCLUSION PRINCIPLES

1. **Seek out points of exclusion.** When designing a product or service, take a look at it from an outside perspective to assess it from different angles. Evaluate points at which people may be inadvertently excluded, and then use what you find to iterate your designs and even generate new ideas and opportunities.
2. **Identify situational challenges.** Sometimes exclusion is temporary or situational, based on the context and setting. Observe and evaluate users' interactions with products or services and design to account for the different contexts in which people will use them. These different contexts shape what people need and prefer at any given time (Jean-Baptiste, 2020).
3. **Provide different ways to participate.** Just because people are different doesn't mean they can't participate; sometimes they simply have to do things in a different way. Providing different ways to participate allows users to pick the method that works best for them.
4. **Provide equivalent experiences.** When creating different ways for people to participate, make sure you facilitate experiences that are usable, equivalent, and comparable—not less than the “normal” experience.
5. **Expand the solution so it works for everyone.** A solution designed for one group can sometimes work for a much broader audience. This can pertain to accessibility features, such as speech to text, or a product that was made for a specific group that can now be expanded to a bigger audience.

An abstract graphic on the left side of the slide, featuring a vibrant red background with a green, curved, translucent shape that resembles a stylized leaf or a modern architectural element. The shape is layered and has a slight shadow, giving it a three-dimensional appearance.

# GOALS

Based on observations and a structured interview with an occupational therapist, we narrowed our primary project goals to helping people with pincer grasp challenges to increase finger strength and improve the ability to manipulate buttons, zippers, and door handles.



# LOGISTICS

This project was designed to include a range of participants (including participant observers) in the research, design, and testing phases. We collaborated with participants to design an app prototype that will help people with various hand disabilities improve finger strength and mobility. Ultimately, our hope was to expand physical access for people with hand disabilities to daily experiences that are meaningful and fulfilling. This access will open doors to richer emotional and social experiences too.

Future research could involve more participants from diverse backgrounds in the codesign process. Design researchers and project participants would collaborate to plan, prototype, and test collective ideas. The more participants involved in the process, the more progress could be made in a relatively short period of time. For example, research would take place over two to three weeks, codesign would take another one to two weeks, and initial testing would take another week (although testing and reporting would continue many months into the future to evaluate the design's effectiveness and to iterate the design outcome).



# STYLE BOARD

# Style Board

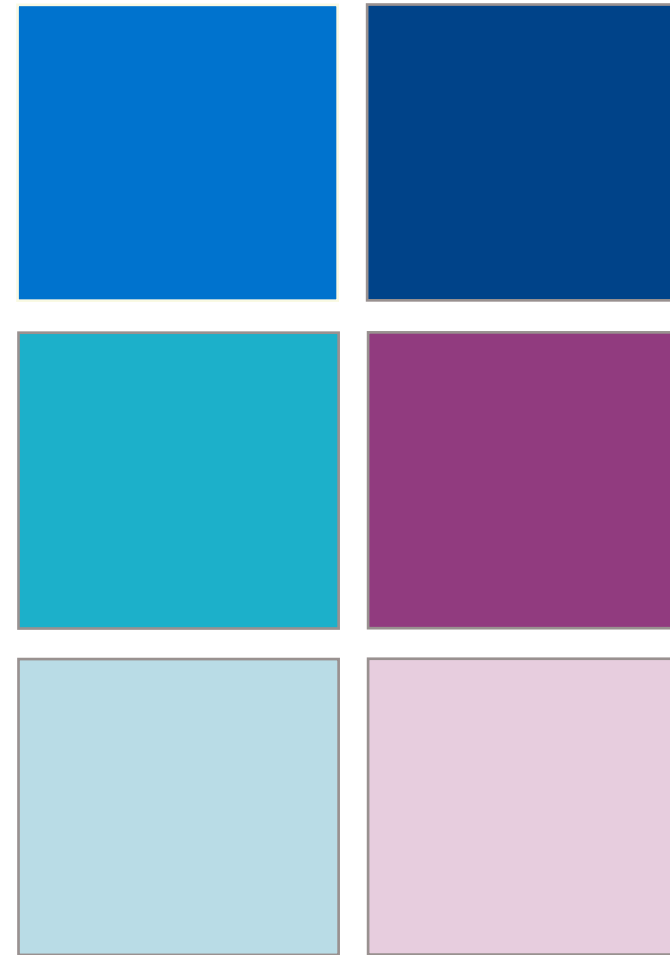
NAME/TAGLINE: Finger Toolbox

CONCEPT DESCRIPTION/PURPOSE: From physical deformities to chronic conditions like psoriasis, many people have disabilities that affect hand mobility. These disabilities make people feel like their hands are tied. Using augmented reality, Finger Toolbox is a mobile application geared toward expanding access for people with hand disabilities to improve their physical and psychological conditions. Everyday tasks will be easier and more social. Most importantly, people will feel able to live their lives like everyone else.

## PHOTOGRAPHY



## COLOR

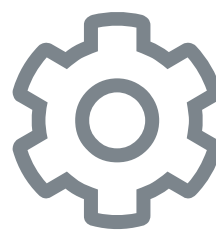


## TYPOGRAPHY

**ABCDEFGHIJKLMNO**  
**PQRSTUVWXYZ**  
**abcdefghijklmno**  
**pqrstuvwxyz**  
**1234567890**

ABCDEFGHIJKLMNO  
PQRSTUVWXYZ  
abcdefghijklmno  
pqrstuvwxyz  
1234567890

## SPOT ILLUSTRATIONS, DIAGRAMS, RULES



## TEXTURES



A close-up portrait of a woman with dark, wavy hair, looking slightly to the right. The image is overlaid with vibrant, semi-transparent, flowing ribbons in shades of yellow, orange, red, and teal. The text 'PERSONA · CHUN ADAMS' is centered in white, sans-serif font.

