

# Portfolio

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Zhengyang Liu

# Designer<sup>+</sup>

<sup>+</sup> symbolizes the cross-disciplinary knowledge necessary for solving intertwined social and cultural problems. As a designer, I have a curious mind to understand and challenge stereotypes in people and society. My international culture perspective allows me to approach design with empathy and adaptability, enabling solutions that resonate across diverse contexts and user needs. In a nutshell, I am an active **innovation design engineer!**

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## My Vision

I'm a designer who thrives at the intersection of technology, human experience, and thoughtful innovation. With a background in product design and interaction, I navigate complex challenges from neurodiverse cognitive behavior to the intricacies of hardware-software integration. My works span from future-oriented interfaces like smart **Internet-of-Things (IoT) systems** to **AI-driven behavioral support systems**—always aiming to make products more **empathetic, tangible, and impactful**.

### Design

Design is a way to translate abstract needs into tangible experiences, shaping not just how things work, but how they feel and mean in context.

### Technology

Technology is a tool for empathy—when harnessed thoughtfully, it enables interactions that are intuitive, accessible, and capable of extending human capabilities in subtle ways.

### Business

Business provides the structure to scale impact; I see it as a strategy to align value creation with sustainability, inclusivity, and real-world application.



**LinkedIn**  
Designer Career



**Instagram as a  
Photographer**



**1**

# Halfmind Reminder

For ADHD users with love.

Retain task managing accessibility.

#2025 #Product Design #Mental Health

#ESP32 #IoT #Design for Manufacturing

# Contents



## Halfmind Flow

Enjoy immersive work-from-home.

Graduation project.

#2025 #Research #Work wellbeing

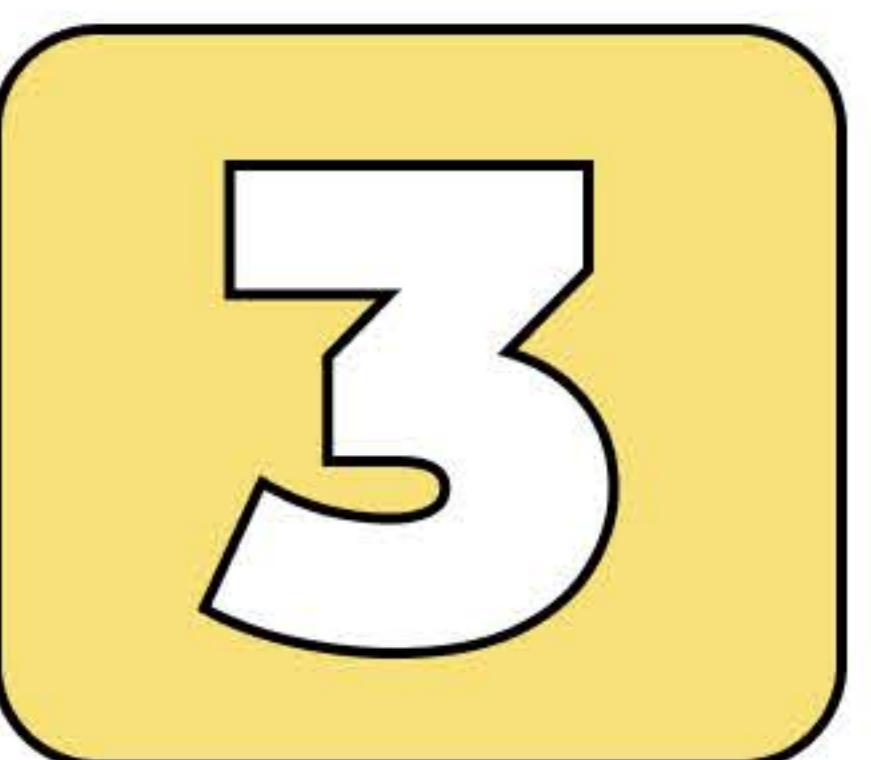
#mm-wave Radar #Signal Processing

**4**

## Tractor Electrification

Design the future strategy to electrify general tractors.

#2024 #Strategic Design #Agriculture



## Halfmind Moti

Your personal motivation coach.

Start doing anything in 60 sec.

#2025 #Digital App #Workwellbeing

#Swift #Cursor #LLM #VoIP

**5**

## Powder Dispenser

For the researchers

Unlock high-throughput possibilities.

#2023 #Product Design #Lab Automation

#Mechanical Design #Robotics

# Halfmind Product Line-up

Attention Allocation at Ease.



## Halfmind Reminder

**Your task whisperer, always within reach.**

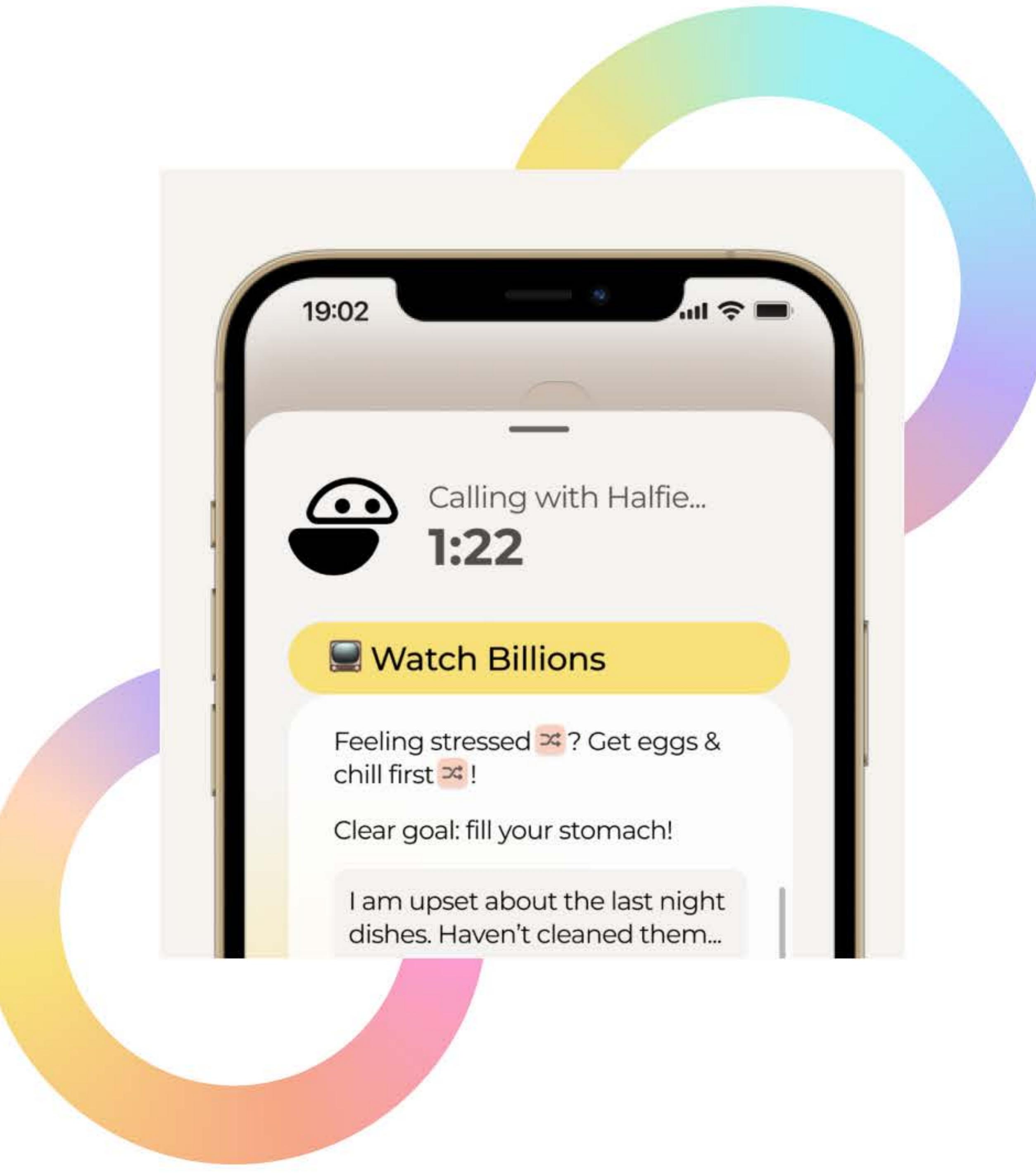
A tactile and auditory companion designed for ADHDers and anyone struggling to start. This connected device helps you record and recall tasks on the fly, bringing your intentions into the physical world. Place it wherever it matters—by your bed, in your kitchen, on your desk—and let it nudge you back to what truly matters.



