

# **IN4MATX 133: User Interface Software**

**Lecture 19:**  
**Prototyping in Research**

# Today's goals

By the end of today, you should be able to...

- Articulate requirements needed for developing early-stage prototypes
- Consider how development requirements often shape design needs, for better or worse
- Describe research outcomes related to personal informatics

**What does it take to make a prototype?**

# What do I mean by making a prototype?

- Moving *beyond* a mockup or interactive prototype (e.g., what you might create in Figma or Adobe XD)
  - Almost always involves some coding
  - Often requires thinking about storage (databases), user profiles, telemetry
  - We'll discuss a bit more why to make a prototype
- You might see different phrases associated with this concept
  - High-fidelity prototype, Minimum viable prototype

# Question



How have you made prototypes in the past?

- A I've never sketched a design or made an app
- B I've made sketches in the past, but never made apps
- C I've made some apps before, never followed a sketch
- D I've made apps that have followed sketches
- E I've made apps with sketches, as well as databases, logins, and telemetry

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A

0%

B

0%

C

0%

D

0%

E

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# **Four stories of design and deployment**

# Four stories of design and deployment

- AT Planner
- ModEat
- SnapPI
- Mindful Garden

# AT Planner

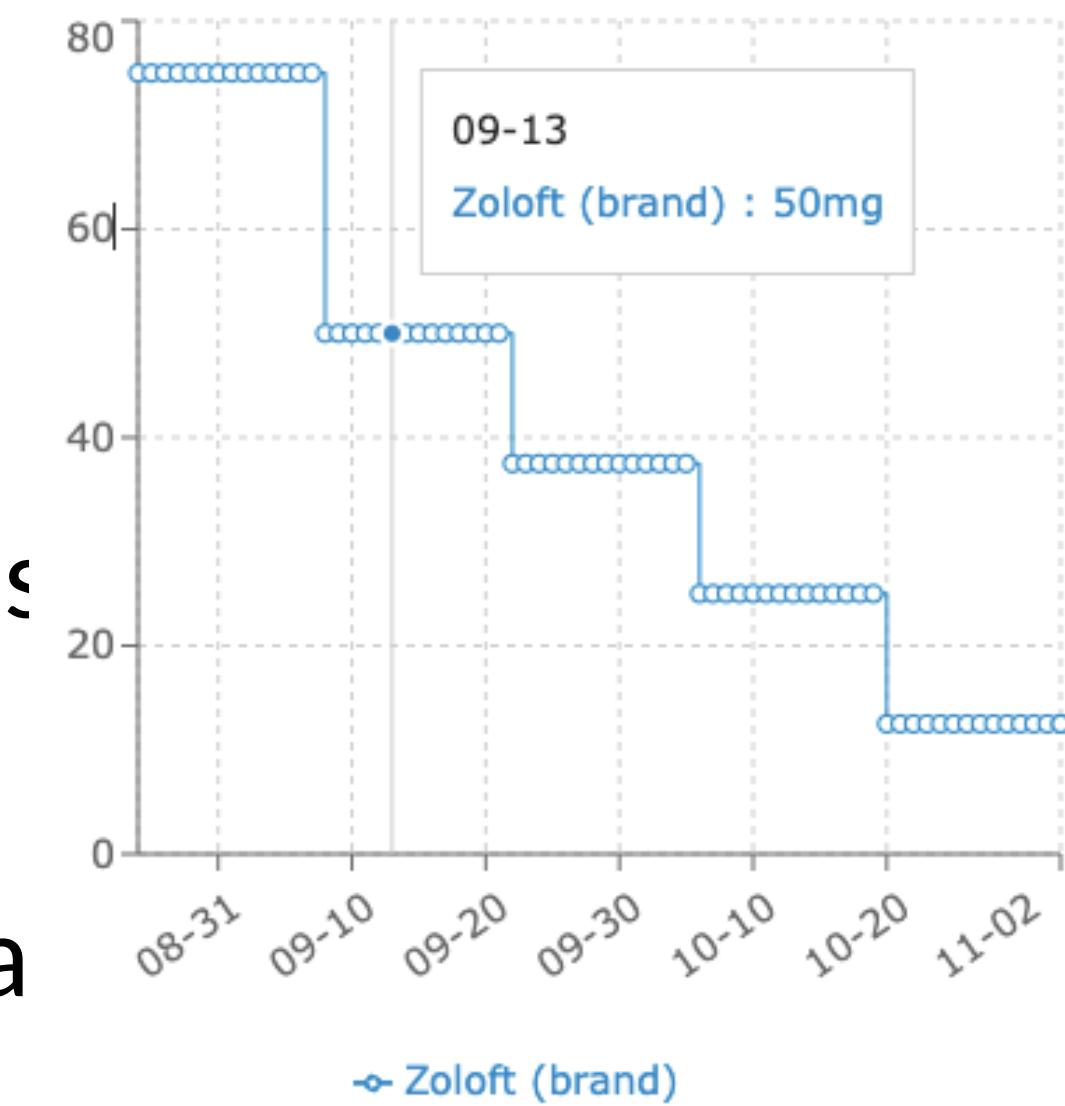
Papoutsaki, A., So, S., Kenderova, G., Shapiro, B., Epstein, D. A. Understanding Delivery of Collectively Built Protocols in an Online Health Community for Discontinuation of Psychiatric Drugs. *PACM HCI, 5(CSCW2)*, 2021

Jo, E., Ryu, M., Kenderova, G., So, S., Shapiro, B., Papoutsaki, A., Epstein, D.A. Designing Flexible Longitudinal Regimens: Supporting Clinician Planning for Discontinuation of Psychiatric Drugs. *CHI 2022*

# AT Planner

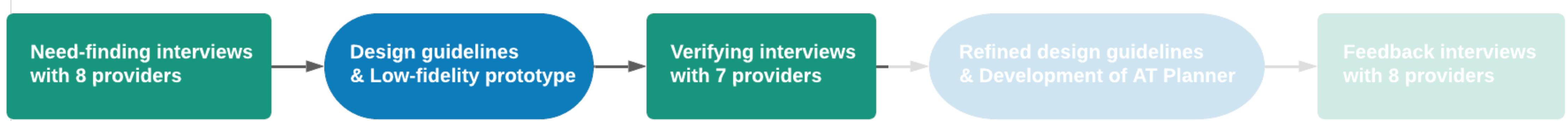
## Context

- Discontinuing use of antidepressants
  - It can be hard to withdraw without withdrawal symptoms. The best way is (*taper*) slowly
  - Many doctors want to support their patients, but don't have time quickly to taper
  - There are also practical restrictions, like drug dosages available
- Can technology help the doctors help their patients?

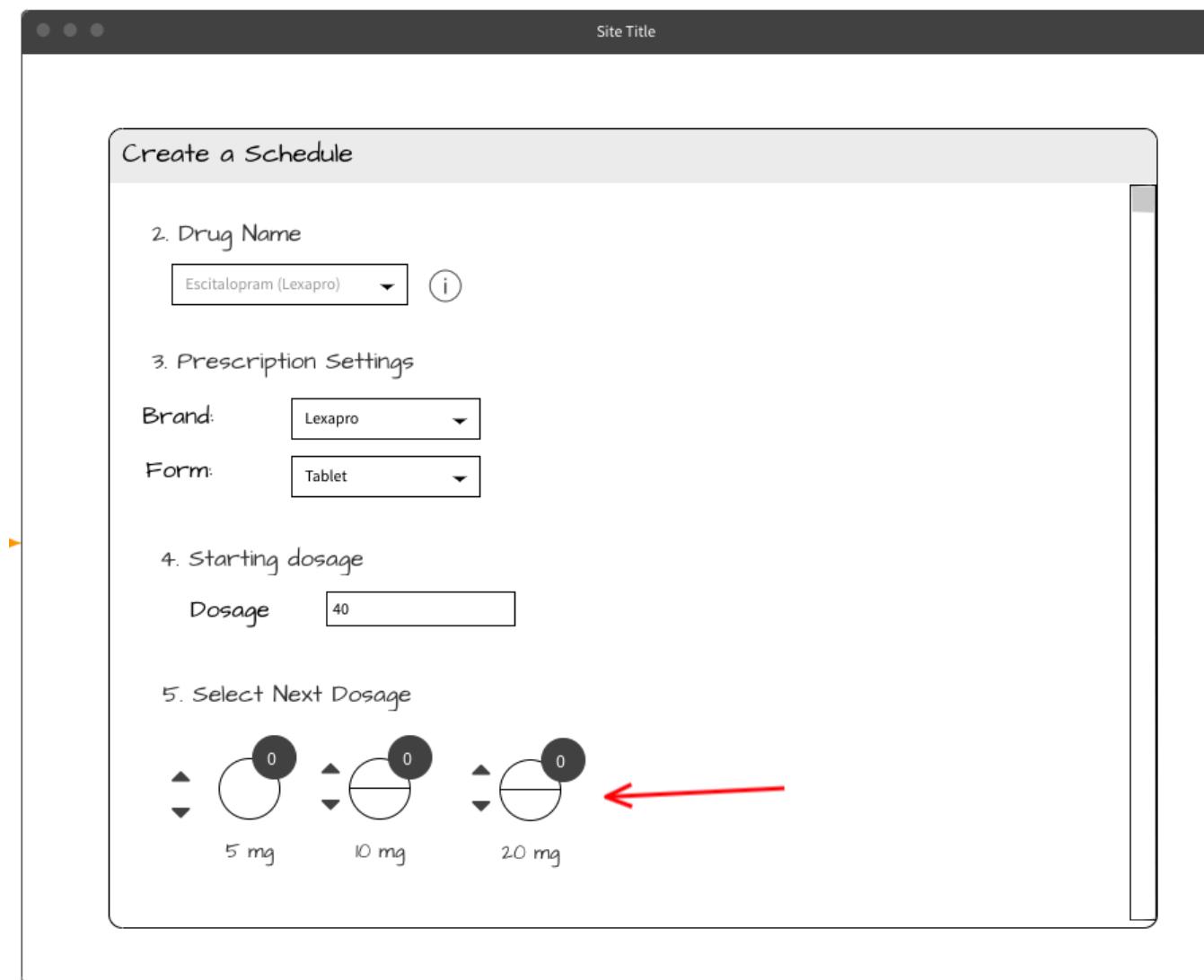
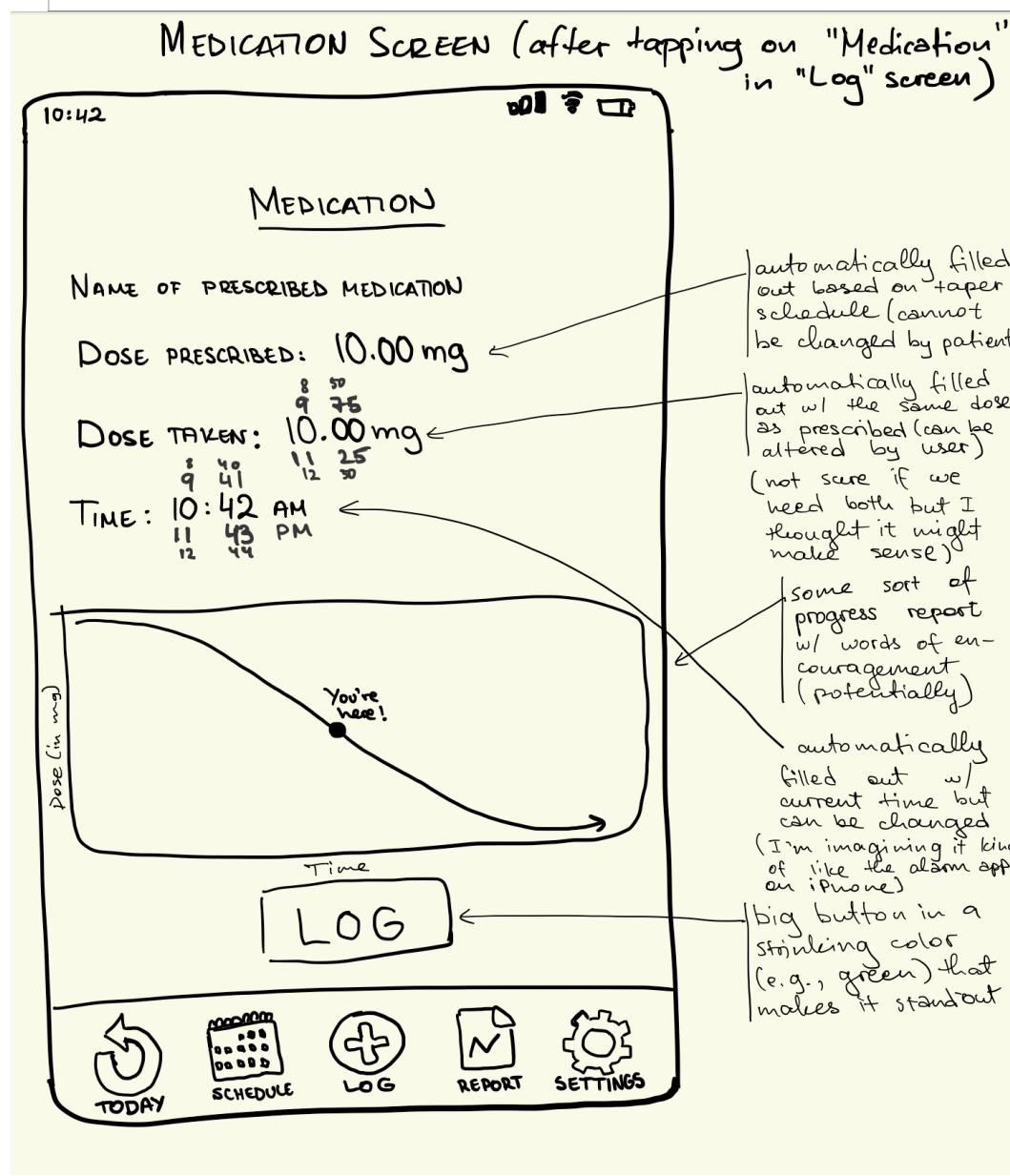