PERSONA · CHUN ADAMS



## Values & Aspirations

- Balance work with family.
- Move ahead professionally in line with newly acquired skills.
- Feel proud of who she is.
- Become involved with the local Chinese culture.
- Volunteer in local community.

## Frustrations & Pain Points

- Not being able to manipulate certain objects, including doors.
- Having to rely on others to do ordinary, routine things.
- Being judged based on her outward appearance rather than her personality or skills.
- Being constantly asked about why her hands look different.

## Biography

Chun recently accepted a new position as a marketing specialist for a renown marketing firm. She wants to make a good impression but is concerned her hand deformities may impact the way she is viewed by the team. Adopted from China, Chun has missing and deformed fingers, which affect her ability to manipulate objects, such as doorknobs, buttons and zippers. She finds things more difficult since she's moved away from home and wonders how she can become more self-reliant..

# CHUN ADAMS

Struggles with missing/deformed fingers



"I want to be viewed for my talents instead of my differences."

**Age:** 32

**Family:** Married w/o children

**Occupation:** Marketing specialist

**Household income:** \$60K/year

**Location:** Pittsburgh, PA

WIFE/SISTER

STRAIGHT

MIDDLE CLASS

MBA DEGREE

OUTGOING

## Attitudes & Motivations

Connecting w/family

Getting ahead professionally

Embracing her identity

Connecting w/ her culture

Volunteering

## Behavioral Tendencies

Stay isolated

Network

Get routinized

Try new activities

Enforce habits

Build knowledge

Become lazy

Exert energy

## Favorite Brands

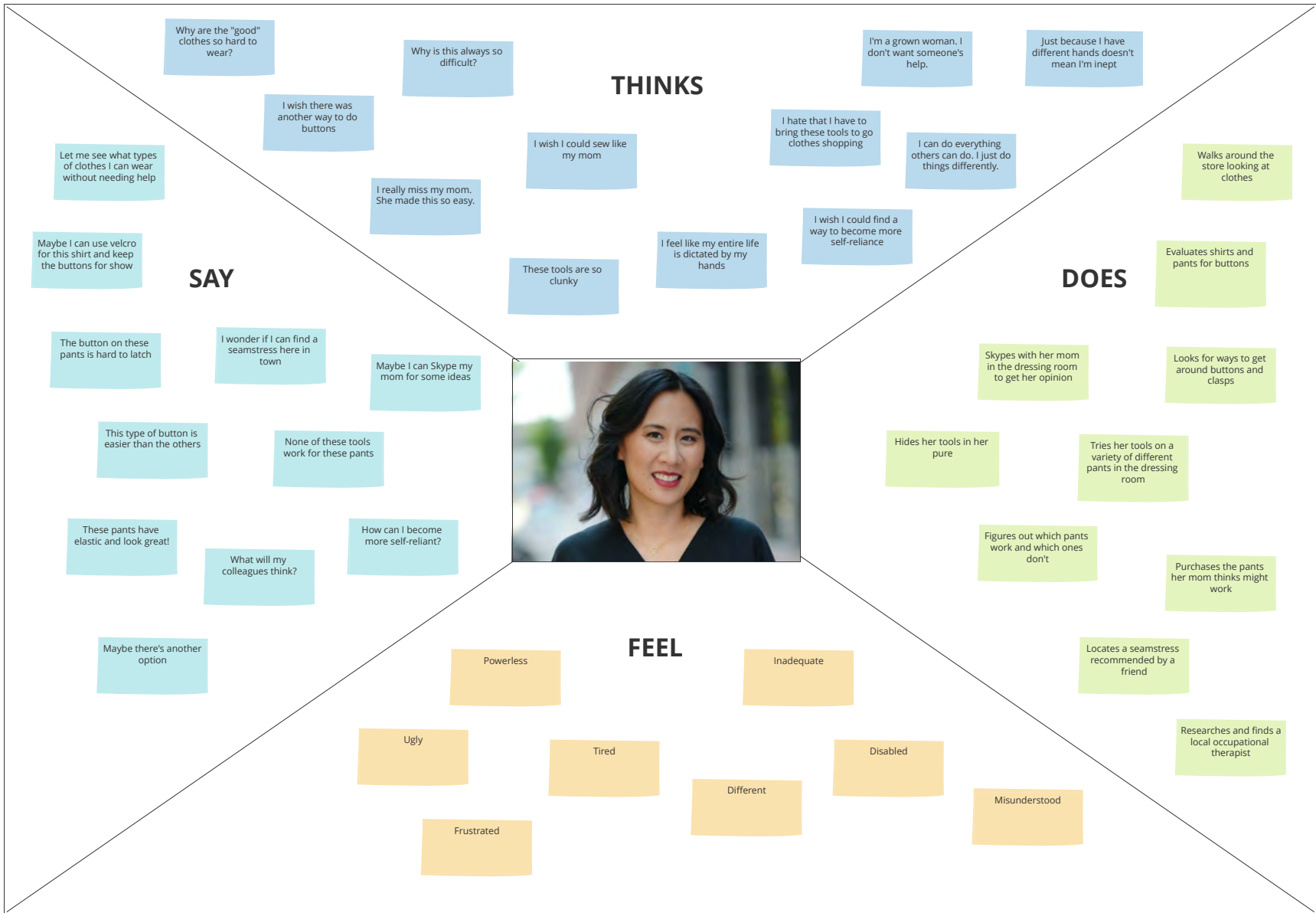
HomeGoods®

ASPCA®

American Red Cross

A portrait of a woman with dark, wavy hair, smiling slightly. The image is overlaid with several translucent, flowing ribbons of color: yellow and orange at the top, red on the left, and teal and blue at the bottom. The text 'EMPATHY MAP · CHUN ADAMS' is centered in white, sans-serif font.