## Halfmind Flow

**Feel your focus. Design your zone.**

A multi-sensory creative environment built for deep work at home. Halfmind Flow senses your presence and mental state using millimeter-wave radar, and tailors ambient sound and lighting to match your inner rhythm. No distractions, no effort—just the immersive nudge you need to enter the zone, and stay there.



## Halfmind Moti (Coming Soon)

**The ultimate call-to-action AI coach.**

Moti is more than a to-do list. It's a voice that initiates first and talks back, in a warm, witty, and persistent AI that calls you before you procrastinate. Designed as a virtual ADHD coach, Moti uses smart conversational LLM strategies and your health & calendar data to get you started when it's hardest to begin. Think of it as your personal therapist & cheerleader, always one call away.

## Branding

Theme color #F5F3F1

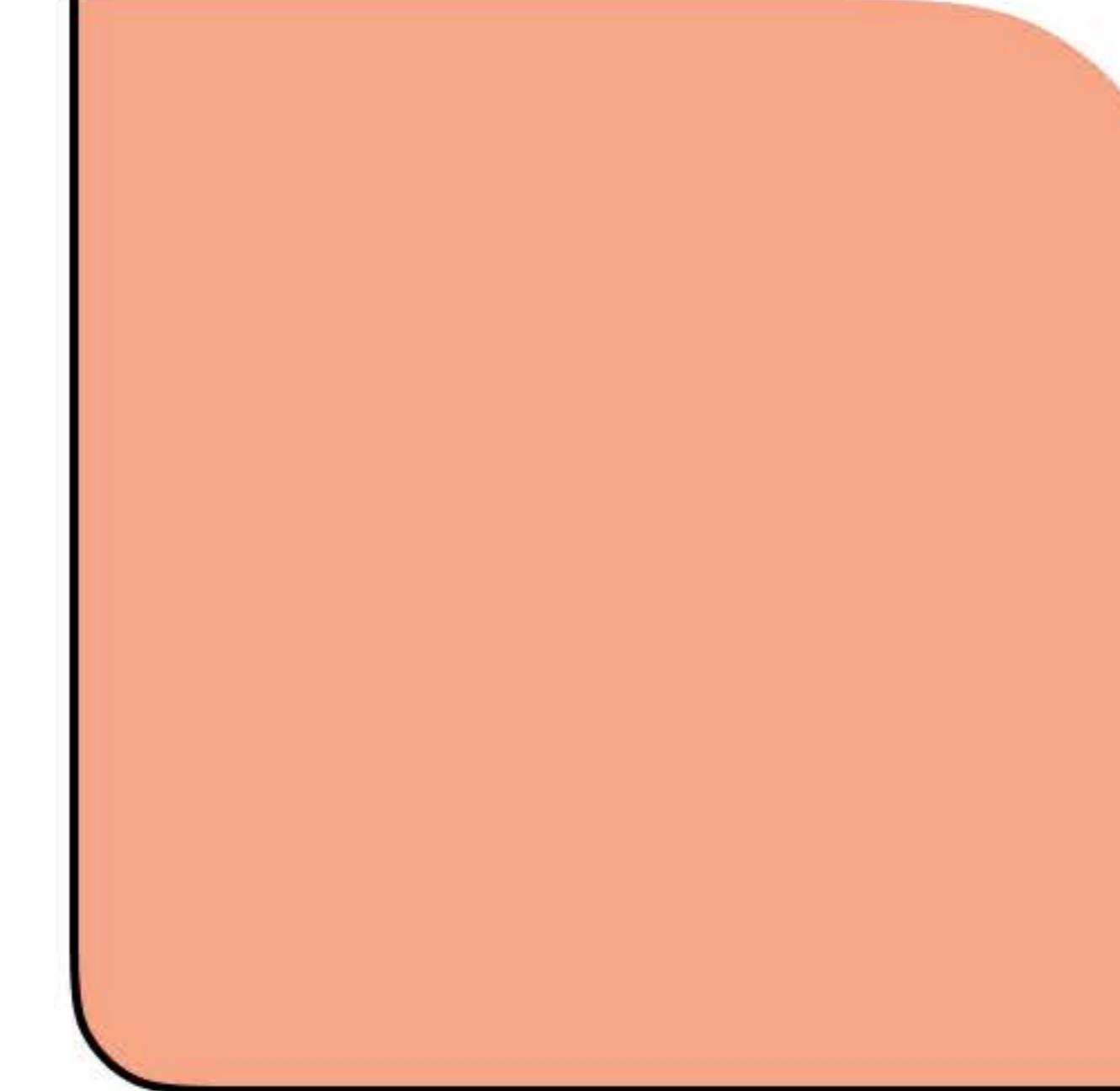


### Meet Halfie

Halfie is the mascot of Halfmind. It is just like us: curious, learning, and, ... sometimes, half-minded.

### Colored Background

#F6F3EF



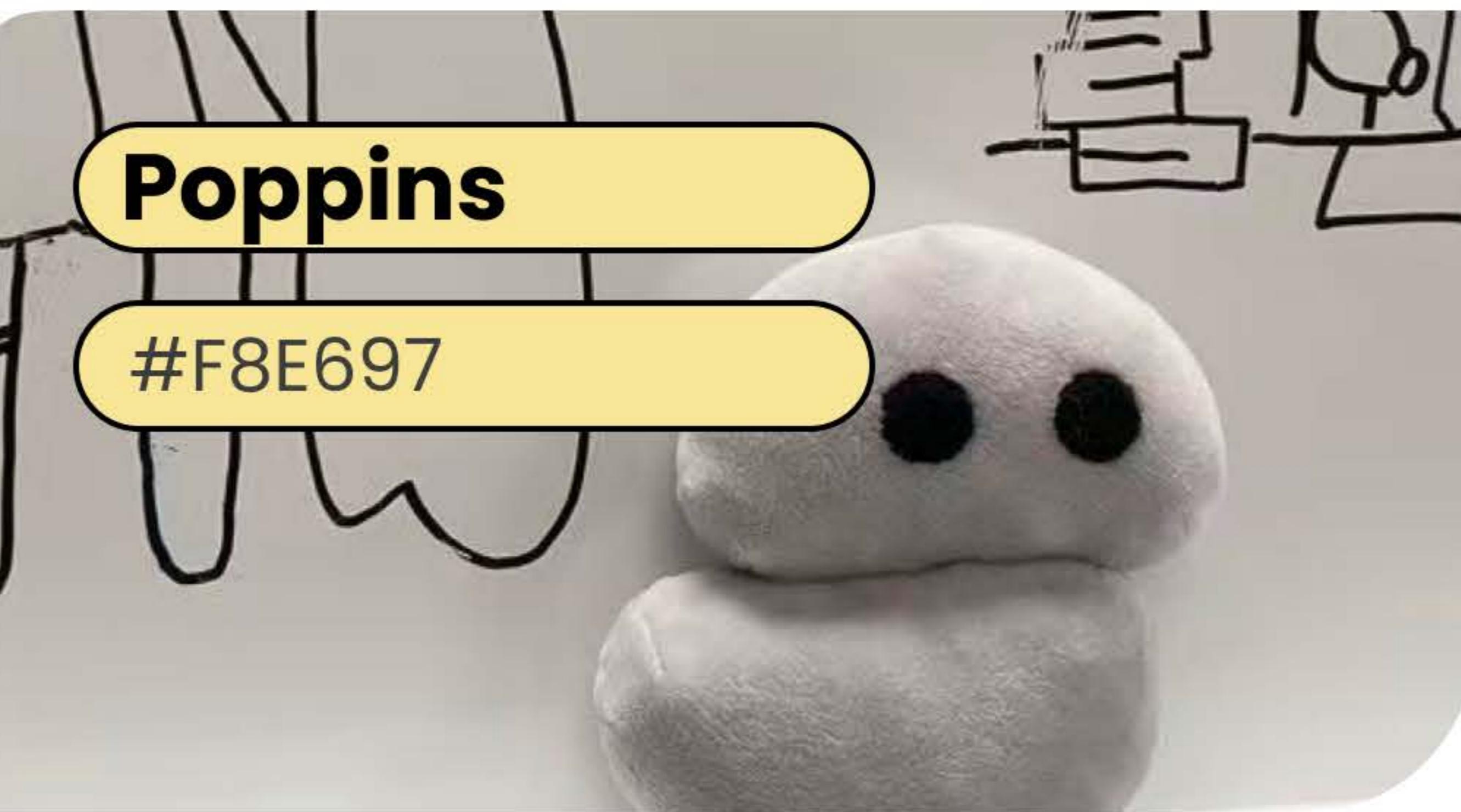
#3D38F5

positive

witty

problem-solving

halfmind



## People

Coral orange was chosen to reflect the brand's core values: youthfulness, playfulness, and forward momentum, combining the confidence and warmth of red with the optimism.