# AT Planner

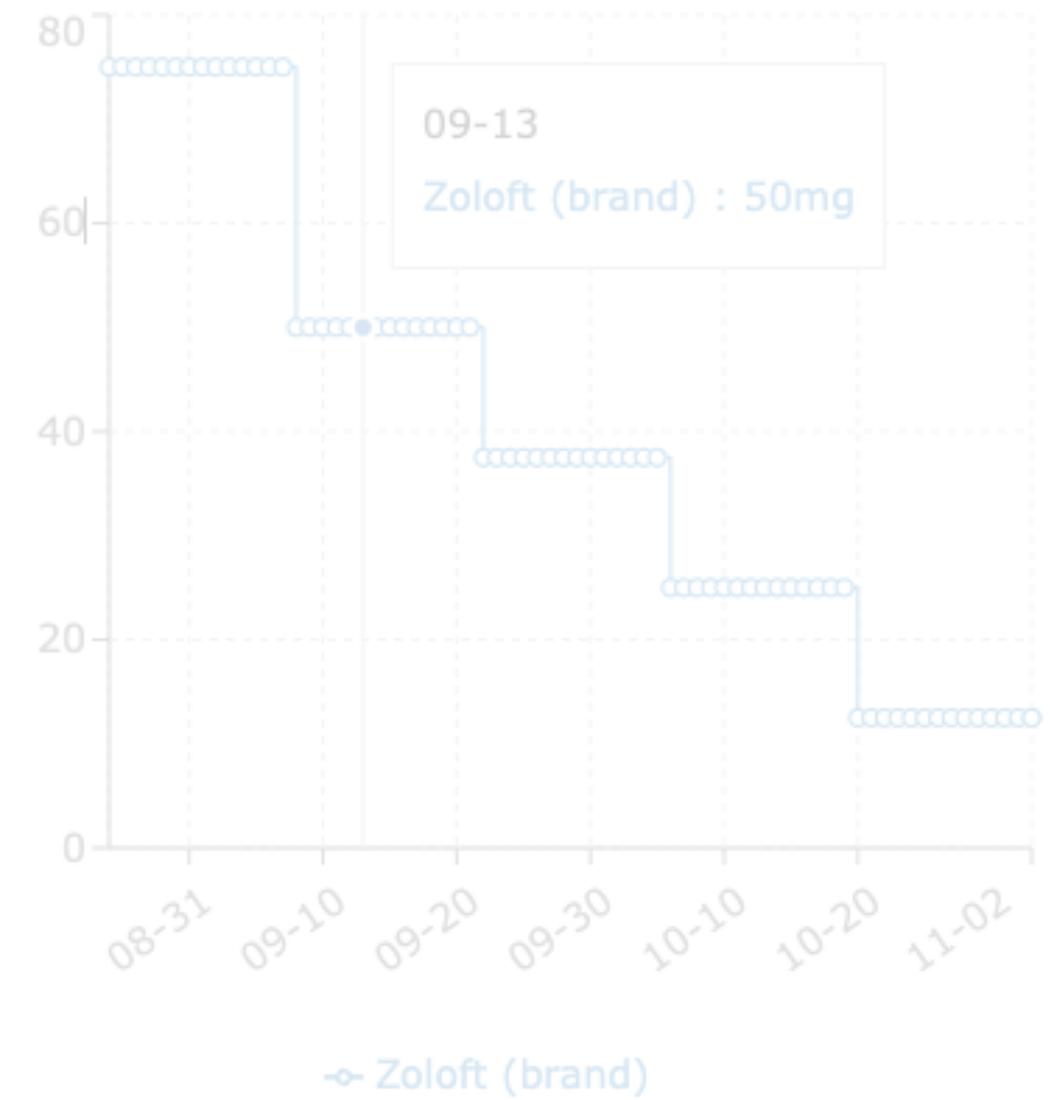
## Our process



Formative study



System design & Development



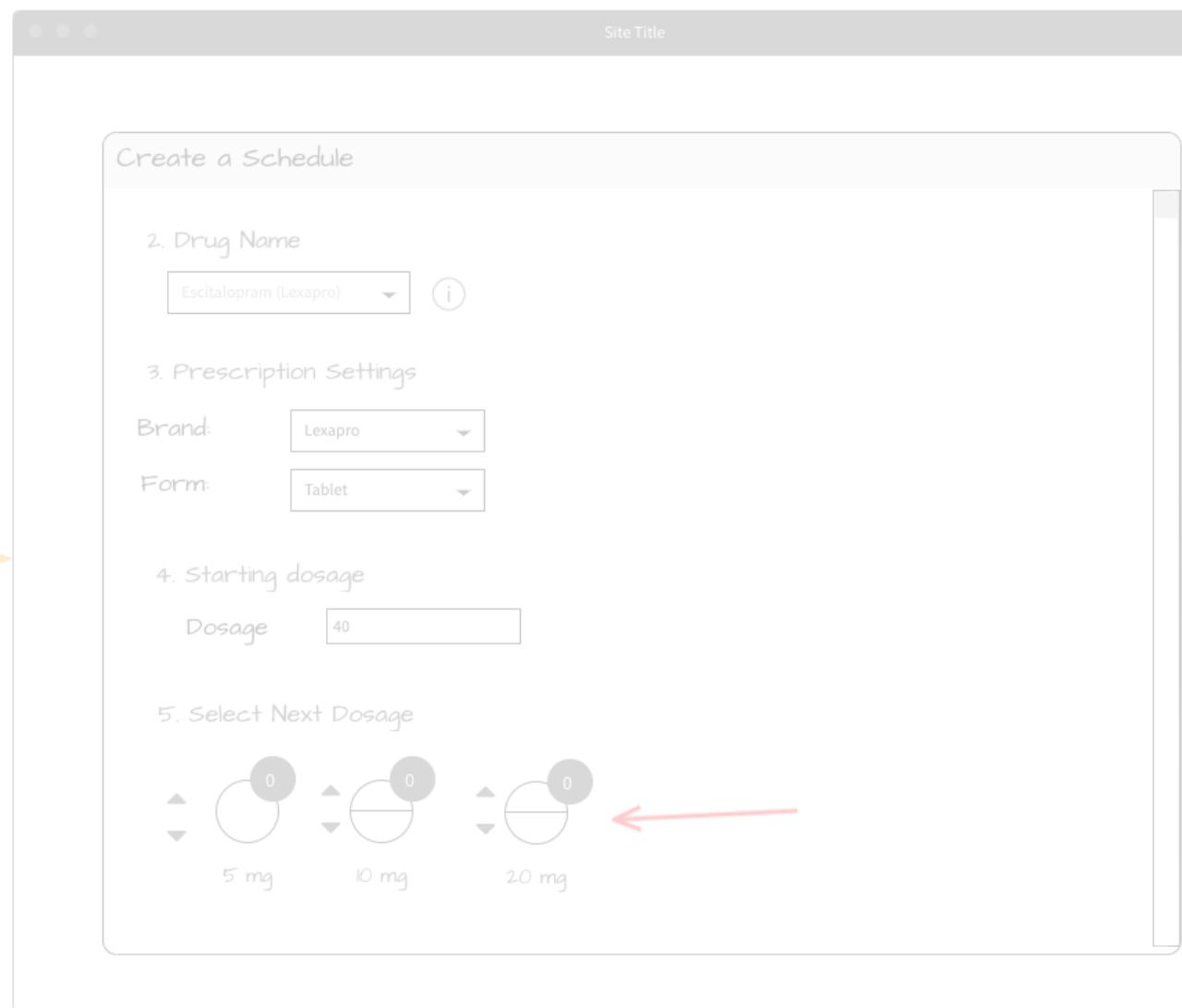
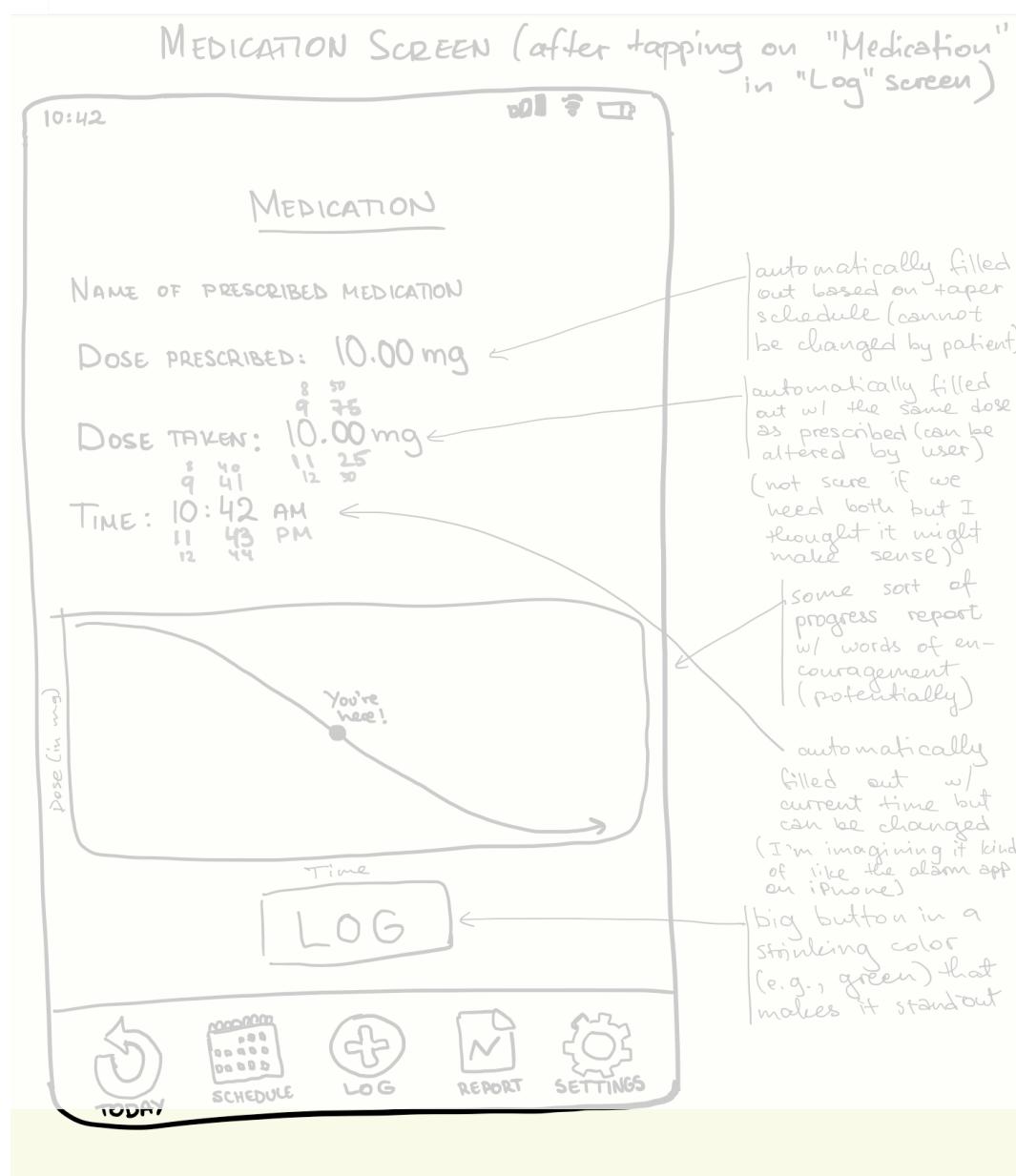
Feedback study