EMPATHY MAP · CHUN ADAMS



**PAIN**

- Chun wants to look fashionable and professional but her accessibility needs tend to get in the way.
- Chun is used to relying on her mother, a seamstress, who traditionally retrofitted her clothes to meet her needs. Chun recently moved away and has lost access to her mother's skills.
- Chun has tried a variety of adaptive tools, but they typically only work for one purpose (small buttons or large buttons) and are clunky to carry and use.
- Chun is tired of her life being dictated by her hands. Perhaps going to an occupational therapist can help her become more self-reliant.

**GAIN**

- Chun has become quite creative with her situation.
- Chun likes to use her personality and communication skills to help her get the assistance she needs.
- Chun prides herself on being a hard and valuable worker.
- Chun likes to use her disability to highlight hand disabilities and adoption.

**SCENARIO:** Chun recently accepted a new position as a marketing specialist for a renown marketing firm. She wants to make a good impression but is concerned her hand deformities may impact the way she is viewed by the team. Adopted from China, Chun has missing and deformed fingers, which affect her ability to manipulate objects, such as doorknobs, buttons and zippers.

Chun wants to look good and fashionable, but unfortunately her choice of clothing is more limited due to the array of zippers, buttons and clasps. Her mother is a seamstress and used to sew her clothes, but Chun recently moved away. Chun has a button pull tool, but it only works for certain types of buttons, and the idea of carrying around a variety of clunky tools is not her idea of being fashionable.

A close-up portrait of a woman with dark, wavy hair, smiling slightly. The image is overlaid with several translucent, flowing ribbons of color: a yellow-to-orange gradient at the top, a red-to-orange gradient on the left, and a blue-to-teal gradient at the bottom. The text 'STORYBOARD · CHUN ADAMS' is centered in white, sans-serif font.

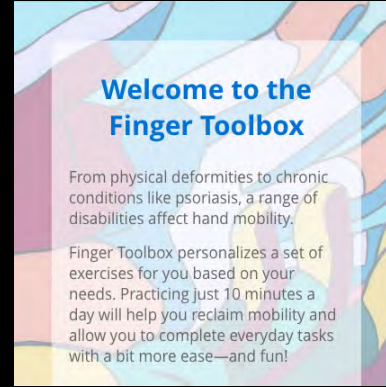
STORYBOARD · CHUN ADAMS



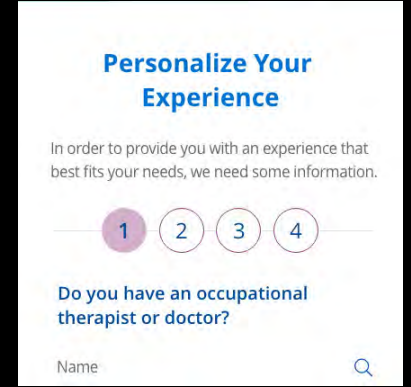
Chun goes to her weekly occupational therapy appointment. Her therapist tells her about a new app, Finger Toolbox, that helps her practice finger exercises on her own time.



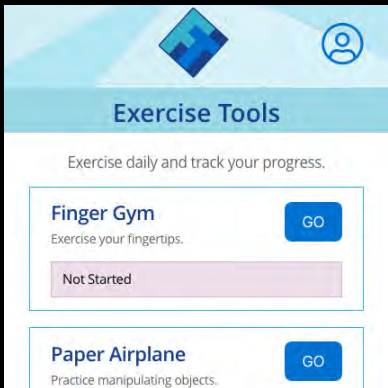
After her appointment, Chun searches for the app and installs it on her phone.



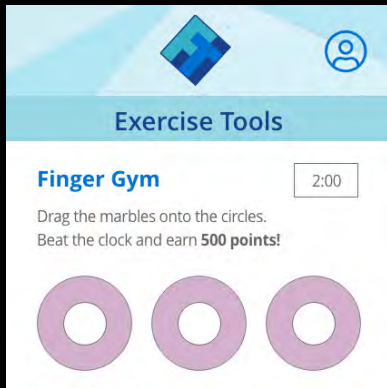
Chun opens the app and takes a look around.



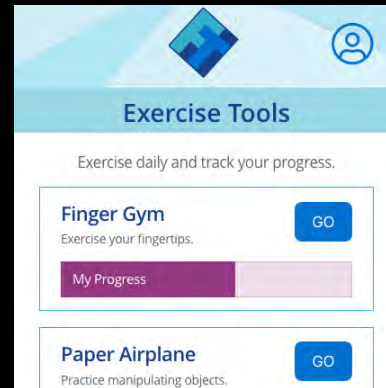
Chun creates an account, signs in, and answers a few questions to personalize her experience and set her goals.



The app assigns Chun personalized exercises based on her condition and goals. She decides to get started with the Finger Gym.




Chun tries out the Finger Gym exercise, which has her use her fingers to move marbles on top of the circles on her screen.



Chun completes part of the Finger Gym exercise, but she gets tired and decides to quit. Her progress is saved for next time.