## Vision

The electric blue was selected for psychological association with focus, calm, and trust, which grounds the more energetic coral and creates a dynamic yet stable identity

## Science-based

Yellow was chosen to complete the prime colors. We hope to bring the outcome of basic cognitive psychology research with multi-disciplinary expertise to the market and benefit the neurodiverse group.





# halfmind Reminder

## Intuitive Task Tracking for ADHDer's

ADHD users, prone to sensory overload and multitasking, often struggle with daily task management. Urgent tasks can be forgotten simply by walking into another room. To address this, it's crucial to separate task handling from the phone.

This project explored the **cognitive affordance** of tool-use. By minimizing the mental effort required to initiate a task, I designed an intuitive interaction flow and a tailored button set to support users effectively.



**30%**  
More Tasks Slashed

Cofounder, Designer, Project Manager  
Entrepreneur project, 2025

### Always Accessible

Place the product within reach, and start tracking tasks in just one click.

### Voice task

Press to record the urgent task in your mind and execute along.

### Connectivity

Sync Multiple Halfmind Reminders automatically via Bluetooth. Place them across the house to keep everything in sight.

**Task paralysis**

**Forgetting**  
**Inattention**

**Impulsive thoughts**

# Concept

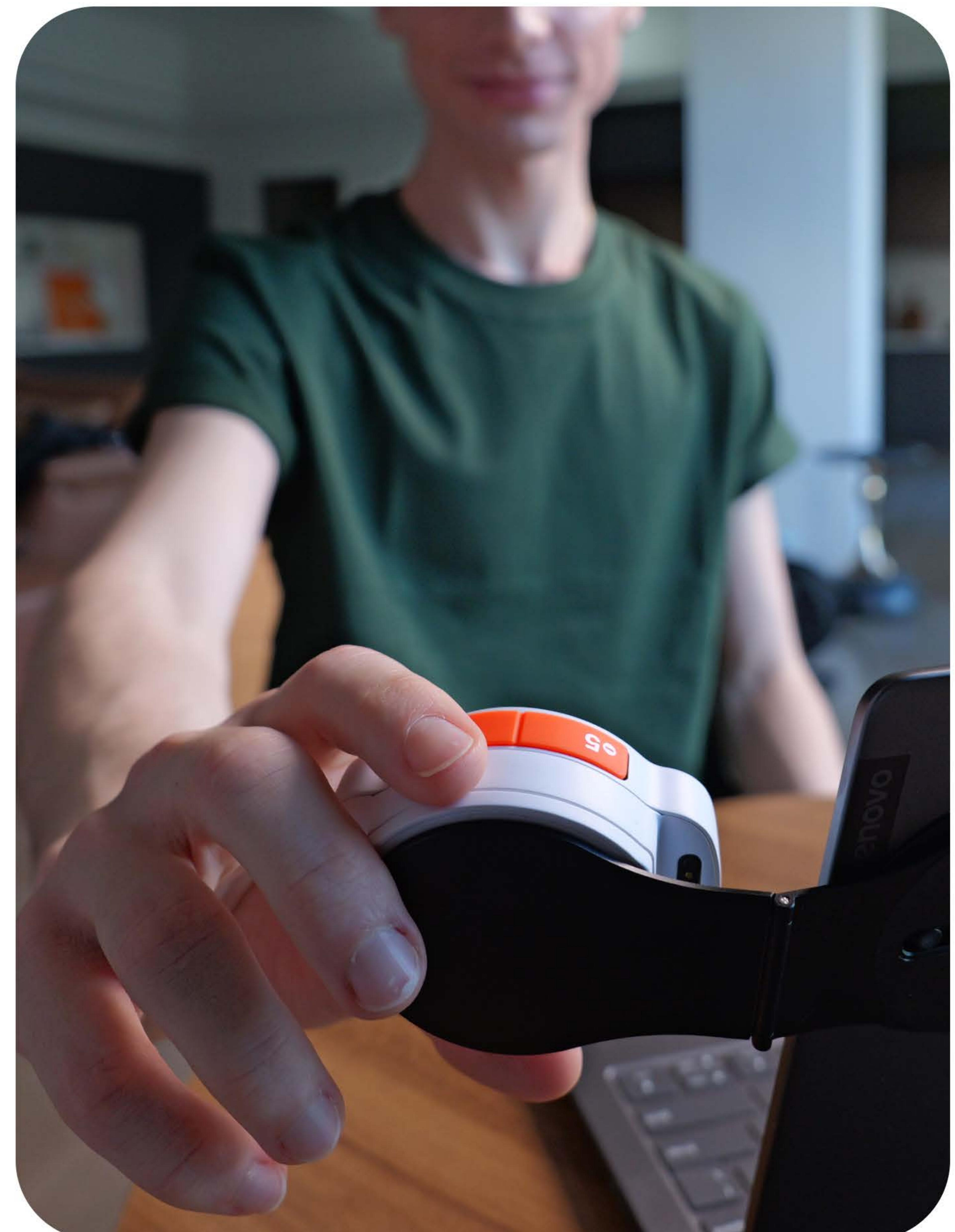
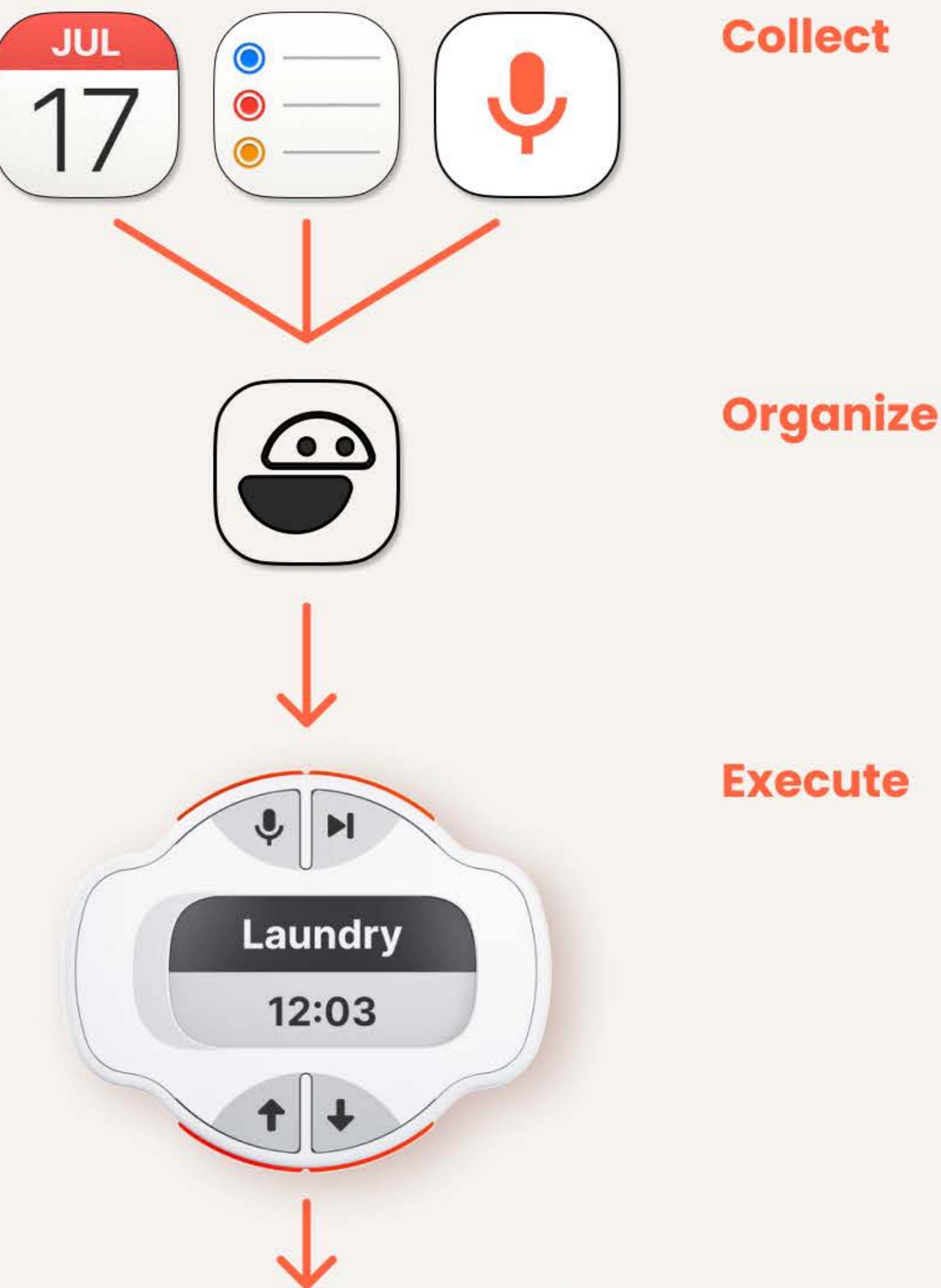
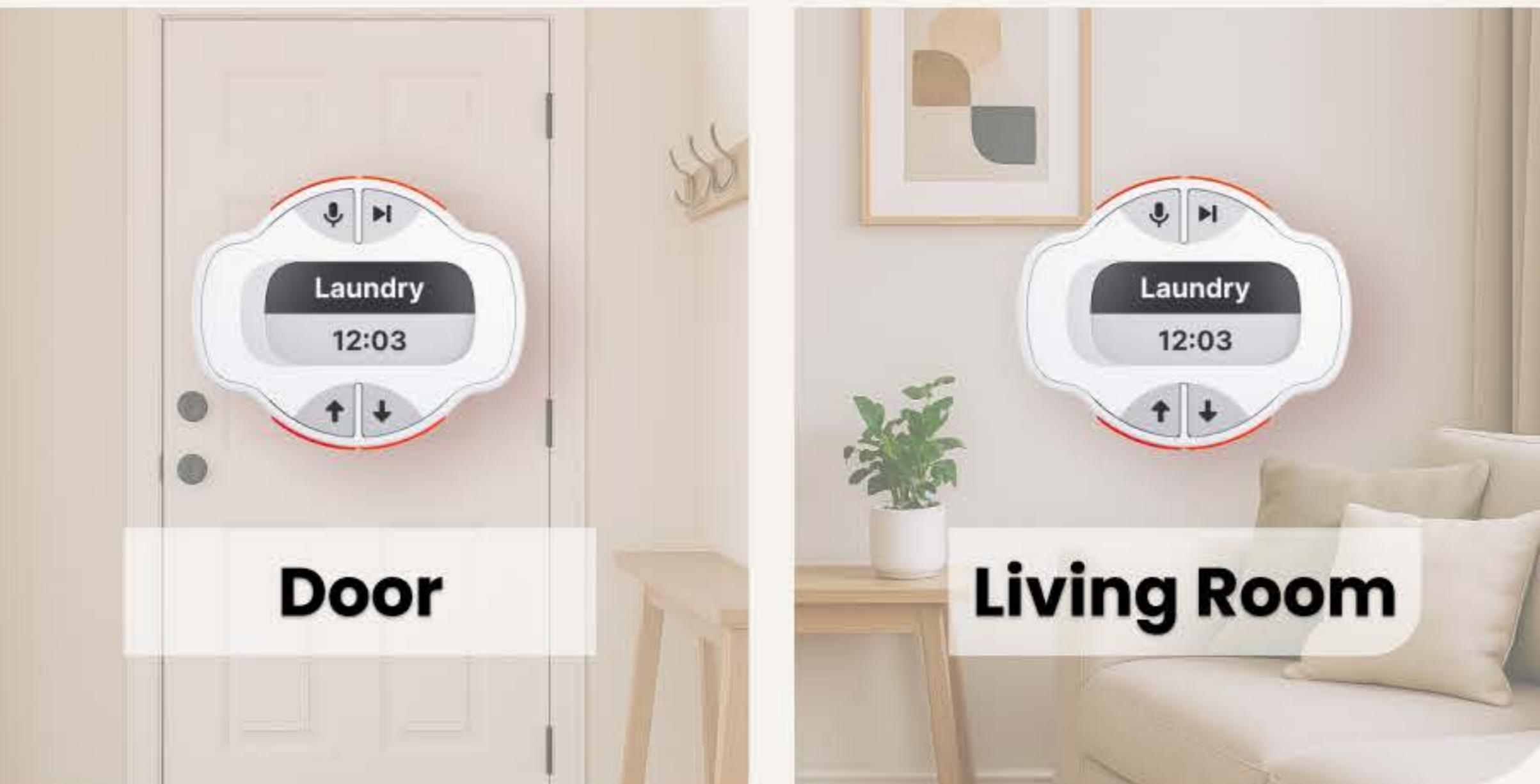
## Attention Touchpoint