# AT Planner

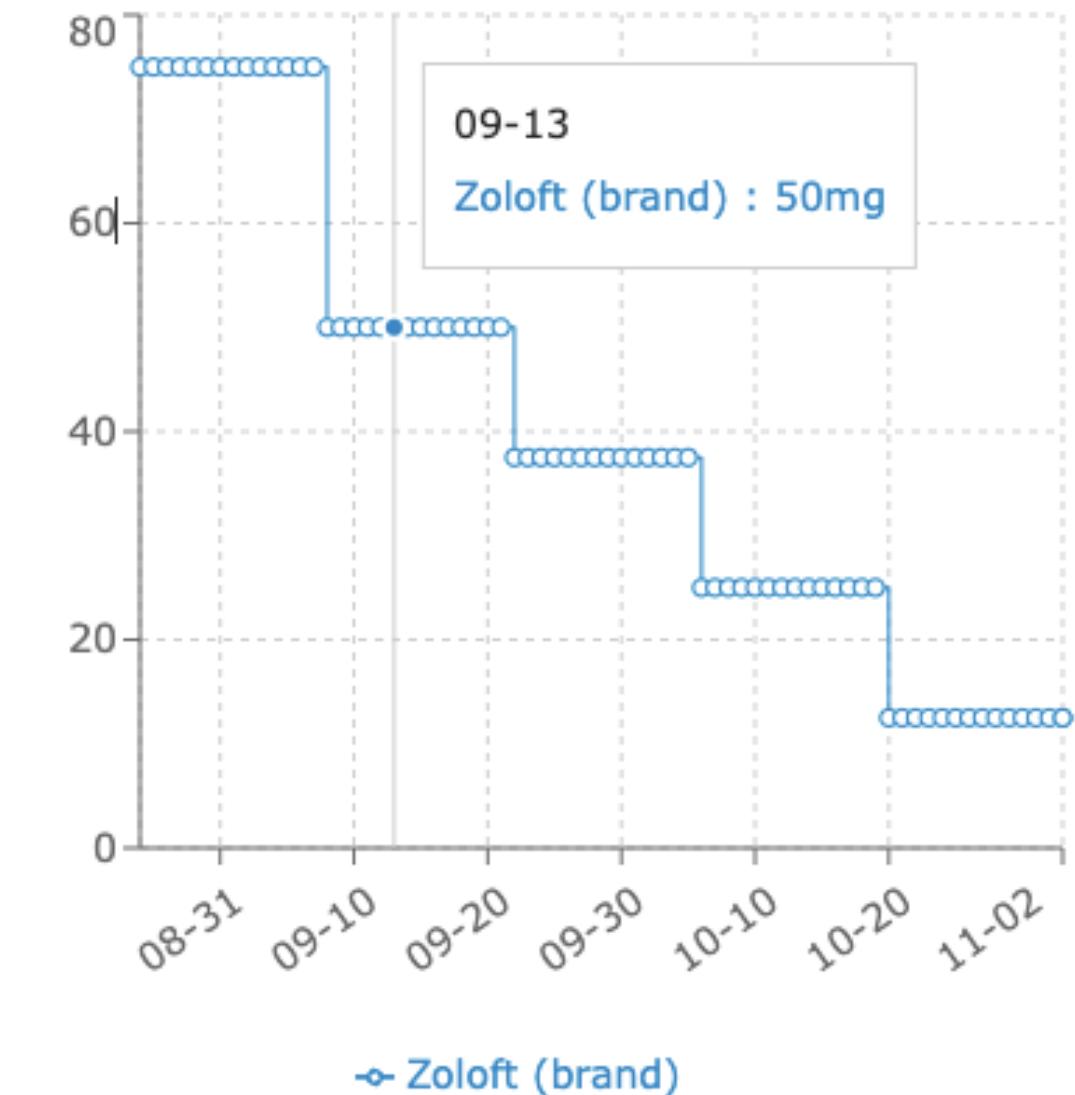
## Our process



Formative study



System design & Development



Feedback study

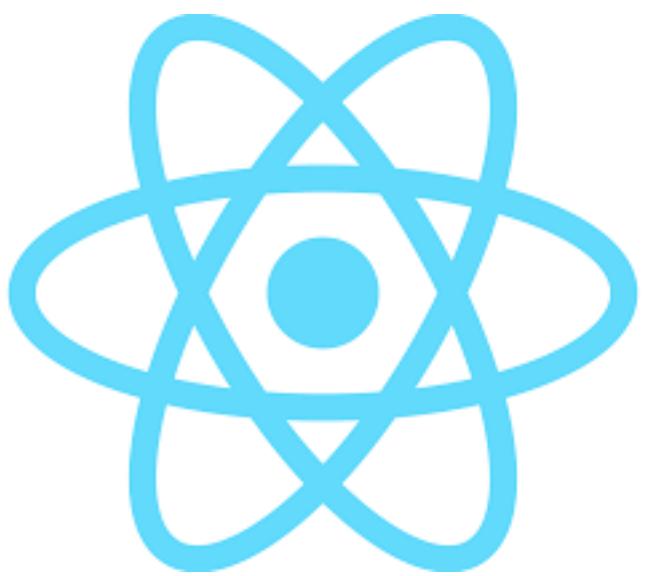
# AT Planner

The screenshot displays the AT Planner application interface. At the top, a blue header bar contains the text "Hello, Dr. John Smith". On the left, a vertical sidebar has a blue header labeled "AT Planner". Below this are three buttons: "Patients" (with a person icon), "Medication schedule" (with a calendar icon), and "Log Out" (with a right-pointing arrow icon). The main content area shows a patient profile for "John Greenberg" with a last visit date of "05/14/2021". A "Medication Schedule" section includes a "Create New" button with a cursor icon hovering over it. A note states "No medication schedule created". Below this is a "Notes" section with a large text input field and a "Save" button at the bottom right.

# AT Planner

## Specifications

- Max use: ~10 non-concurrent people, one time use
- React for website, Vega-Lite for visualizations
- No database, no profiles, no telemetry
- Built by 1 experienced developer over ~2 months



# AT Planner

## Why build it?

- A more “real” test of the interaction
  - The doctors could input a hypothetical patient’s data and see how the system responded
- Force us to face hard design questions
  - We had to think through edge cases, such as how doctors would want a system should respond if no appropriate pills of that medication were available

# AT Planner

## What was easy?

- The space makes sense technically
  - You need some math to figure out how dosages should decrease, and a lookup for what pill sizes are available for each medication
- Proof of concept with low technical specifications
  - The patient data could be totally fake. When you refresh the webpage, it's gone. No database needed!

# AT Planner

## What was hard?

- This was the end of the line
  - The bigger challenges in getting this out in the world have to do with HIPAA and medical IT infrastructure

# ModEat

Silva, L. M., Cibrian, F. L., Epstein, D. A., Bhattacharya, A., Ankrah, E. A., Monteiro, E., Beltran, J. A., Schuck, S. E., Lakes, K. D., Hayes, G. R. Adapting Multidevice Deployments During a Pandemic: Lessons Learned From Two Studies. *IEEE Pervasive Computing*, 21(1), 2021

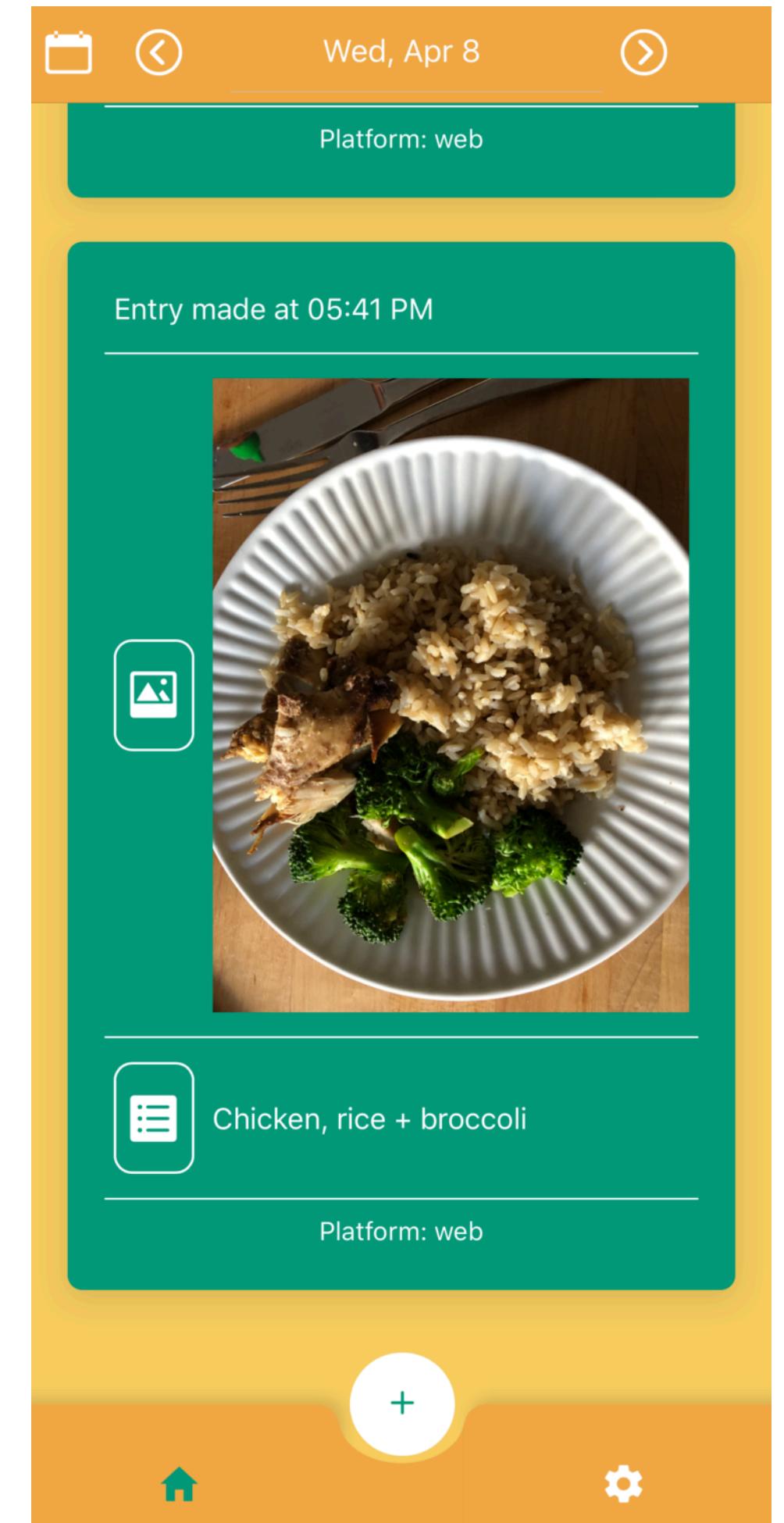
Silva, L. M., & Epstein, D. A. Investigating Preferred Food Description Practices in Digital Food Journaling. *DIS 2021*

Silva, L. M., Ankrah, E., Huai, Y., & Epstein, D.A. Exploring Opportunities for Multimodality and Multiple Devices in Food Journaling. *PACM HCI, 7(MHCI)*, 2023

# ModEat

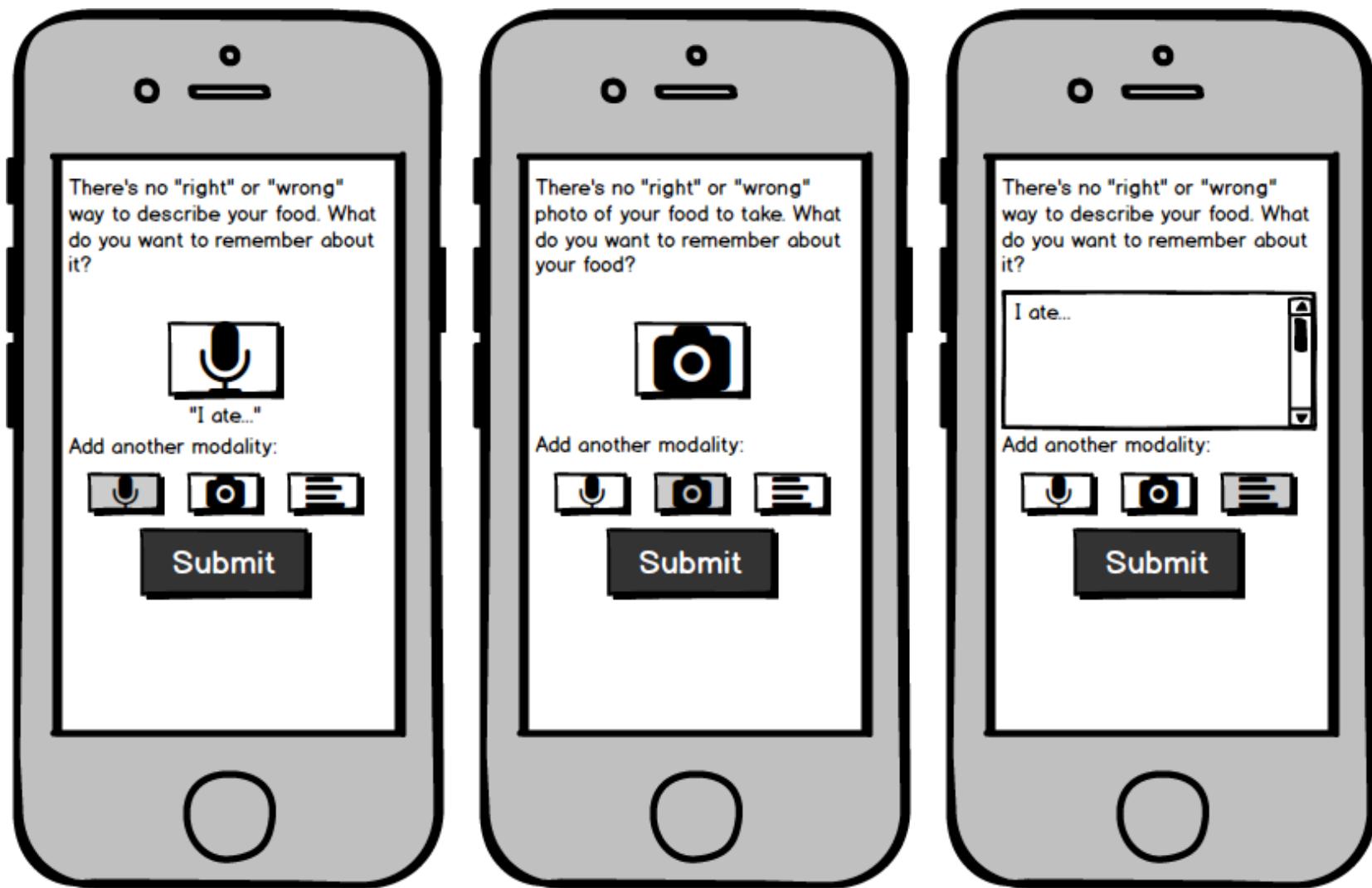
## Context

- Food journaling
  - It's burdensome, and people abandon it quickly
  - Being flexible in how to journal can theoretically lower burden, like supporting taking pictures or verbally describing foods
  - But apps don't give much choice, and are primarily for mobile
  - Do people find it more practical to journal across devices and modalities?