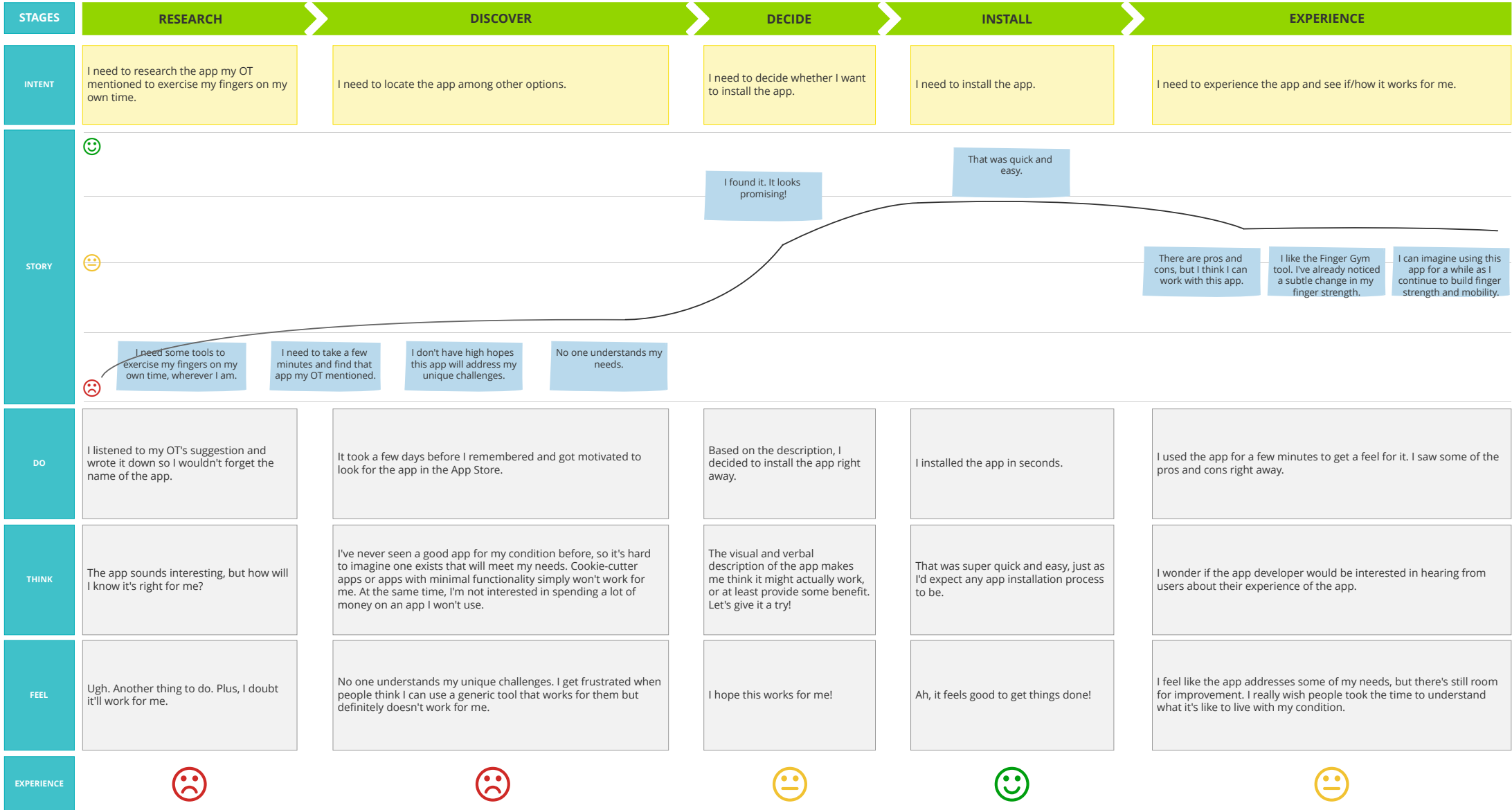


Chun checks in with her occupational therapist and reports on her progress with the app.

A portrait of a woman with dark, wavy hair, smiling slightly. The image is overlaid with several translucent, flowing ribbons in vibrant colors: yellow, orange, red, and teal. The text 'EXPERIENCE MAP • CHUN ADAMS' is centered in white, sans-serif font.

EXPERIENCE MAP • CHUN ADAMS

# Experience Map | Chun Adams



I found it. It looks promising!

That was quick and easy.

There are pros and cons, but I think I can work with this app.

I like the Finger Gym tool. I've already noticed a subtle change in my finger strength.

I can imagine using this app for a while as I continue to build finger strength and mobility.

I need some tools to exercise my fingers on my own time, wherever I am.

I need to take a few minutes and find that app my OT mentioned.

I don't have high hopes this app will address my unique challenges.

No one understands my needs.

A person wearing a patterned dress is shown from the waist down, holding a branch with small, light-colored flowers. The image is overlaid with several translucent, flowing ribbons in vibrant colors: yellow, orange, red, and teal. The text "PERSONA · AMANDA LEE" is centered in a white, sans-serif font.

PERSONA · AMANDA LEE



## Values & Aspirations

- Live pain free (w/o medication)
- Discover a healthy and safe long-term treatment plan
- Be able to do art projects and daily tasks like everyone else
- Help others cope with the effects of psoriasis

## Frustrations & Pain Points

- Chronic pain
- Shame about the appearance of her skin
- Embarrassment about her difficulty with simple tasks
- Feeling abnormal

## Biography

An established freelance book designer, Amanda lives in Cincinnati and works remotely for several clients. She is also a multimedia artist and likes getting her hands dirty. Amanda was recently diagnosed with psoriasis and psoriatic arthritis. Her hands are the most affected, making it difficult to do her work and daily activities. In addition to her skin rash, she sometimes experiences joint weakness and a lack of mobility.