ADHD users forget things so easily, and this is what we care for them in the first place.

Any interact-able button    eventually leads to an automatic task for 5 minutes: just the amount of time to initiate.

Following the Getting-Things-Done method, Halfmind Reminder can instruct on task management with science.

## Sync across the place



# UI on App & Device



# Prototyping & Manufacturing



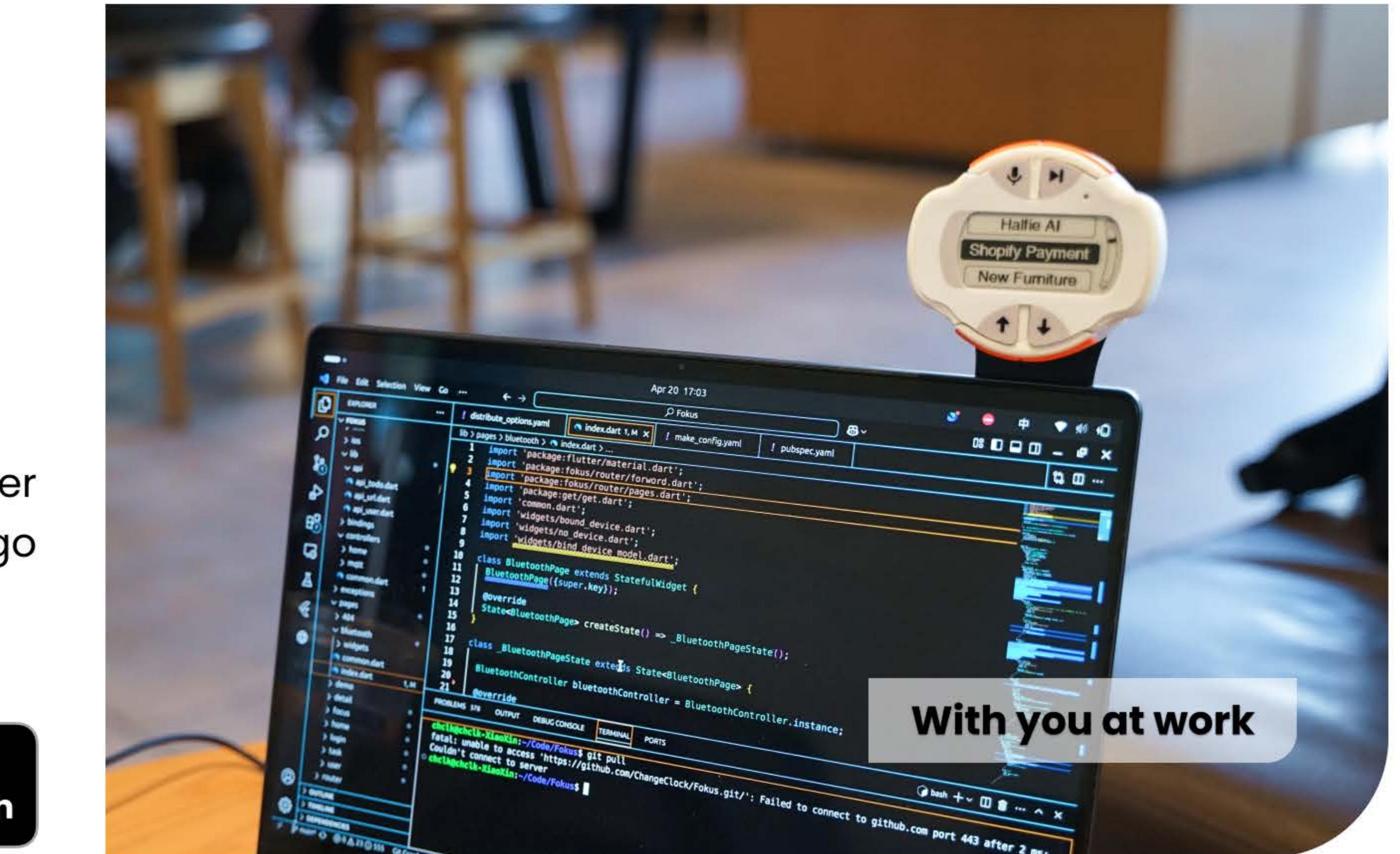
Powered by **ESP32-C6**, the 2.13-inch e-ink display shows your task.