# ModEat

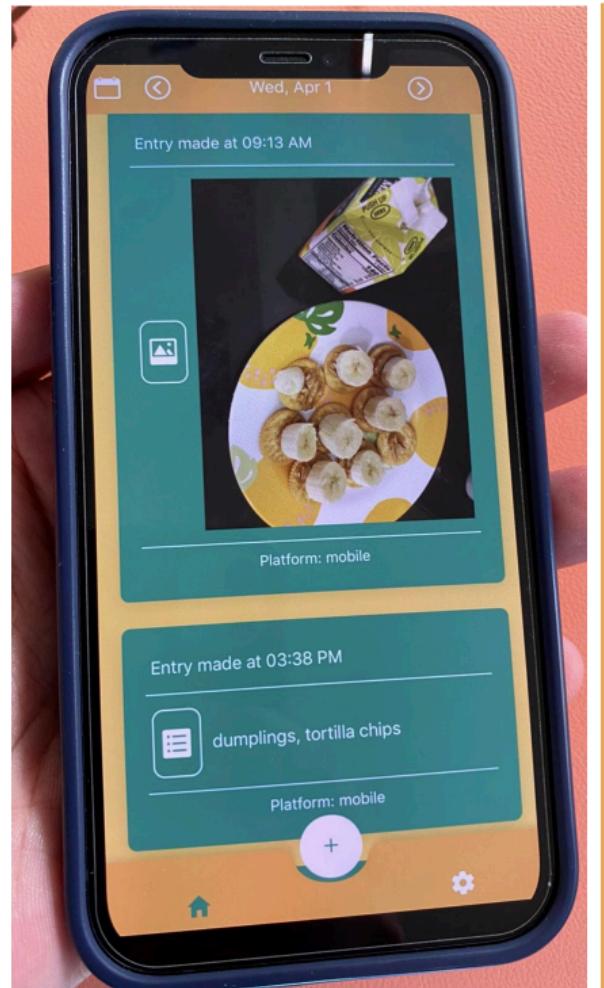
## Our process



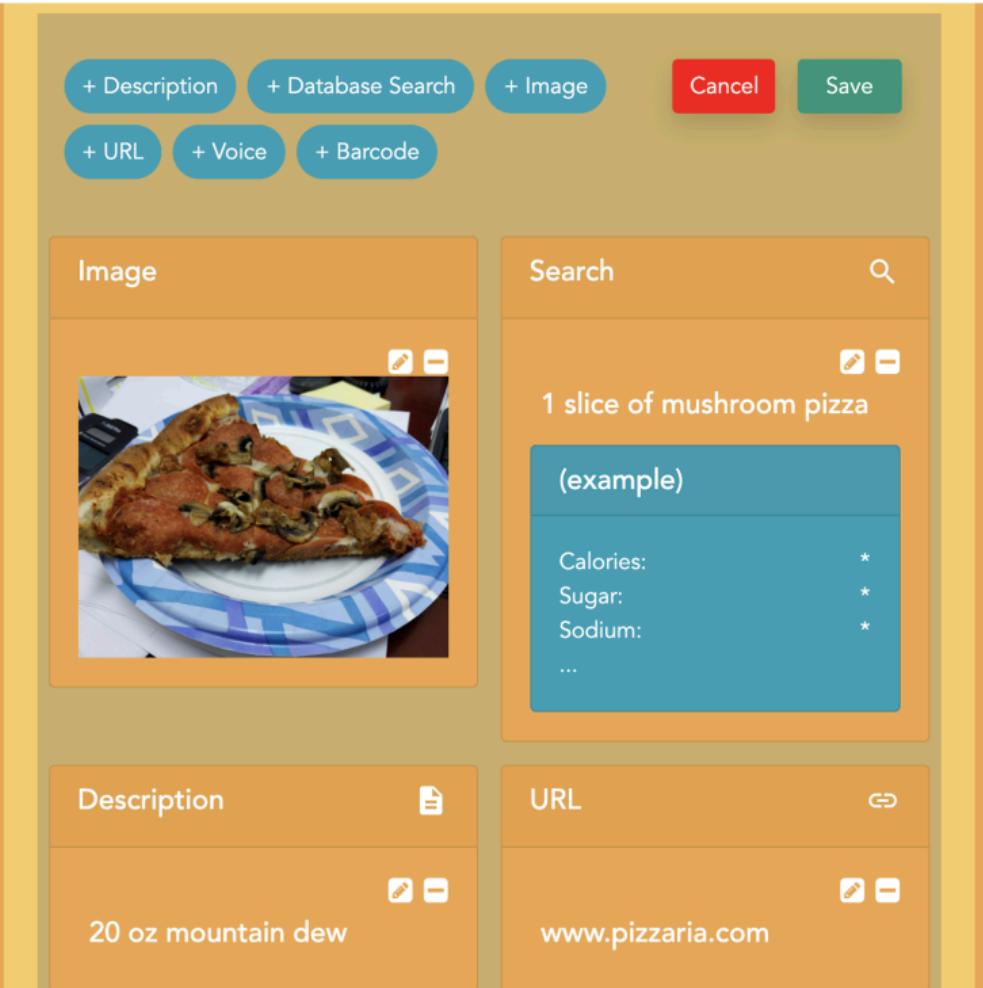
System	Journal Device	Journal Entry Style	Database Lookup	Barcode scanning	Voice log	Photos
Barcode Ed [79] (2006)	PDA		✓	✓		
PmEB [87] (2007)	Phone	✓				
MAHI [54] (2008)	Phone/Computer			✓	✓	
BALANCE [25] (2009)	Phone	✓				
VERA [5] (2012)	Phone					✓
POND [3] (2013)	Phone	✓				
DECAF [22] (2015)	Phone				✓	
MyBehavior [71] (2015)	Phone	✓ (1.0)			✓ (2.0)	
DIMA-P [13] (2016)	Phone	✓			✓	
Food4Thought [29] (2016)	Phone				✓	
Bites'n'Bits [9] (2017)	Phone				✓	
MyFitnessPal (Commercial)	Phone/Computer	✓	✓			
YouFood (Commercial)	Phone					✓

**Table 1.** Prior research and commercial systems often utilize mobile devices for food journaling, examining a range of entry styles. Few systems have supported more than one device for entry.

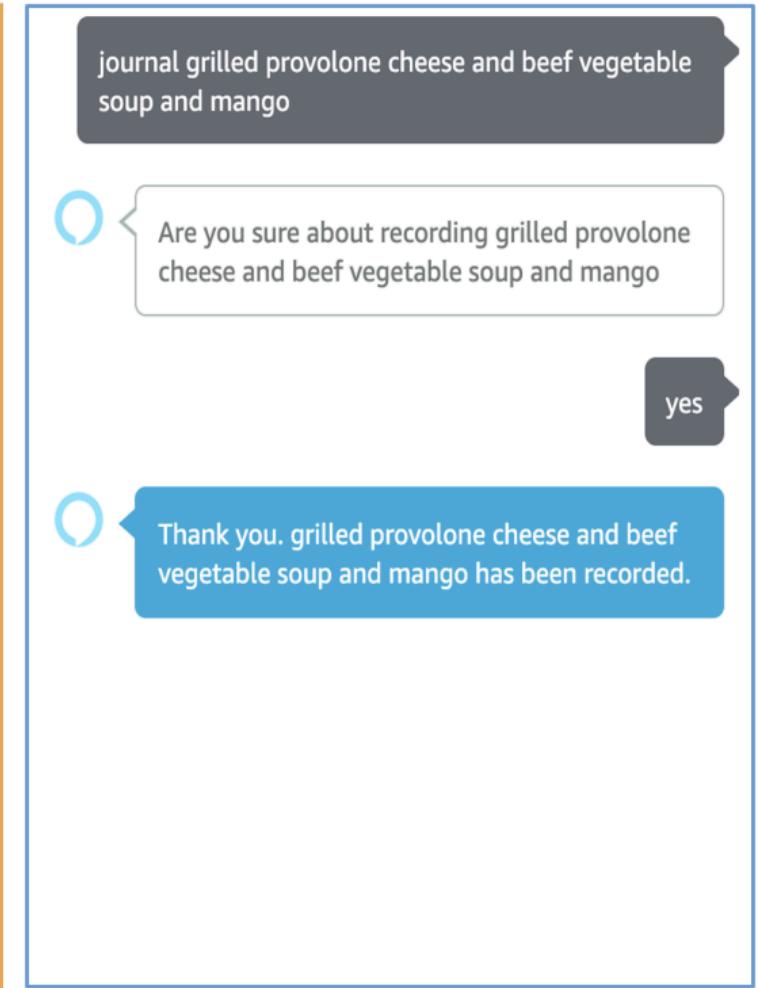
# ModEat



(a) Phone.



(b) Computer.



(c) Voice Assistant.



Voice	✓	✓	✓	✓
Photo		✓		✓
Barcode	✓			
Text description	✓		✓	
Database lookup	✓		✓	
Recipe link	✓		✓	

# ModEat

## Specifications

- Max use: ~20 concurrent people, ~4 devices/person, 2 weeks
- Ionic for iOS & Android mobile apps, Angular for website, Apple Watch, Alexa & Google Assistant
- Firebase for database and image storage
- Built by 2 undergrads (Alexa & Google Assistant), 1 undergrad and 1 experienced developer (Mobile, Web, Watch, Database) over ~6 months



# ModEat

## Why build it?

- We wanted to see what people would do in their everyday lives
- In retrospect, we probably could have cut some corners on the number of platforms we supported
  - But frankly, all of the little things added up (modalities, devices, database, user profiles)

# ModEat

## What was easy?

- A (mostly) common programming stack (HTML/CSS/JavaScript)
  - We could reuse code for backend stuff, particularly database saving and loading
  - Some reuse between frontend components, especially between web and mobile
- Could skip a lot of functionality that a real food journal would need
  - Calorie lookups, daily summaries

# ModEat

## What was hard?

- Supporting interaction across platforms
  - Smart speakers center voice rather than a screen, which required rethinking the interaction design
- Doing a “good enough” job with the interfaces on each platform
  - Not as simple as taking the mobile interface and “making it wider” for desktop

# SnapPI

Wang, D., Chheang, M., Ji, S., Mohta, R., Epstein, D. A. SnapPI: Understanding Everyday Use of Personal Informatics Data Stickers on Ephemeral Social Media. *PACM HCI*, 6(CSCW), 2022

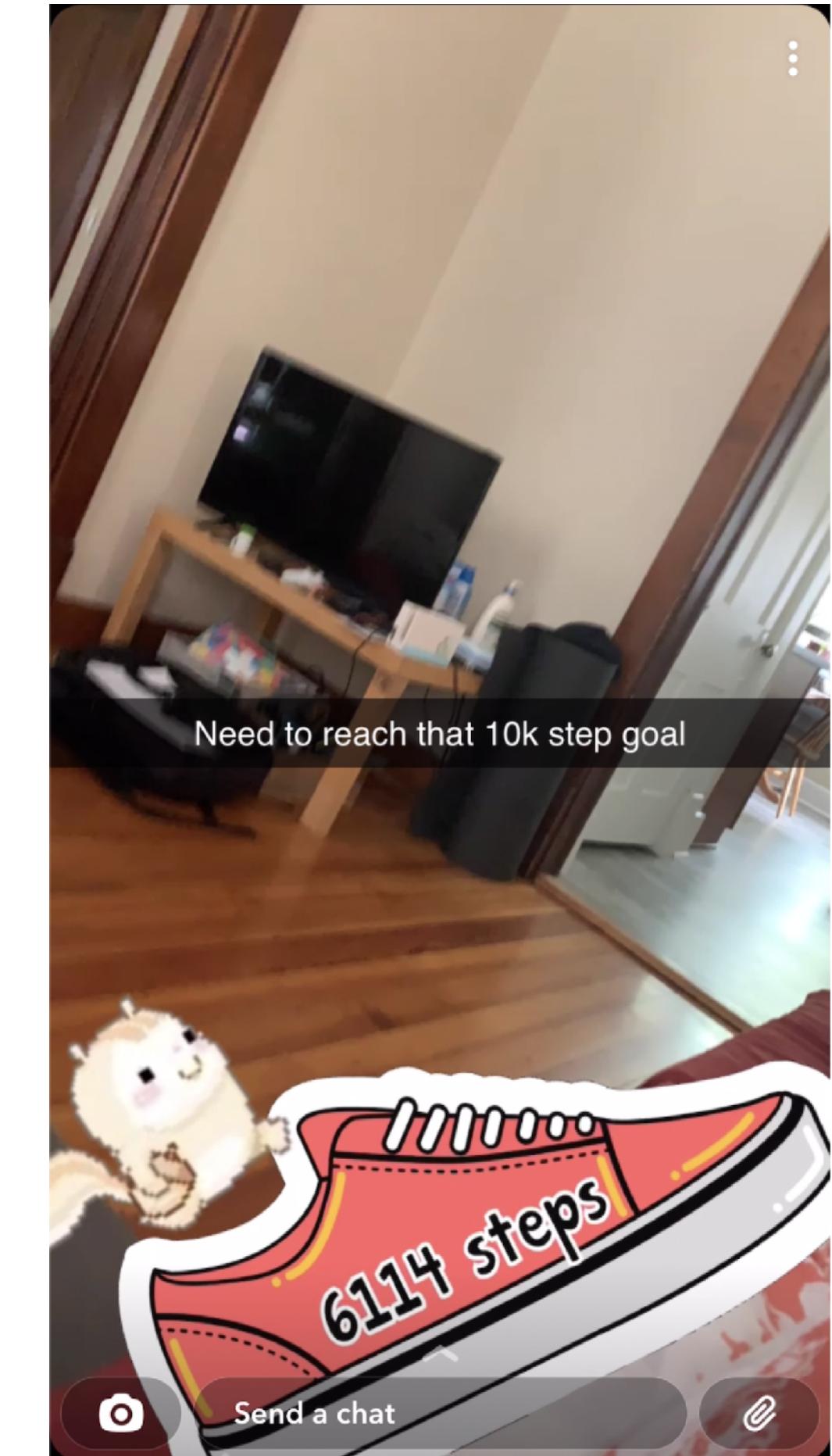
Epstein, D. A., Ji, S., Beltran, D., D'Haenens, G., Li, Z., Zhou, T. Exploring Design Principles for Sharing of Personal Informatics Data on Ephemeral Social Media. *PACM HCI*, 4(CSCW2), 2020

Epstein, D. A., Liu, F., Monroy-Hernández, A., Wang, D. Revisiting Piggyback Prototyping: Examining Benefits and Tradeoffs in Extending Existing Social Computing Systems. *PACM HCI*, 6(CSCW), 2022