# AMANDA LEE

Struggles w/psoriasis



"I want to feel normal and minimize the physical pain."

**Age:** 41

**Family:** Married w/o children

**Occupation:** Freelance book designer and art director

**Household income:** \$100K/year

**Location:** Cincinnati, OH

**WIFE/AUNT**  
**STRAIGHT**  
**MIDDLE CLASS**  
**BFA DEGREE**  
**CREATIVE**

## Attitudes & Motivations

Managing physical pain

Connecting w/family

Exploring new creative outlets

Eating healthy food

Staying physically active

## Behavioral Tendencies

Stay isolated

Network

Get routinized

Try new activities

Enforce habits

Build knowledge

Become lazy

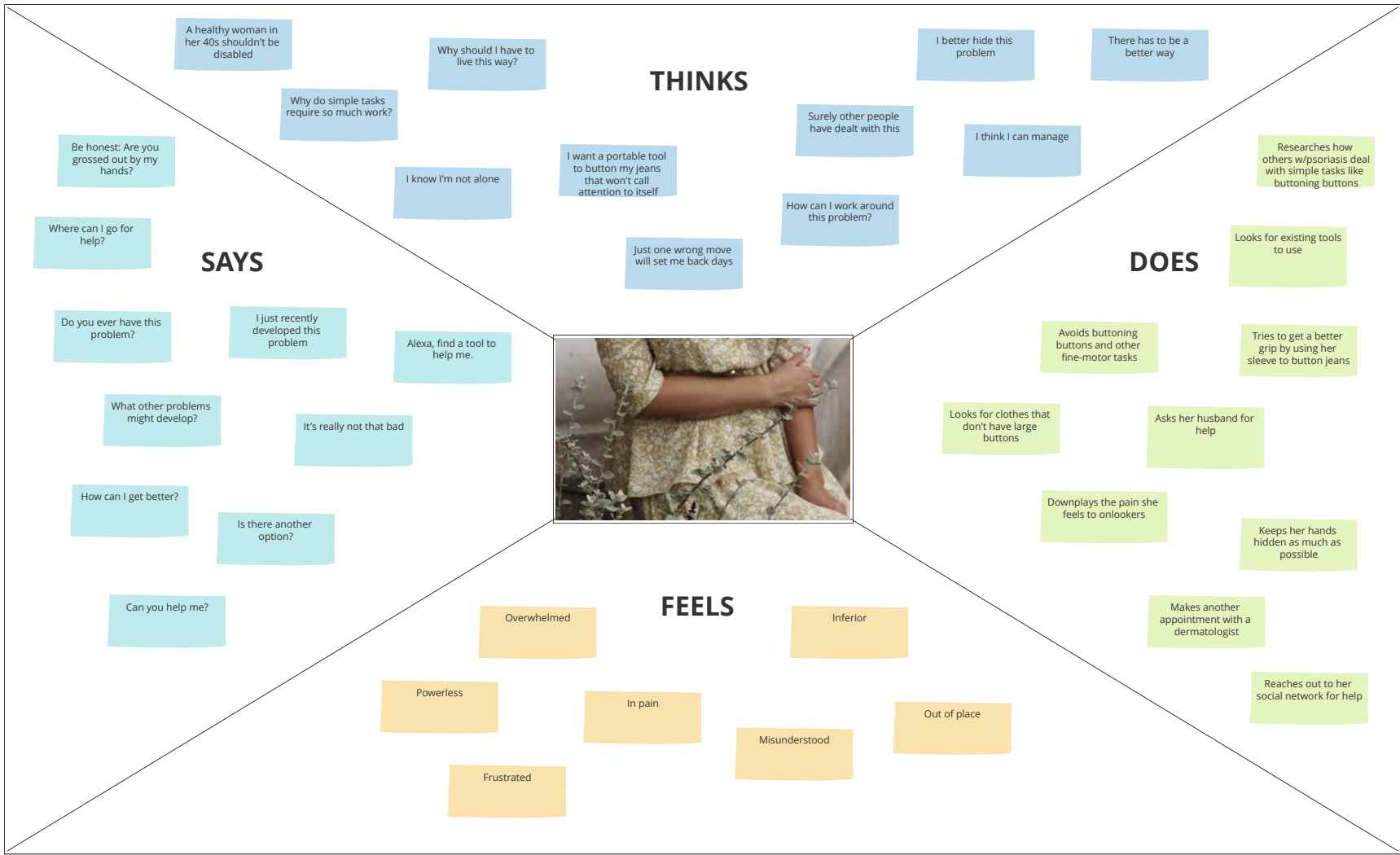
Exert energy

## Favorite Brands



A person wearing a patterned dress is shown from the waist down, holding a branch with small, light-colored flowers. The image is overlaid with several translucent, colorful ribbons in shades of yellow, orange, red, and teal. The background is dark and moody. The text "EMPATHY MAP · AMANDA LEE" is centered in white, sans-serif font.

EMPATHY MAP · AMANDA LEE



**PAIN**

- Amanda feels discouraged that she can't do everyday tasks, like buttoning her jeans.
- In public settings, Amanda is embarrassed by her hand disability, which calls her out as "other" and "different."
- Amanda is frustrated that the only long-term solution she is aware of is prescription medication, which she has health concerns about taking.
- Amanda feels stuck in a cycle of limited mobility and repeated injury that makes it hard for her to try new activities. Her personal fashion choices are also limited by what she can't do with her hands.