**Injection Molding** was used to manufacture the first 500 pieces.



3D printed prototype in PLA with full functionality, including **MagSafe** compatibility.

**Stay on track** wherever you go



Download on the App Store

Preorder on halfmind.tech

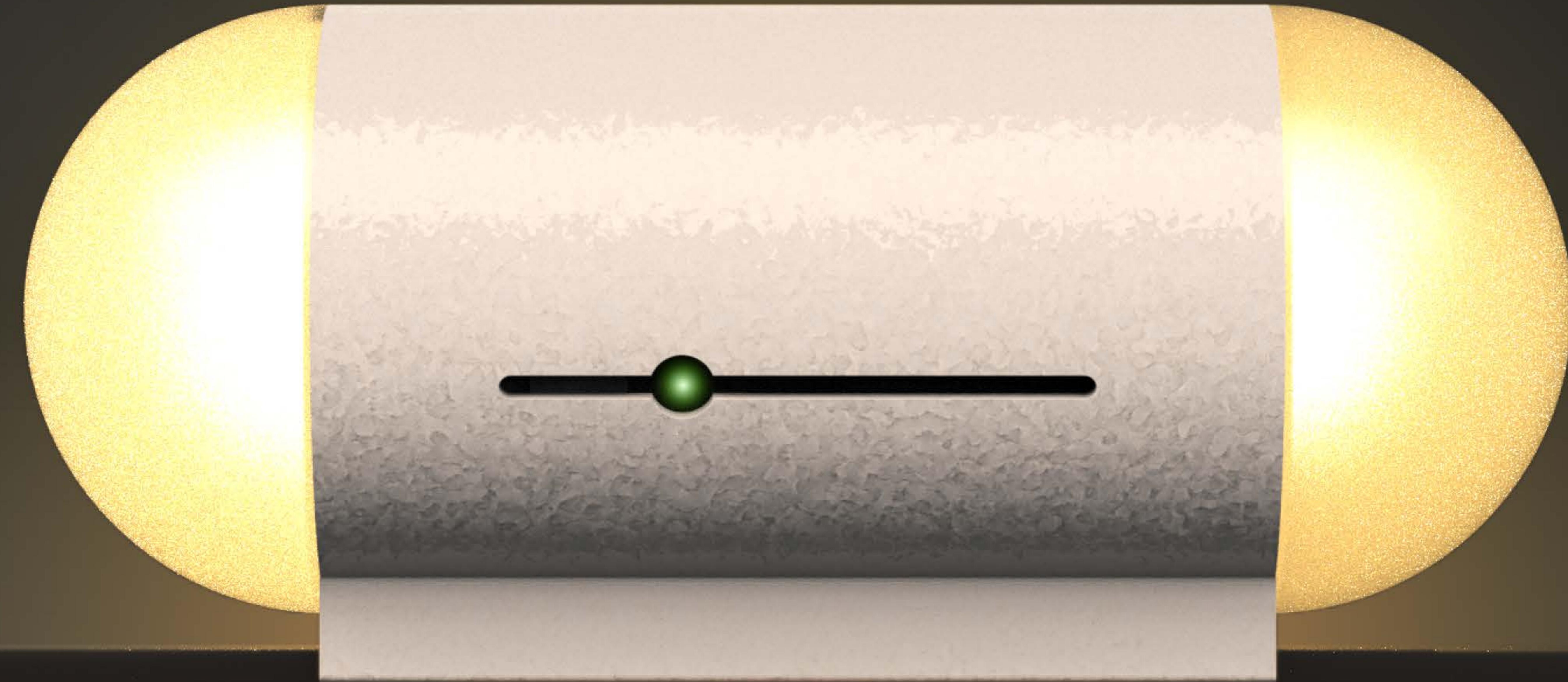
**MagSafe**

**With you at work**



# halfmind Flow

**Enjoy immersive work-from-home**



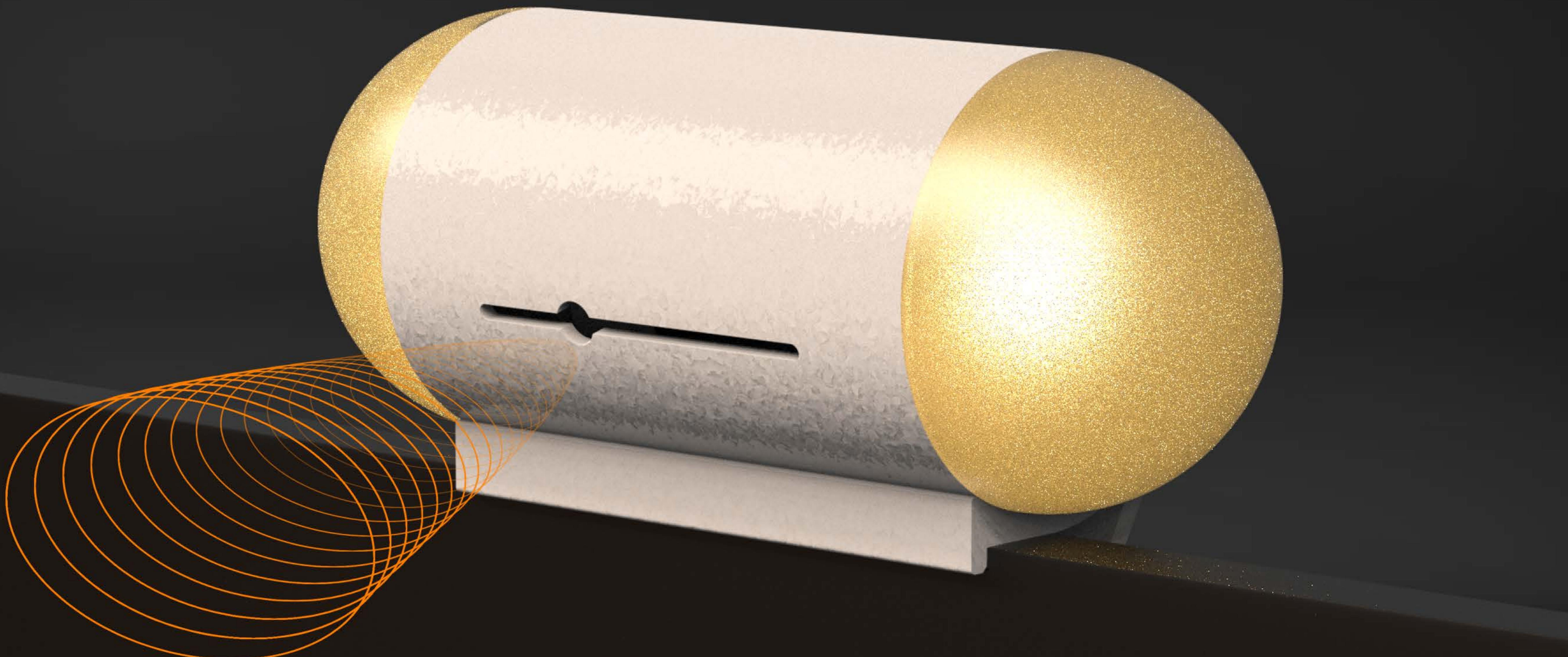
Halfmind Flow is a working companion that assist your focus capability.