# SnapPI

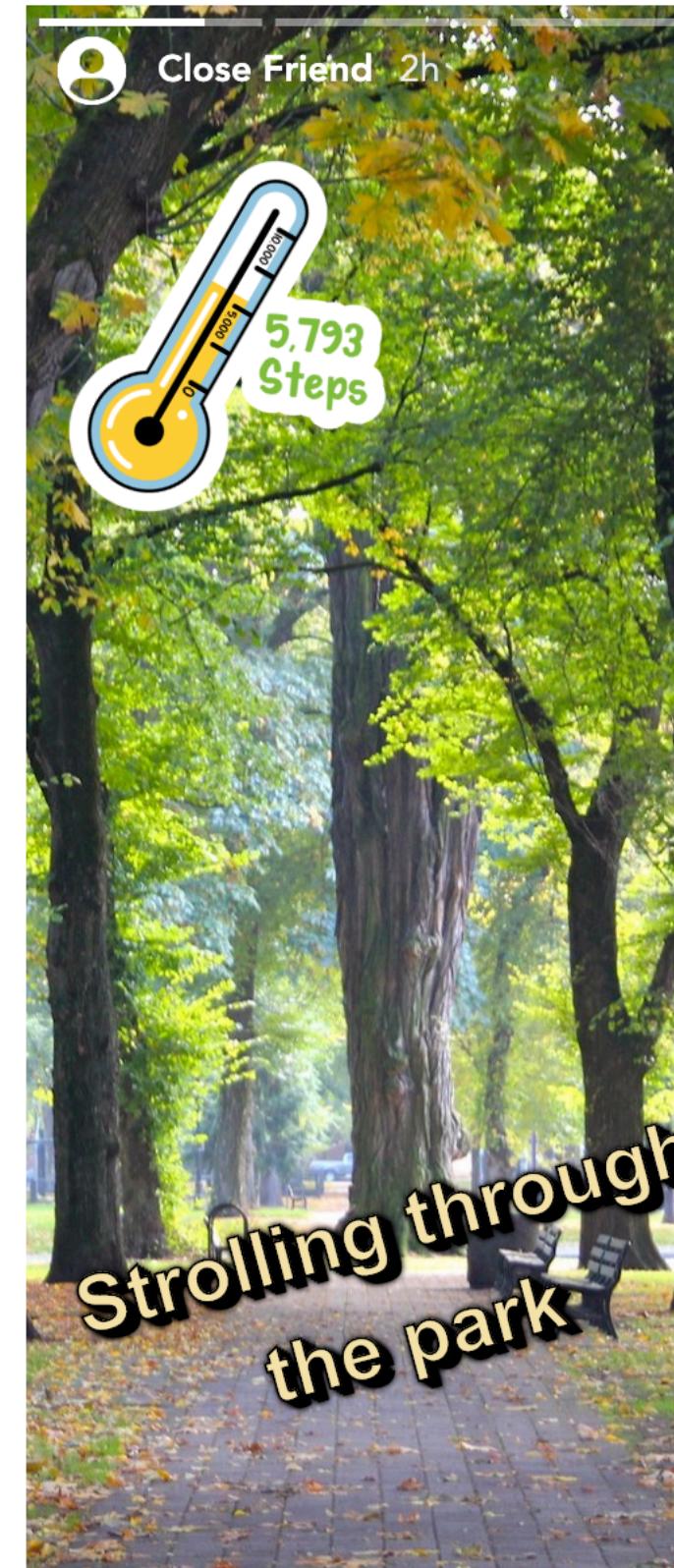
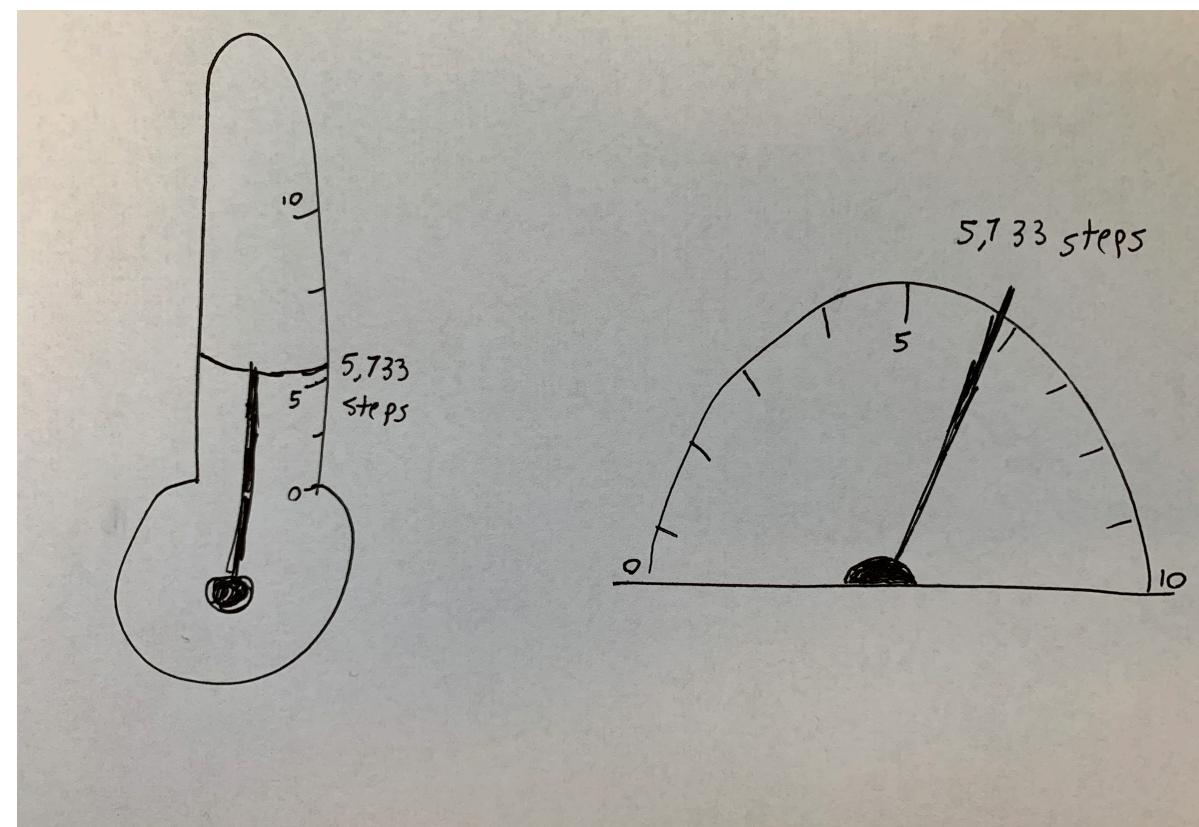
## Context

- Health data on social media
  - It can be awkward. People often try to present themselves positively on social media, but often need vulnerability and accountability to get help around their health goals
  - More casual, everyday sharing may be more appropriate to achieve these goals, which led us to design stickers for Snapchat, as a casual platform and interaction technique
- What do people actually think of data-driven stickers on Snapchat?



# SnapPI

## Our process



Based on this snap, please rate to what level you agree with each of the following statements.

I would find this Snap fun to receive.

Strongly Disagree       Strongly Agree

I would feel good about responding to this Snap.

Strongly Disagree       Strongly Agree

I would learn a lot about my close friend or family member from this Snap.

Strongly Disagree       Strongly Agree

I would find this Snap exciting to receive.

Strongly Disagree       Strongly Agree

I am inclined to respond to this Snap.

Strongly Disagree       Strongly Agree

I think the information obtained about my close friend or family member from this Snap would be helpful.

Strongly Disagree       Strongly Agree

I might respond to this Snap.

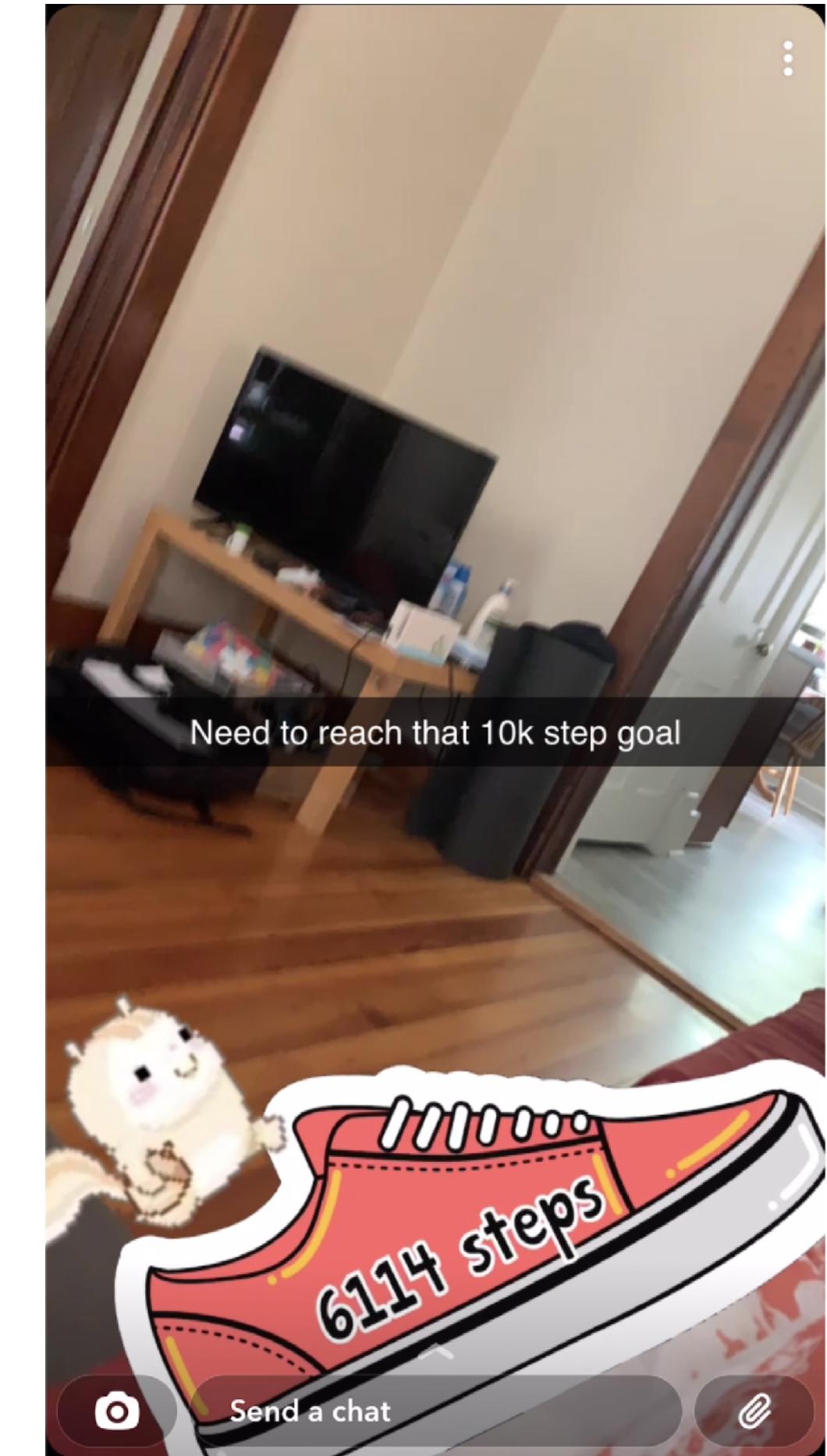
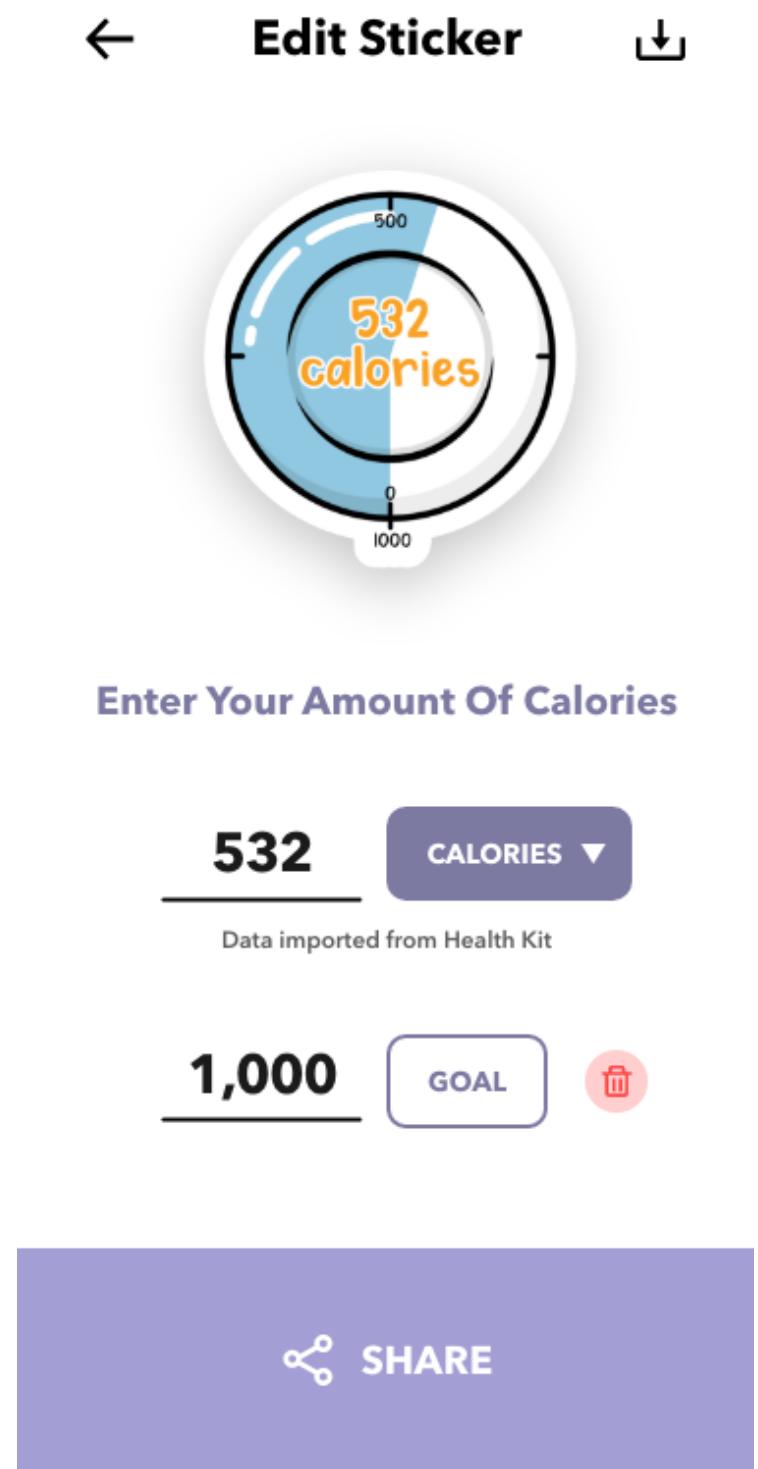
Strongly Disagree       Strongly Agree

I would feel positive about responding to this Snap.