**GAIN**

- Amanda is creative and inclined to find her own solutions to problems.
- Amanda has several friends and family members she could go to for advice.
- Amanda has good research skills and is confident she'll figure this out.
- Amanda has overcome other health hurdles and adopted a healthier lifestyle.

**SCENARIO:**

An established freelance book designer, Amanda lives in Cincinnati and works remotely for several clients. She is also a multimedia artist and likes getting her hands dirty. Amanda was recently diagnosed with psoriasis and psoriatic arthritis. Her hands are the most affected, making it difficult to do her work and daily activities. In addition to her skin rash, she sometimes experiences joint weakness and a lack of mobility.

Amanda signed up for a painting class in Cincinnati. But after arriving at the first class session, she immediately regrets her decision. She realizes she has to wear gloves to protect her skin from the paint and chemicals, making her feel awkward in a social setting.

In the private sphere, she has recently encountered difficulty buttoning her jeans because the large, hard buttons are painful to grasp and operate. These types of movements often split her fingers and reopen old wounds. When she's experiencing a flare-up, her grip is also weakened and the pain doesn't justify the end result of buttoned jeans, so she just leaves her pants unbuttoned and wears a long shirt to cover up.

Amanda's preferred condition is one in which she fits in with other people in social settings and is able to do the activities she enjoys. She's tired of having a "secret" that she's ashamed of and feels compelled to find creative ways to constantly hide from others.

A woman in a patterned dress is shown from the waist down, holding a branch with small, light-colored flowers. The image is overlaid with several translucent, flowing ribbons in vibrant colors: yellow, orange, red, and teal. The background is dark and moody, with the woman's dress and the branch being the primary focus. The text "STORYBOARD · AMANDA LEE" is centered in a white, sans-serif font.

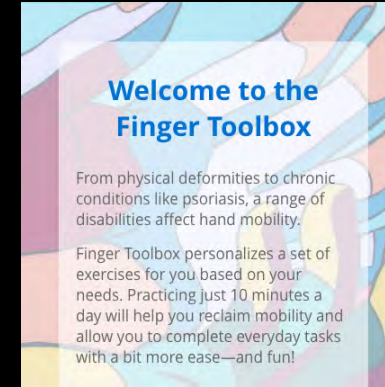
STORYBOARD · AMANDA LEE



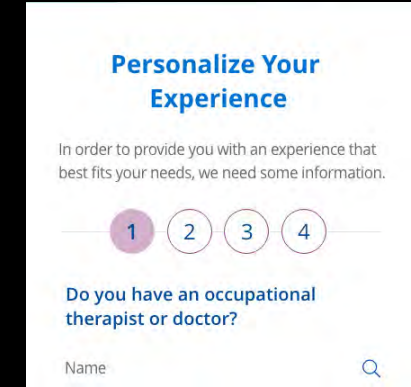
Amanda is experiencing a psoriasis flare-up and needs help. She has a lot of work to do that involves typing and drawing on her tablet, two activities that aggravate her condition.



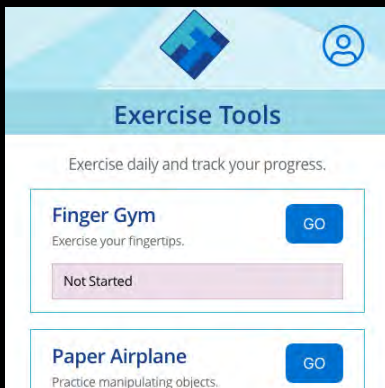
Amanda wonders if an app exists to help people like her build up hand strength and improve finger mobility. She picks up her phone and searches in the App Store.



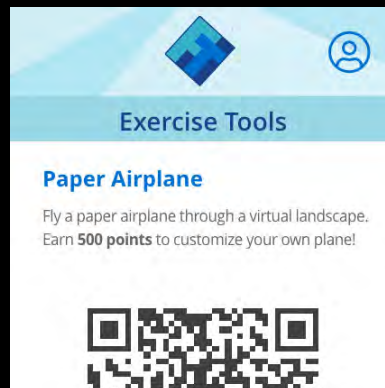
Amanda finds an app called Finger Toolbox. From the description, it looks like something that could help her. She downloads and installs it on her phone and opens it to learn more.



Amanda creates an account, signs in, and answers a few questions to personalize her experience and set her goals.



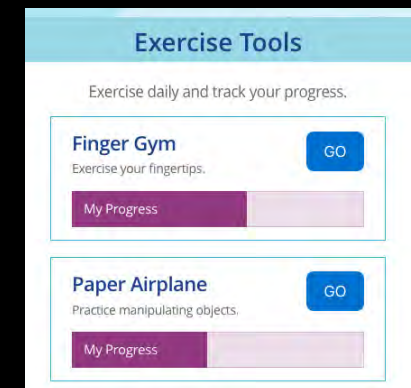
The app assigns Amanda personalized exercises based on her condition and goals. She starts with the Paper Airplane.



To access the Paper Airplane augmented reality (AR) experience, Amanda has to scan a Metaverse QR code.



Amanda pinches the virtual Paper Airplane to fly it around her office. Her fingertips are sore, but she's able to do the exercise.