# Concept

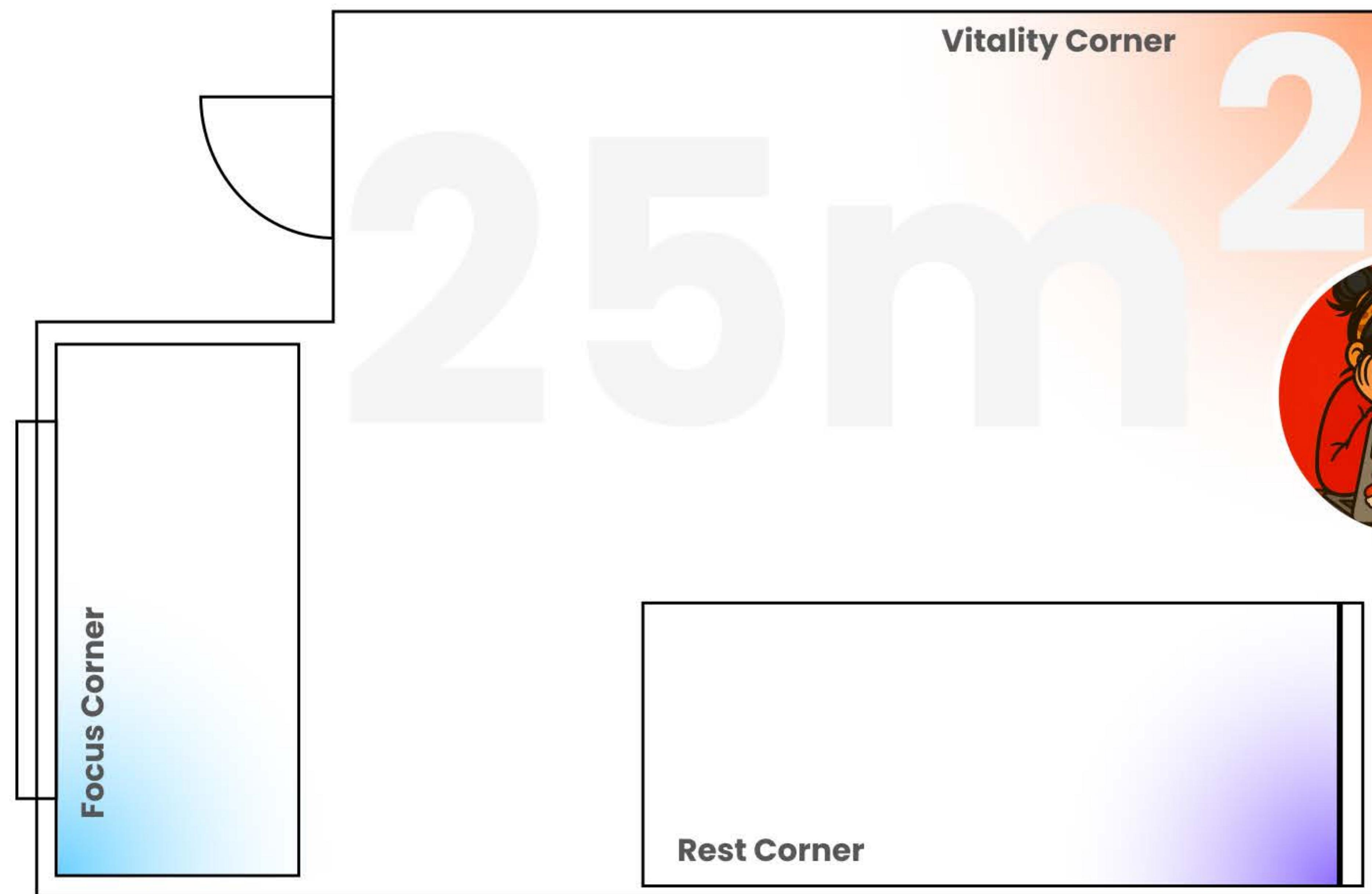
**Know your actions, know  
your emotions.**

Sensory experiences are powerful tools that assist people daily across behavior and cognitive processes. From task execution to attention allocation, Halfmind Flow is a 6-month research project that utilizes mm-wave radar to brew the multi-sensory vibe to your action and mood.

By integrating special needs from ADHD users, I developed a system that comes with "lowest friction" to invite user into mind flow.



# User Research



## Corners in a room

Young adults aged between 18 and 30 often live in a smaller apartment with limited room for work and rest. Instead of independent rooms for each function, I refer to the environment where life takes place as "corners". While applicable to all scenarios, this project focuses on the "office corner", where typically working from home takes place on a desk and a chair. We are trying to create such an absorbing focus corner where users will experience **zero load task initiation and sustained focus**.

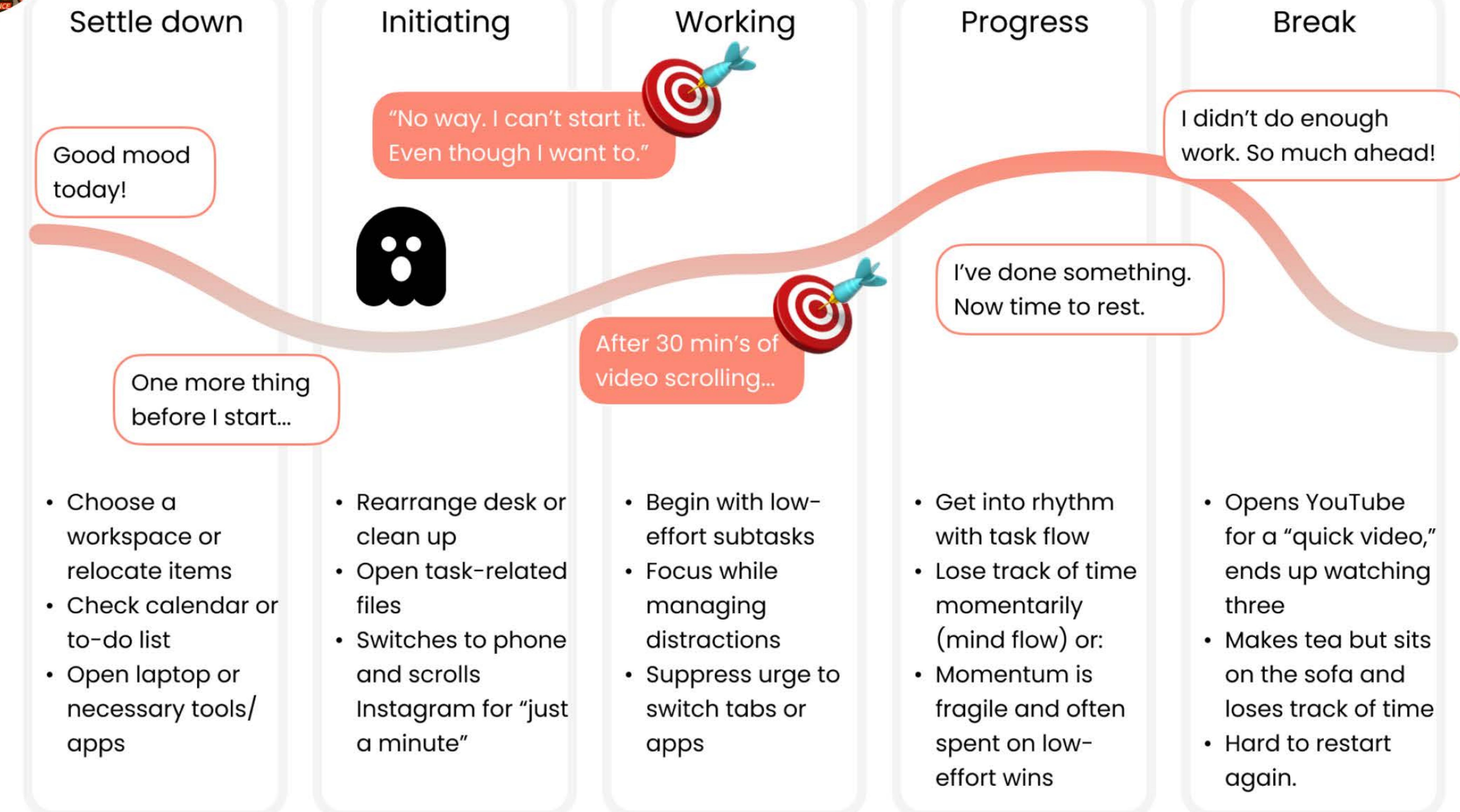
## Persona: Ricky

Ricky (26) is a freelance media worker in the advertising industry. She expressed her concern about overlapping work and life in a room but was unable to solve it. She was diagnosed with ADHD (Attention Deficit Sub-type)

## 💡 Task Initiation & Sustained Focus

ADHD users tend to be pressured before they start. This trait is significantly expanding to normal people's daily life. People are more distracted at home office due to the sense of autonomy but lack of regulation. They also reward themselves more frequently to pause deep focus for other enjoyable activities.