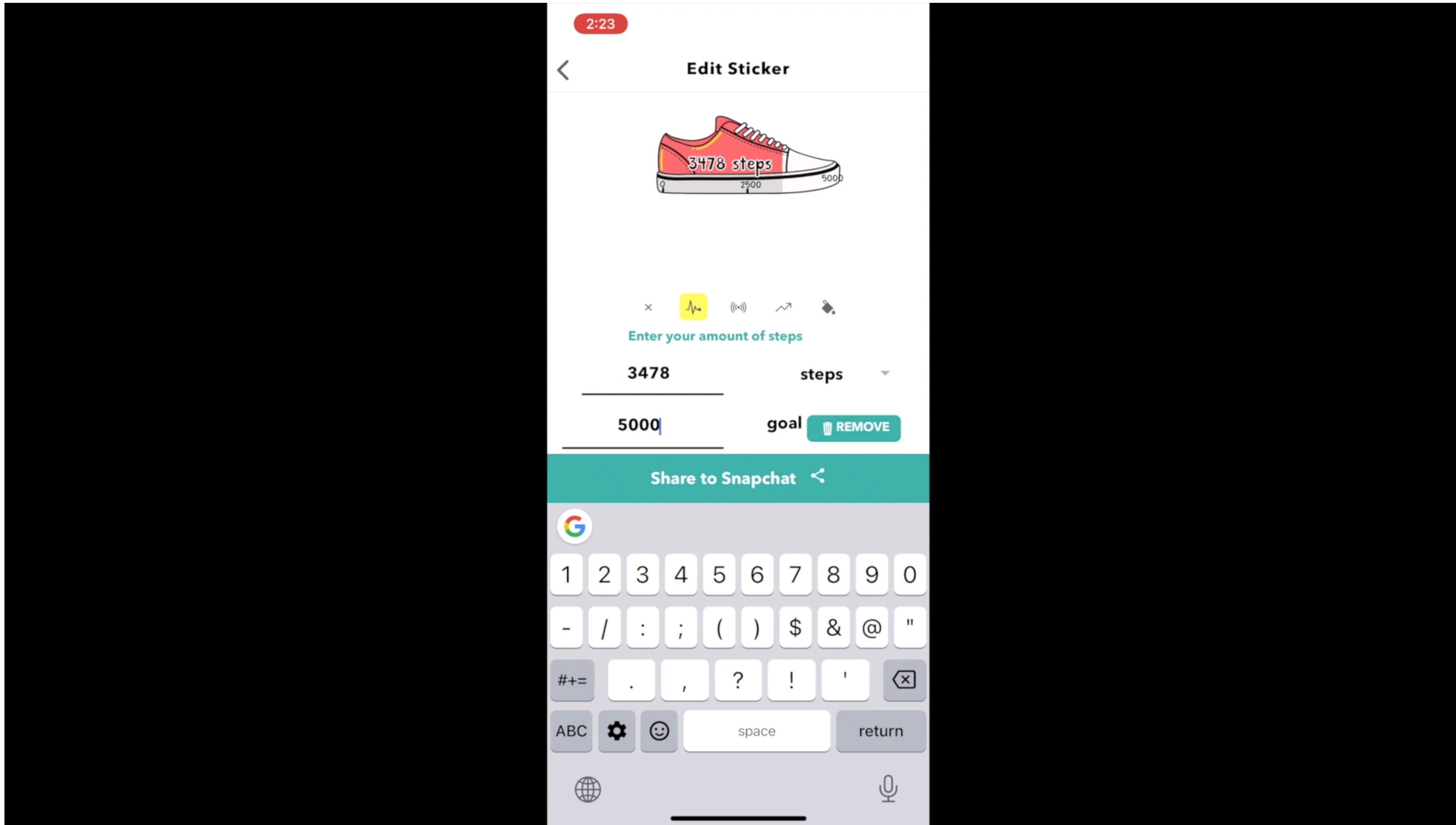
Strongly Disagree       Strongly Agree

# SnapPI

## Our process



# SnapPI



# SnapPI

## Specifications

- Max use: ~25 concurrent people, 3 weeks
- Ionic for mobile (iOS-only), APIs from Apple Health, Spotify, Nutritionix for tracked user data, Firebase for database
- Snap's Creative Kit API for getting the stickers into Snapchat
- Custom website for hosting the stickers (more on this later)
- Built by 4 undergrads, 1 experienced developer, and me (just a little) over ~2 years



# SnapPI

## Why build it?

- Initial reactions to the concept of stickers were positive
- But, we wanted to know if people would actually use the stickers
  - People are notoriously skeptical to bring up health and wellbeing topics on social media, so we wanted to see if stickers would help

# SnapPI

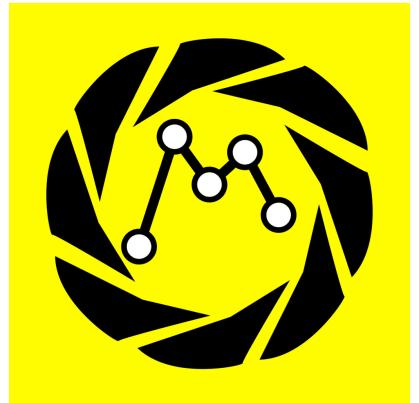
## What was easy?

- We could leverage Snapchat
  - We didn't have to reinvent social media; people were already talking to their friends
  - We didn't have to remake Snapchat's customization options
- Could integrate with existing tools for tracking (Spotify, HealthKit, Nutritionix)
  - We could focus on building the social component instead

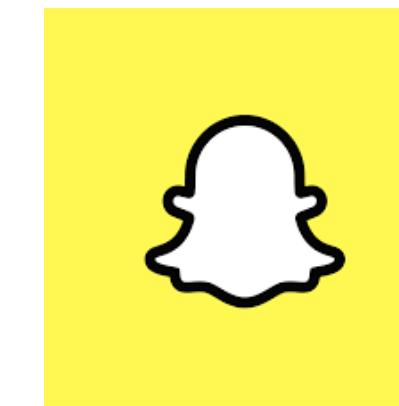
# SnapPI

## What was hard?

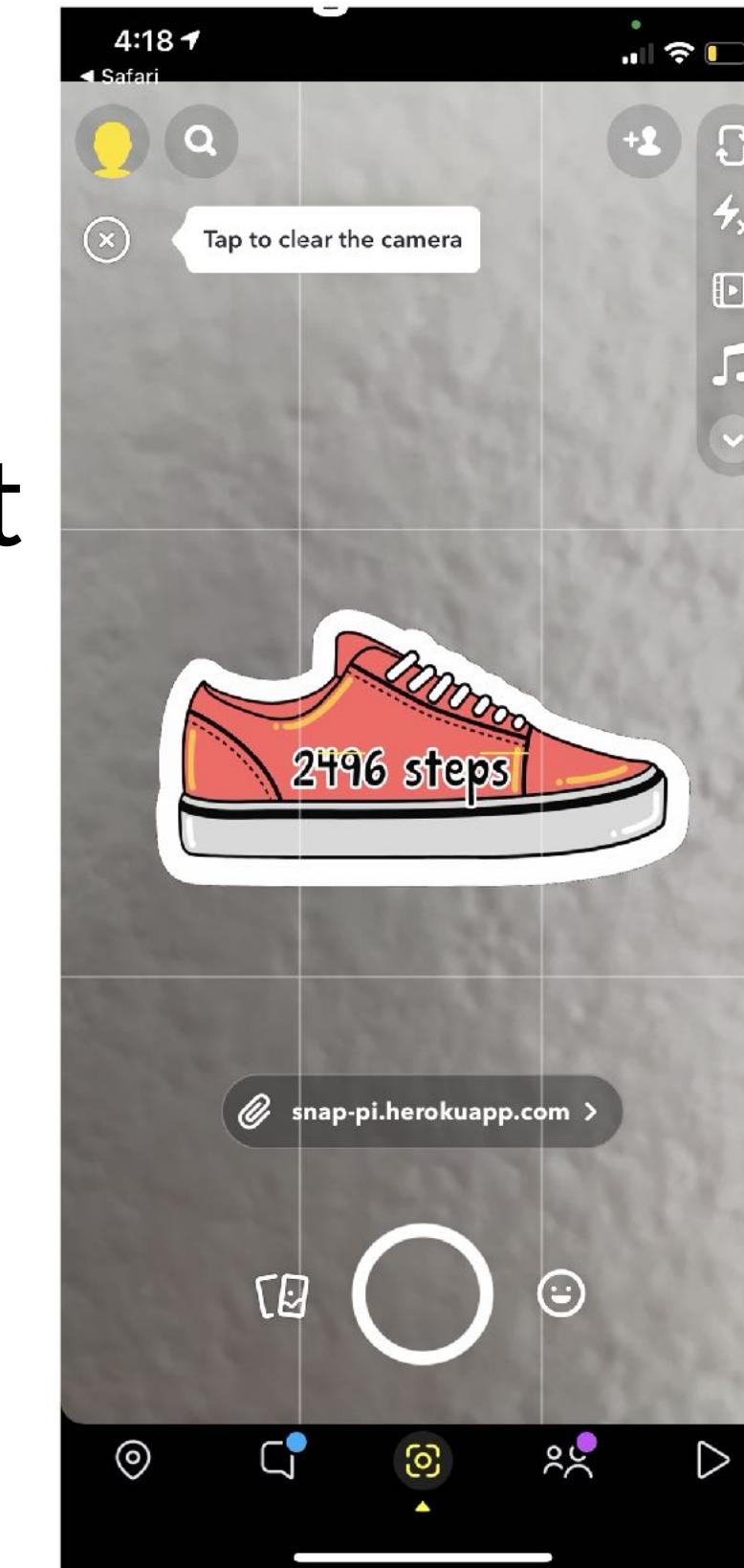
- Getting a sticker to actually show up in Snapchat



Our App



Snapchat



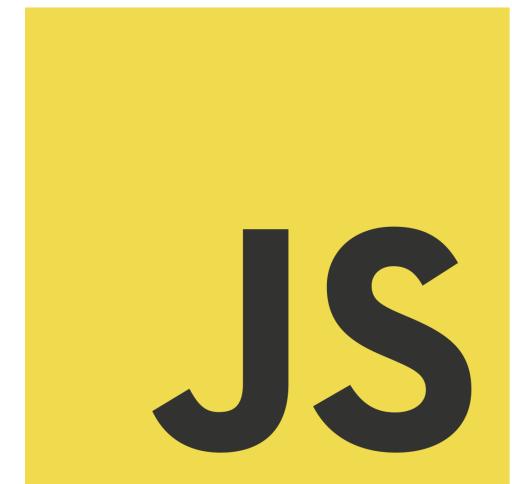
# SnapPI

# What was hard?

- Getting a sticker to actually show up in Snapchat



# The static image



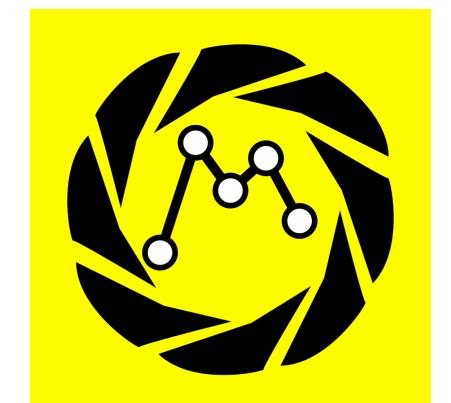
# Code to animate the fill

```
animation_options(el, svg, param, options) {
    // @ts-ignore
    var tl = gsap.timeline({ paused: true });
    //Maxing this out at 100 so the bar fills up,
    var percent = Math.min(100, Math.floor(options.percent));
    if(param == 'fill') {
        var gsap_animation = tl.to("#fill-mask",
            .to("#fill-mask", {duration:1, yPercent:-100}),
            .to(svg, 0.8, {
                scaleX: 1.05,
                scaleY: 1.05,
                // @ts-ignore
                ease: Elastic.easeOut
            }).to(svg, 0,{t
                scaleX: 1,
                scaleY: 1,
                // @ts-ignore
                ease: Elastic.easeOut
            });
    }
}
```

# SnapPI

# What was hard?

- Getting a sticker to actually show up in Snapchat

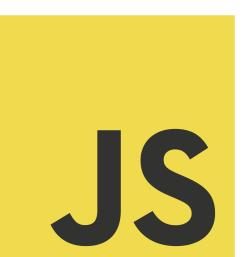


# Our App



# The static image

```
<clipPath id="clip-path">
| | <rect id="fill-mask" class="cls-1" x="
| </clipPath>
</defs>
<g id="cutlines">
| <path class="cls-2"
| | d="M35.58,135.07a15.69,15.69,0,0,0,2.54,4.
</g>
<g id="sticker">
| <path class="cls-3" fill="#0a0a0a"
| | d="M157.57,104.81l-1.43-3.06s-9.16-2-33-13
| <path fill="#0a0a0a"
| | d="M146.15,108.63l-18.7-3.18L89.1,87,89,86
| <path class="cls-3" fill="#0a0a0a"
| | d="M133.7,130.52c-3.39,0-6.8-.14-10.14-.43
```

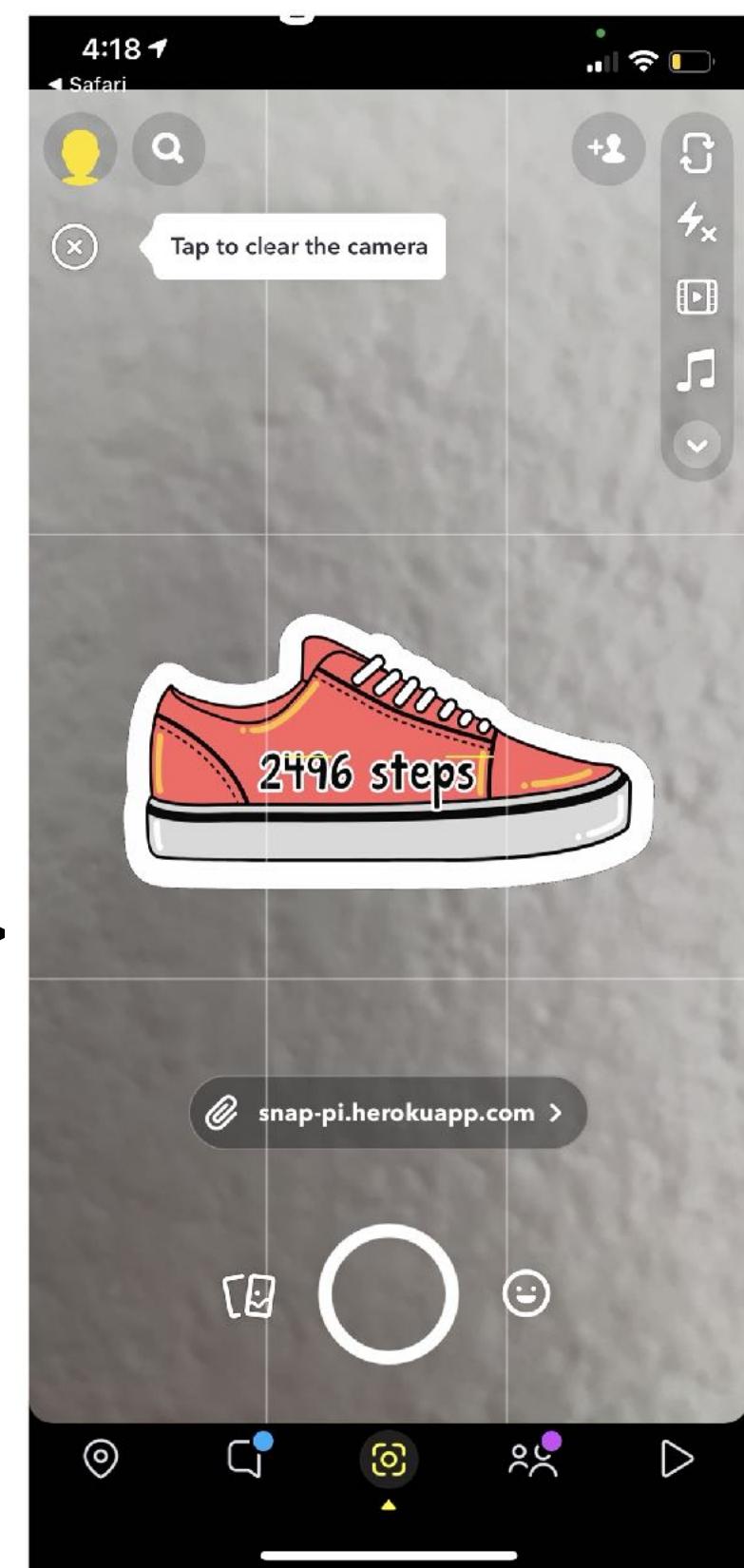
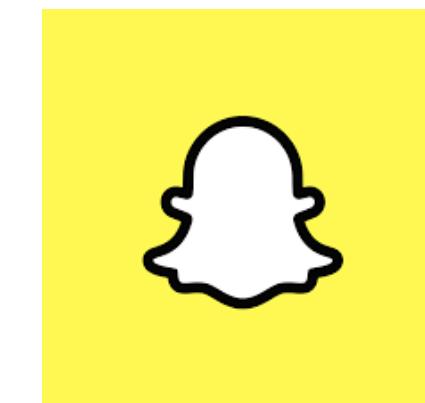