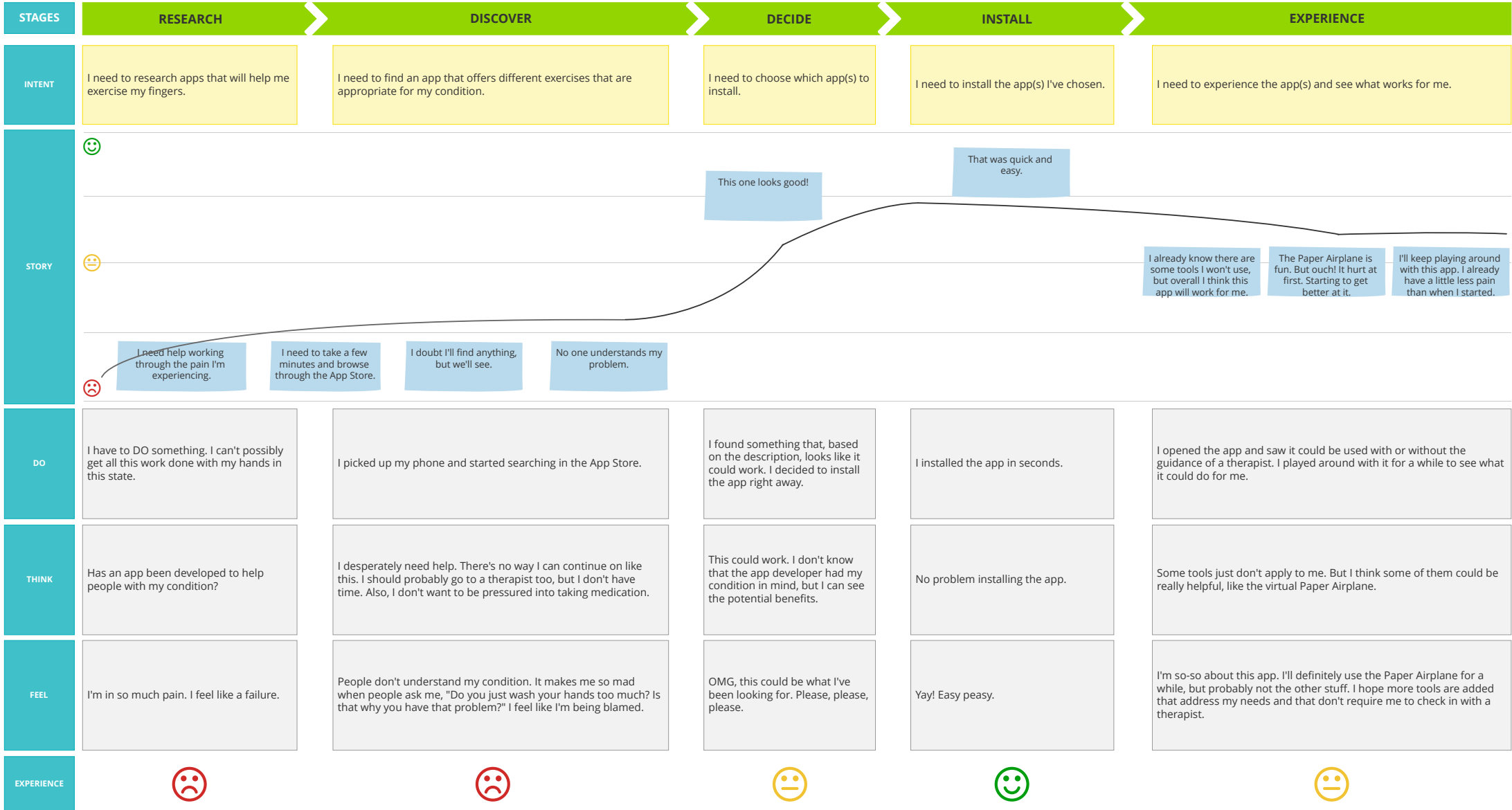


After a few minutes playing with the Paper Airplane, Amanda quits. She exits the AR experience and her progress is saved for next time.

A person wearing a patterned dress is shown from the waist down, holding a branch with small, light-colored flowers. The image is overlaid with several translucent, colorful ribbons in shades of yellow, orange, red, and teal. The background is dark and moody.