## User Journey of Focus Challenge in Work



# Prototyping & Validation

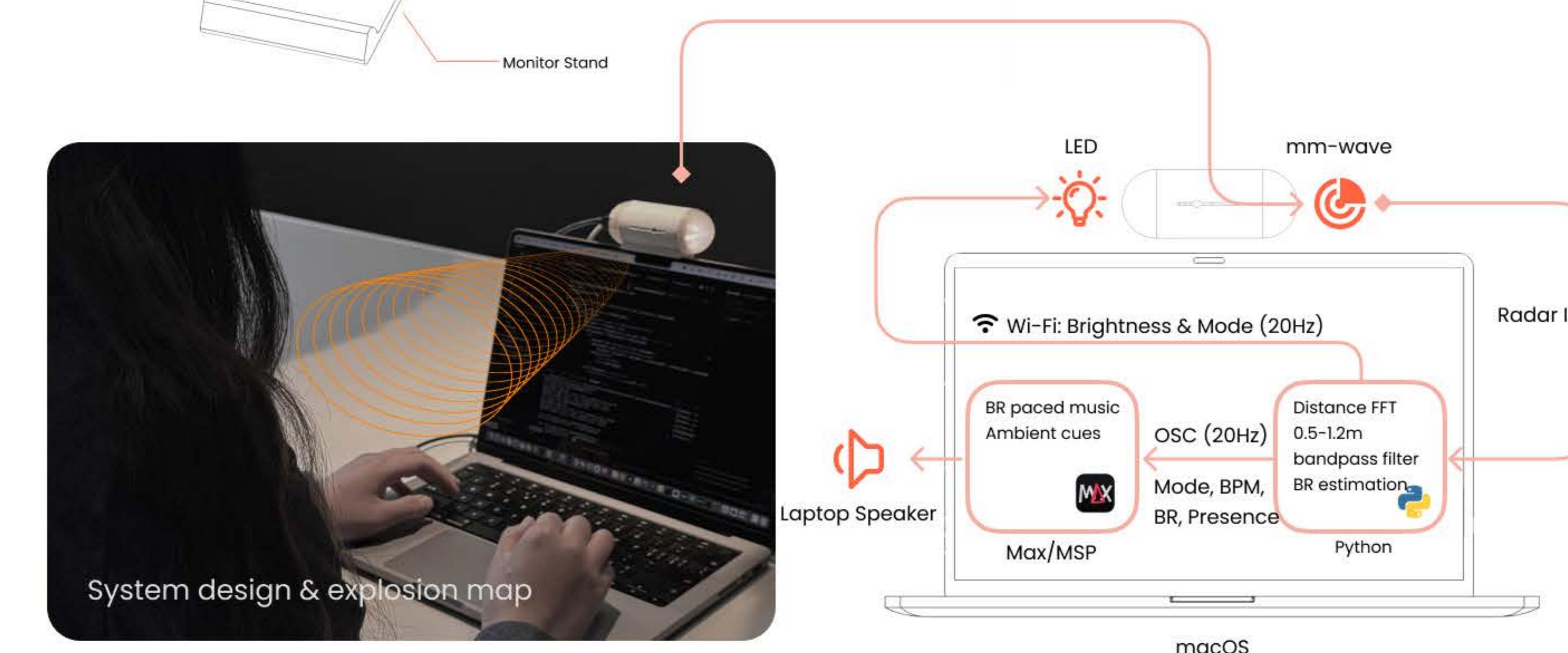
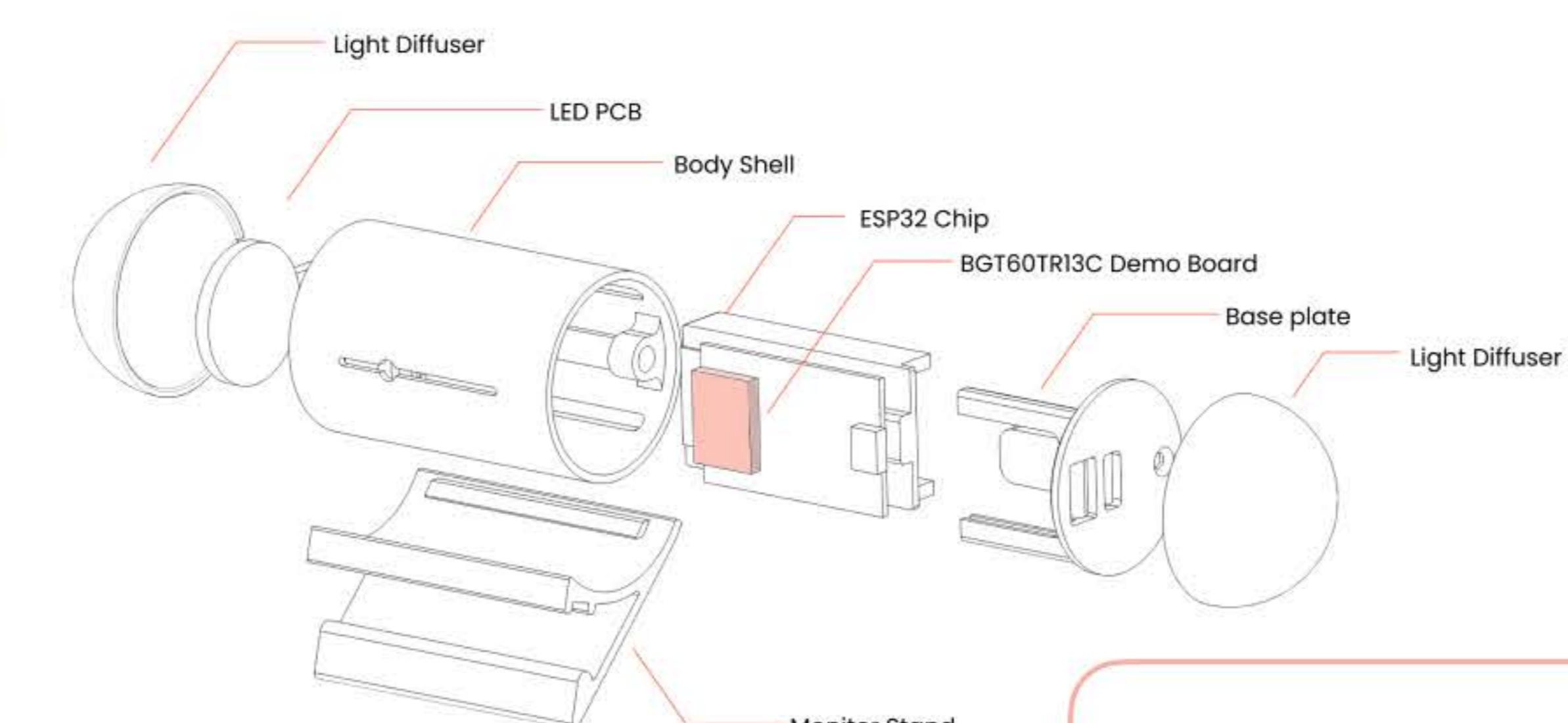


## Make

Using multiple PLA materials, the shell was designed and 3D printed to house the radar board, ESP32 controller, and lighting board.