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        var gsap_animation = tl.to("#fill-mask",
            .to("#fill-mask", {duration:1, yPercent: 100}),
            .to(svg, 0.8, {
                scaleX: 1.05,
                scaleY: 1.05,
                // @ts-ignore
                ease: Elastic.easeOut
            }).to(svg, 0, [
                scaleX: 1,
                scaleY: 1,
                // @ts-ignore
                ease: Elastic.easeOut
            ]);
    }
}
```



# Snapchat



# SnapPI

## What was hard?

- Limitations of other platforms
  - Instagram/Facebook Stories and TikTok didn't have similar APIs to CreativeKit, so we were stuck with Snapchat
- Giving people enough options that they'd actually consider using it
  - We made ~30 stickers, each one required graphic design and custom programming

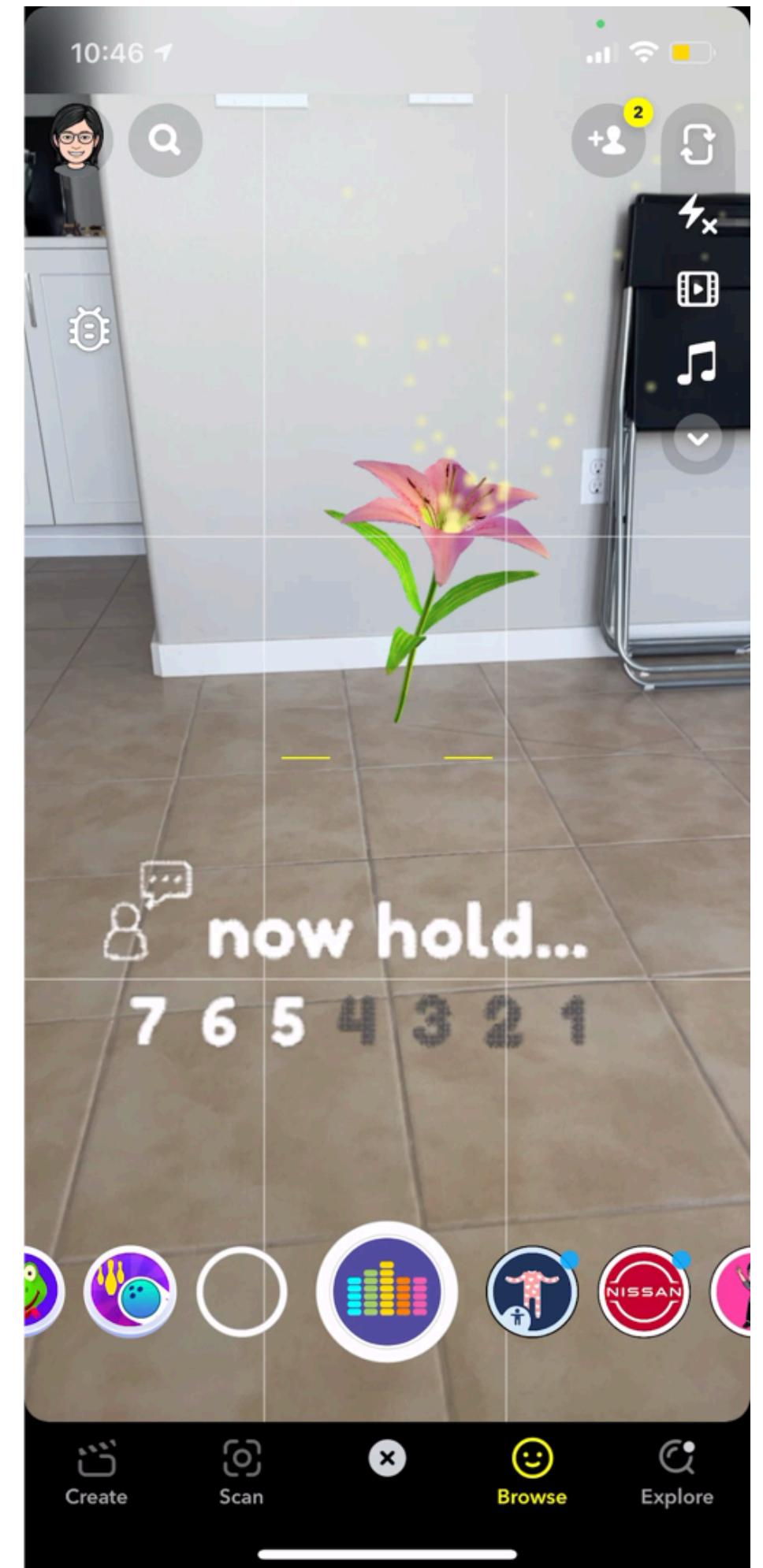
# Mindful Garden

Liu, L. H., Lu, X., Martinez, R., Wang, D., Liu, F., Monroy-Hernández, A., Epstein, D. A. Mindful garden: Supporting reflection on biosignals in a co-located augmented reality mindfulness experience. *CSCW 2022 Companion*

# Mindful Garden

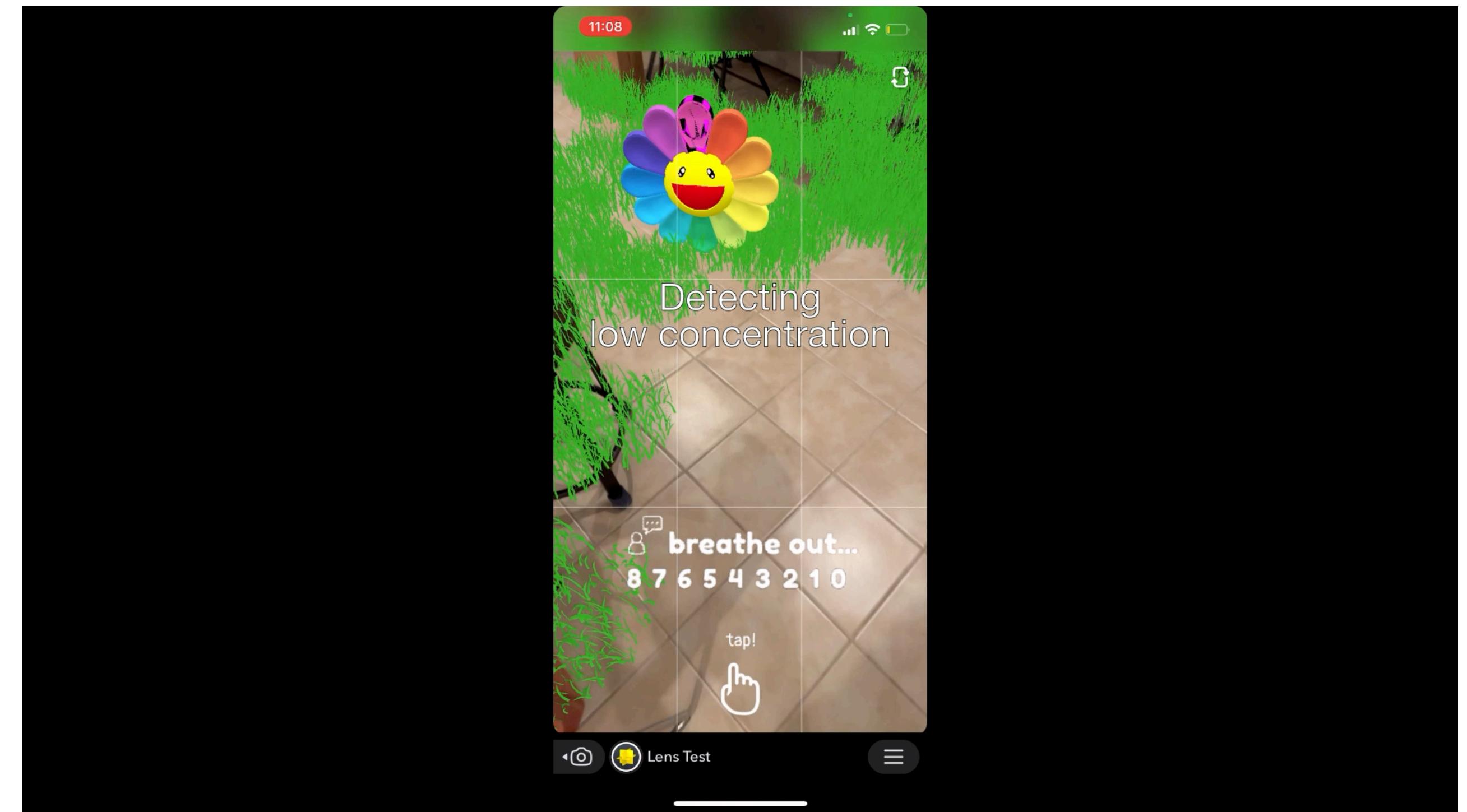
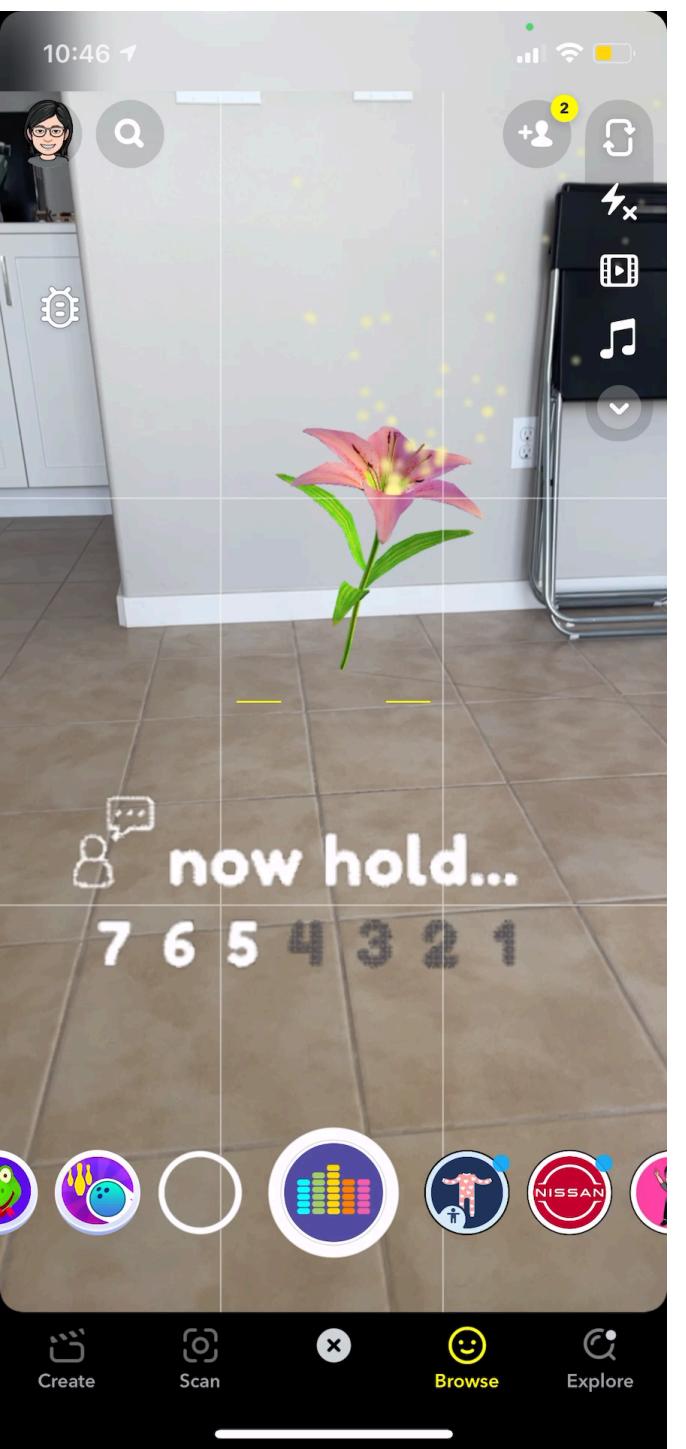
## Context

- Co-located Augmented Reality
  - New form of interaction, technology developers are trying to identify use cases
  - One common proposal has been using AR to bring people into a shared meditative space
  - The experience could be richer if we knew more about how the person was feeling
- Can we successfully integrate biosignal data into a co-located AR experience?



# Mindful Garden

## Our process



# Mindful Garden

## Mindful Garden: Supporting Reflection on Biosignals in a Co-Located Augmented Reality Mindfulness Experience

Lika Haizhou Liu\*, Xi Lu\*, Richard Martinez\*, Dennis Wang\*,  
Fannie Liu, Andrés Monroy-Hernández, Daniel A. Epstein



University of  
California, Irvine



PIE Lab  
Personal  
Informatics  
Everyday

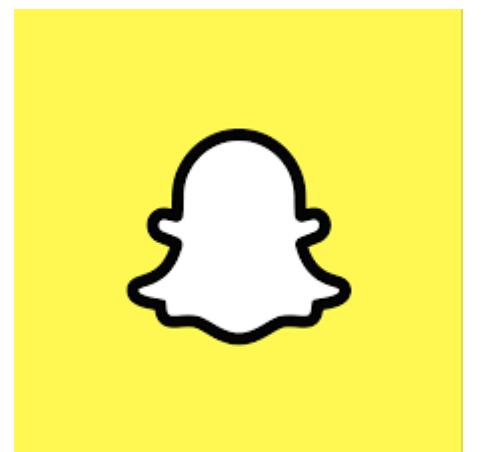


GLS Center  
Games +  
Learning +  
Society

# Mindful Garden

## Specifications

- Max use: 2-4 concurrent colocated people, one-time
- Built as an application for Snap's Lens Studio, which provided social AR
- Muse headset for sensing brainwaves
- No database, minimal profiles, no telemetry
- Built by 3 experienced developers over ~6 months, but part-time, plus some starter code from Snapchat



# Mindful Garden

## Why build it?

- A proof-of-concept: is this even possible?
- And if we can do this, what do people think of it?
  - Colocated AR and brainwave sensing are both very new, very few people have experience with them