EXPERIENCE MAP • AMANDA LEE

# Experience Map | Amanda Lee

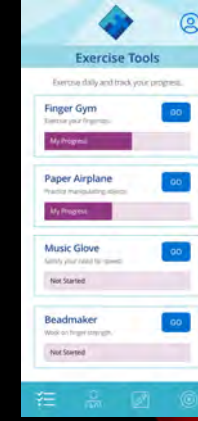
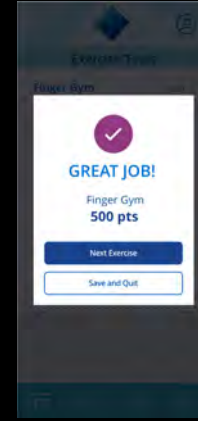
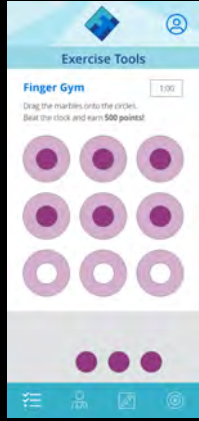
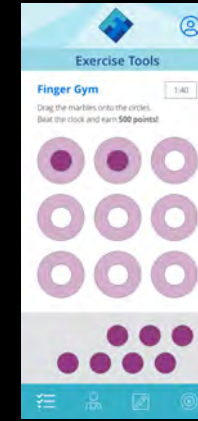
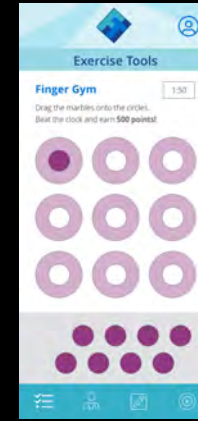
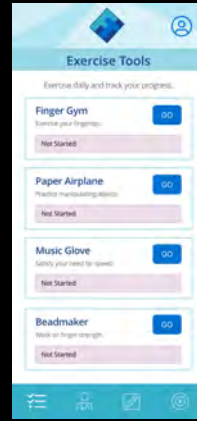
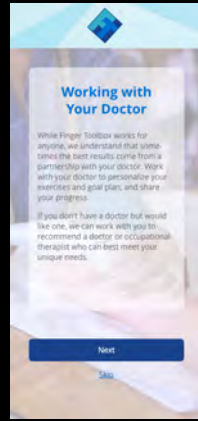
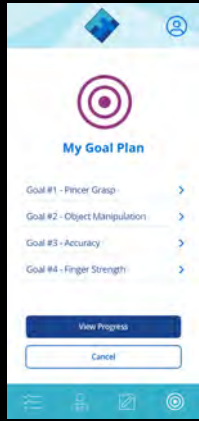
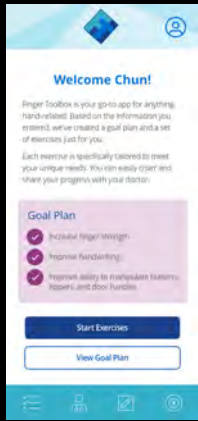
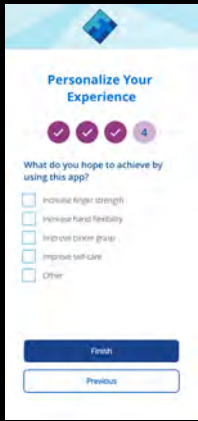
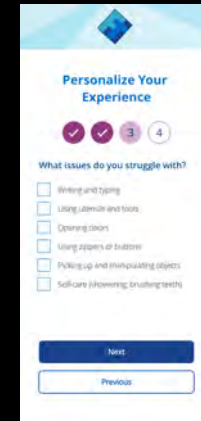
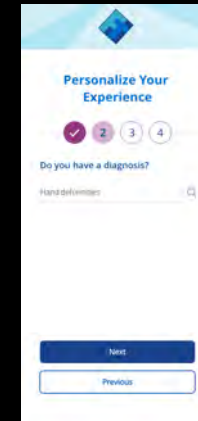
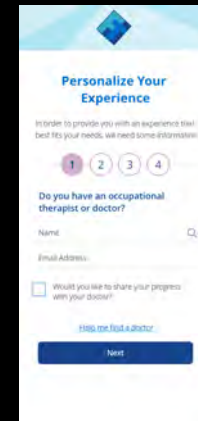
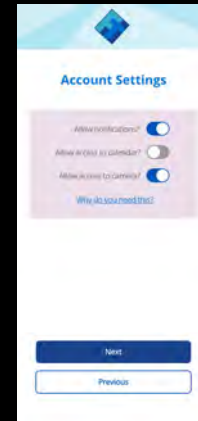
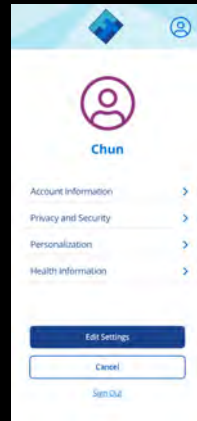
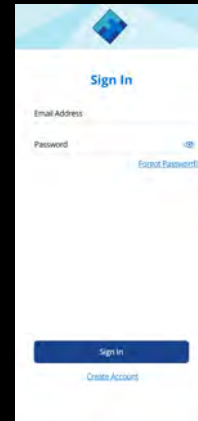
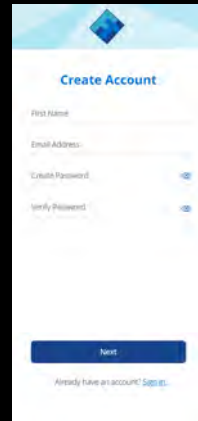
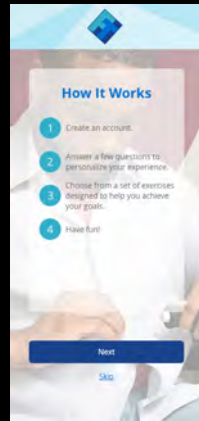
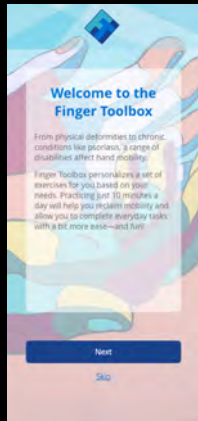


An abstract graphic on the left side of the slide, featuring a vibrant red background with a green, curved, translucent shape that resembles a stylized leaf or a modern architectural element. The shape is layered and has a slight shadow, giving it a three-dimensional appearance.

# DESIGN PROTOTYPE

The [app prototype](#), Finger Toolbox, was designed in Adobe XD and incorporates augmented reality via [Metaverse](#). It personalizes a set of exercises for users based on their unique needs. The app incentivizes users to practice at least 10 minutes a day to help them reclaim mobility and the ability to perform everyday tasks. As an optional feature, it also integrates treatment with the user's occupational therapist or doctor.







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# QUESTIONS?

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