  - The interaction is going to be hard to “Wizard of Oz”, or get people’s honest perceptions of without use

# Mindful Garden

## What was easy?

- Multi-person AR
  - Provided by Lens Studio
  - But without that library, it would have taken a lot of engineering work (on the order of years!)
- Brainwave sensing
  - Similarly, we could rely on the Muse hardware, and this would have been a lot of work otherwise

# Mindful Garden

## What was hard?

- Data transfer
  - We had to come up with a creative solution for getting data from the Muse headset onto the platform
  - We could only transfer a few “bits” of information (low/medium/high) rather than the depth we wanted to. But as a proof-of-concept, this was enough

# Question



Which of these apps would you  
be the most interested to try?

- A AT Planner
- B ModEat
- C SnapPI
- D Mindful Garden
- E Sorry professor, none of them :-)

## Which of these apps would you be the most interested to try?

- A AT Planner
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A

0%

B

0%

C

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D

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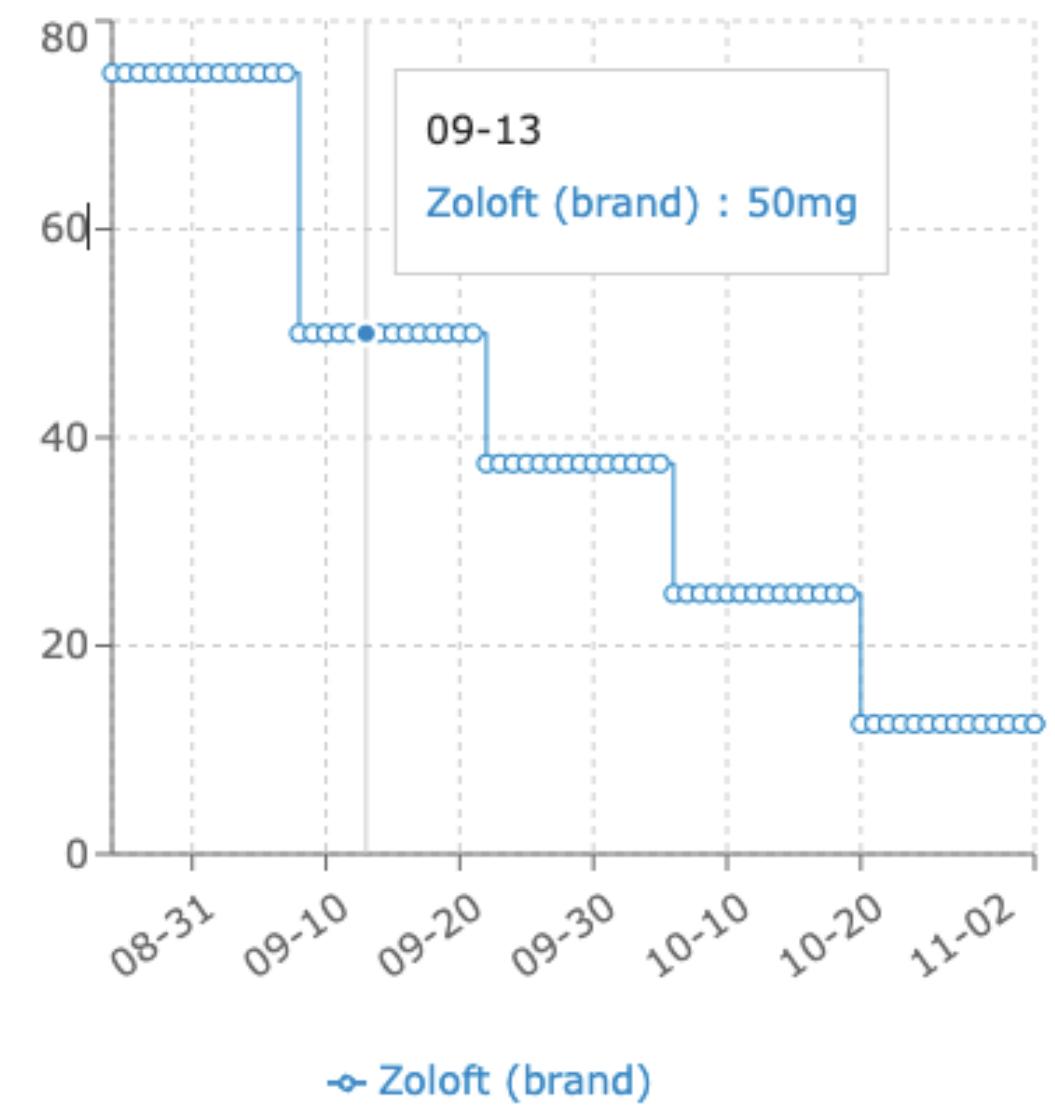
E

0%

# **Major takeaways**

# Major takeaways

- Making prototypes:
  - Forces you to address ambiguity present in mockups
  - Enables you to better understand the needs of your users
  - Contributes to understanding whether or how people will use your product



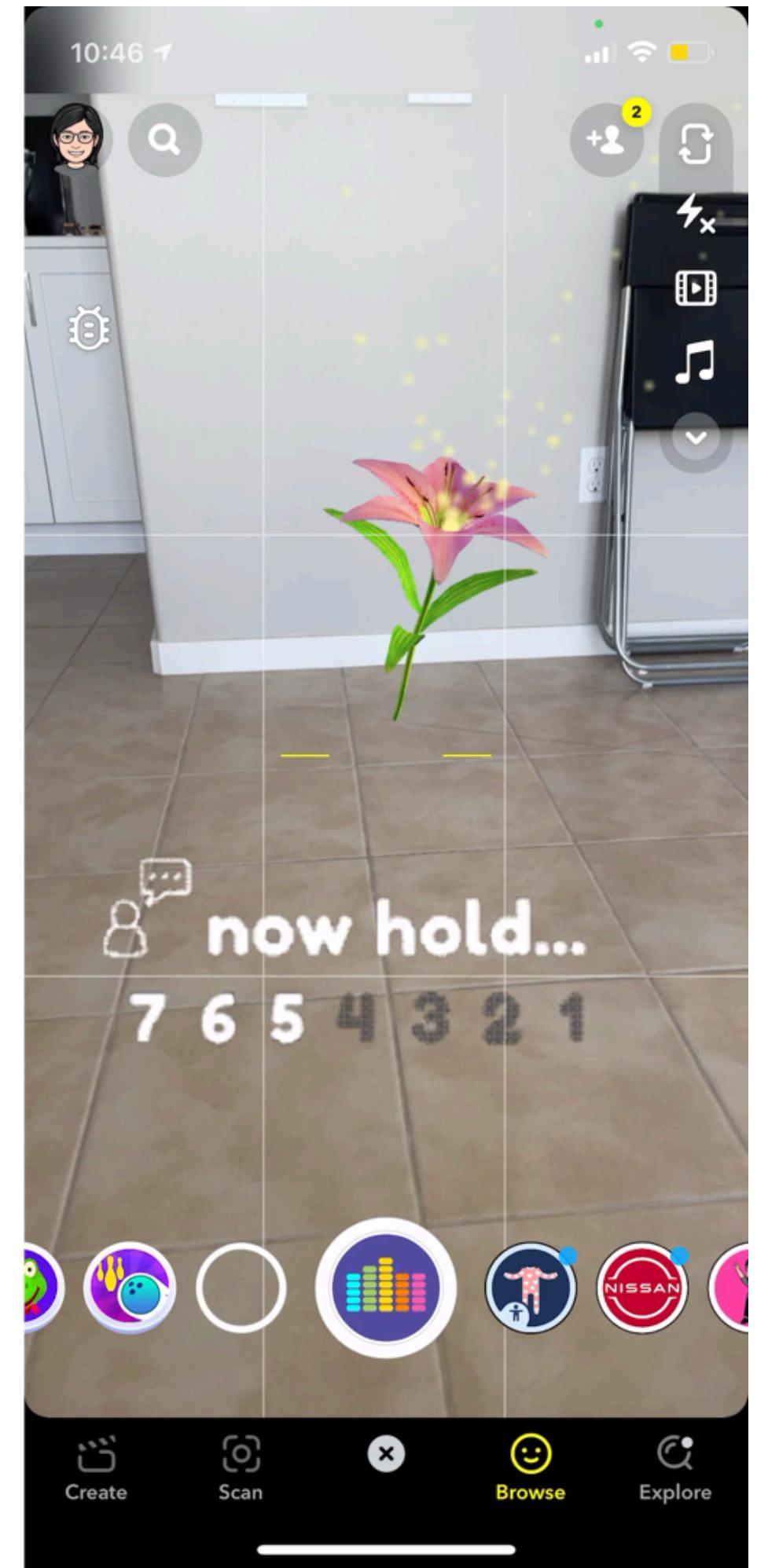
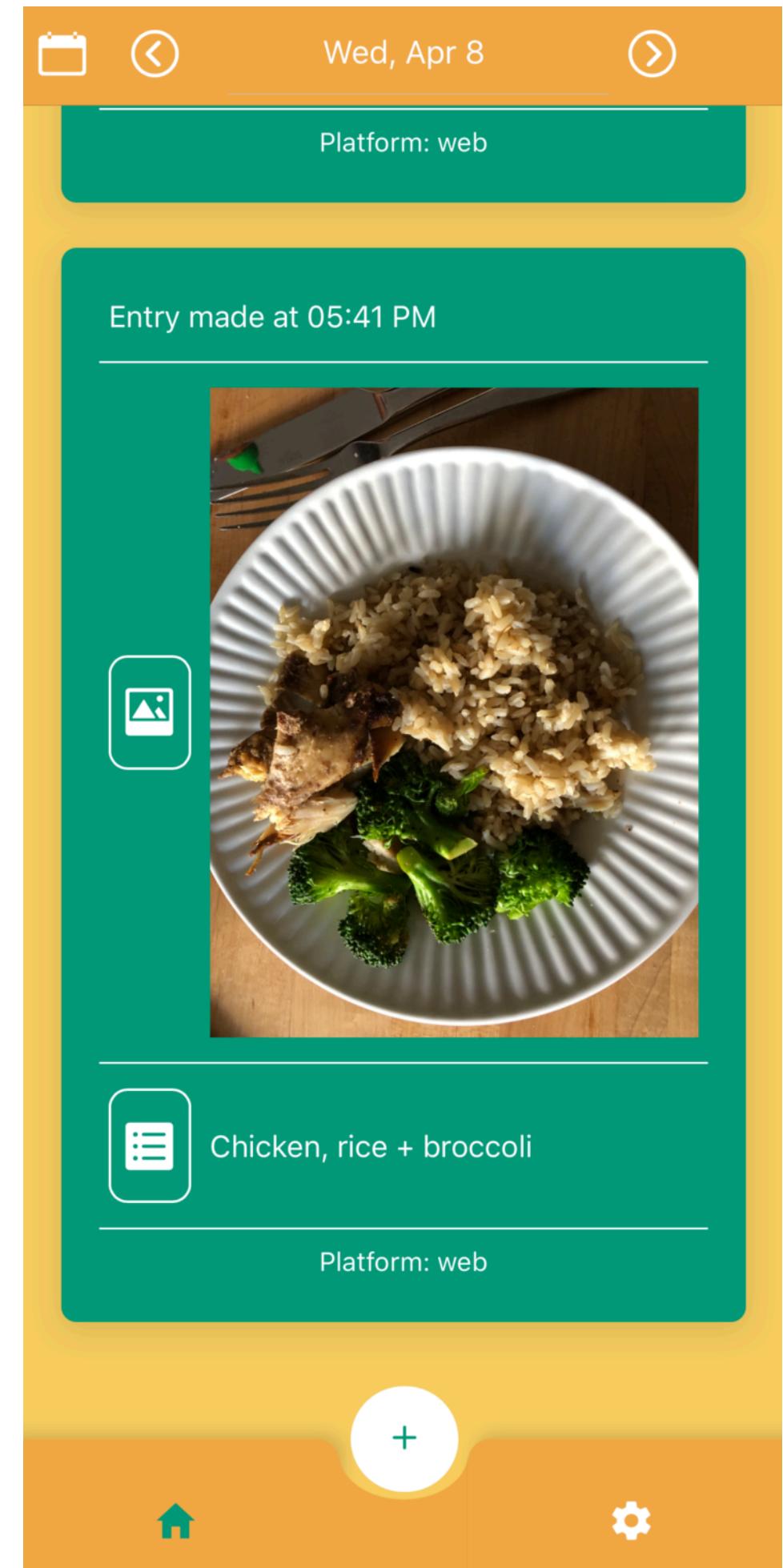
# Major takeaways

- You're often limited by what the devices and platforms you're extending support
  - Especially if you're pushing the boundaries of what these platforms can do, which is often happening if you're trying to innovate



# Major takeaways

- In UX Prototyping, you only have to follow good Software Engineering principles to a point
  - The prototype just needs to work long enough and well enough to answer your questions
  - You can often intentionally ignore sectors of the market, use cases not relevant to your questions, and infrequent edge cases



# Major takeaways

- Developers sometimes like to short-circuit the design process 😊
  - Identifying whether something is the “right design” requires patience and deep thought, and building something might seem more productive and fun
  - Your mileage may vary, of course

# Today's goals

By the end of today, you should be able to...

- Articulate requirements needed for developing early-stage prototypes
- Consider how development requirements often shape design needs, for better or worse
- Describe research outcomes related to personal informatics

# **IN4MATX 133: User Interface Software**

**Lecture 19:**  
**Prototyping in Research**