## Engineer

A classic Fast Fourier Transform (FFT) was implemented to extract distance FFT data to gain insights of breathing patterns. This data was processed by Max/MSP to generate an slightly slower ambient music to nudge for calmer actions and moods.

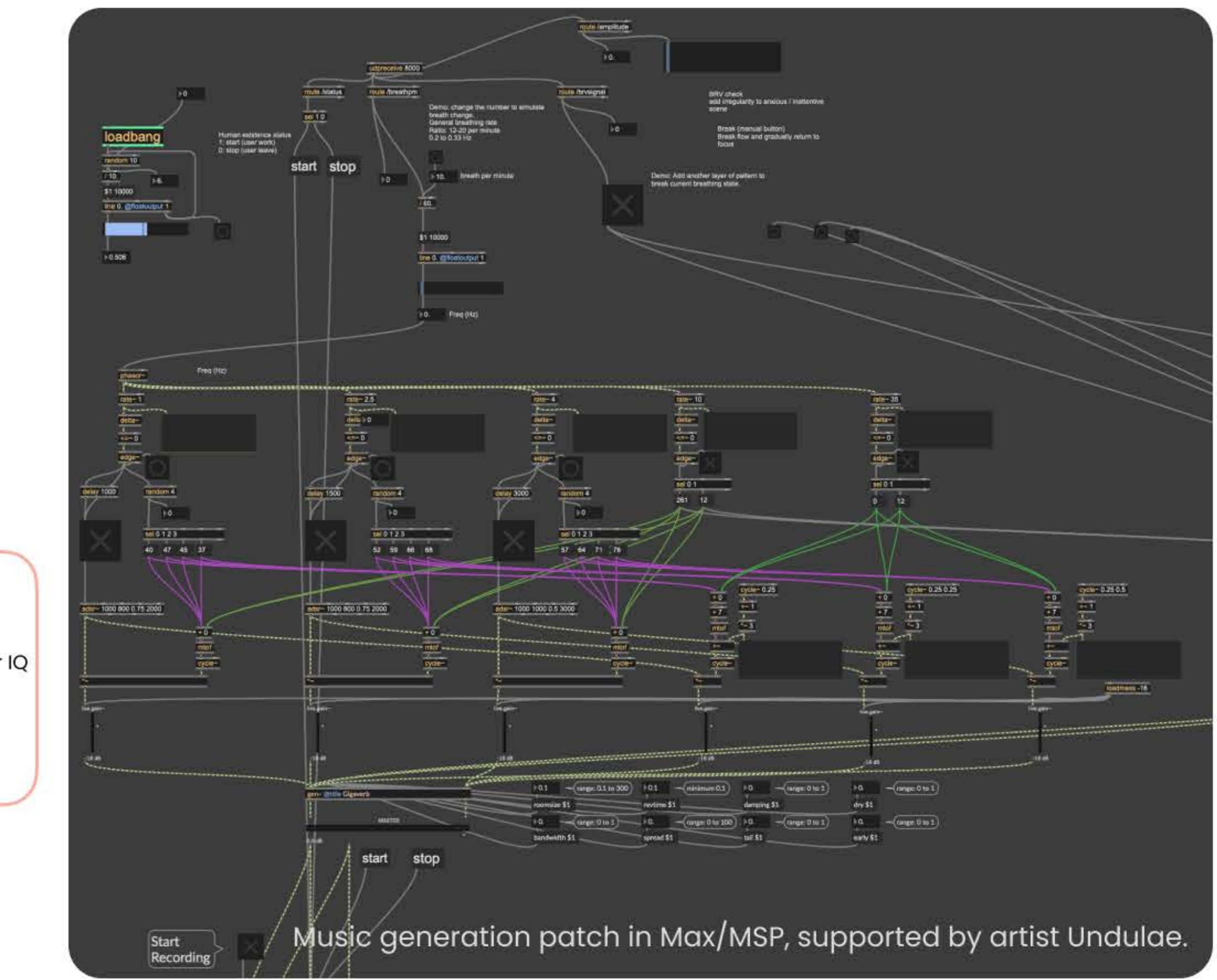


## Test

We tested the prototype in a controlled environment. Participants (N=17) were asked to finish two attention tests on two consecutive days to see if any performance improved. The results showed that the frustration level dropped and valence increased significantly, proving the efficacy of this multi-sensory system.

**Frustration** NASA-TLX ( $p<.05$ )

**Valence** PrEmo ( $p<.05$ )





# halfmind Moti

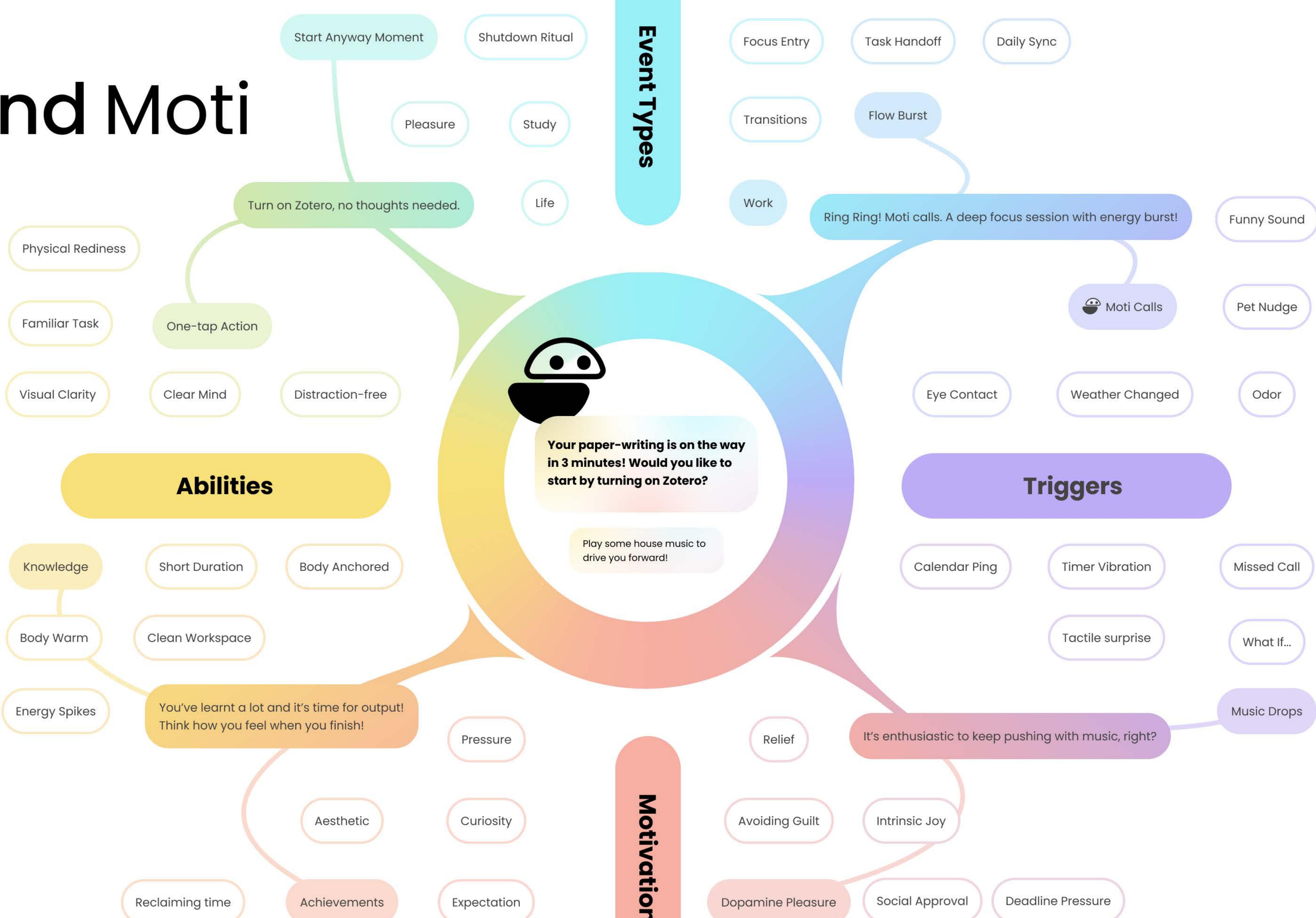
**Initiate in 60 sec.  
Call Moti now!**

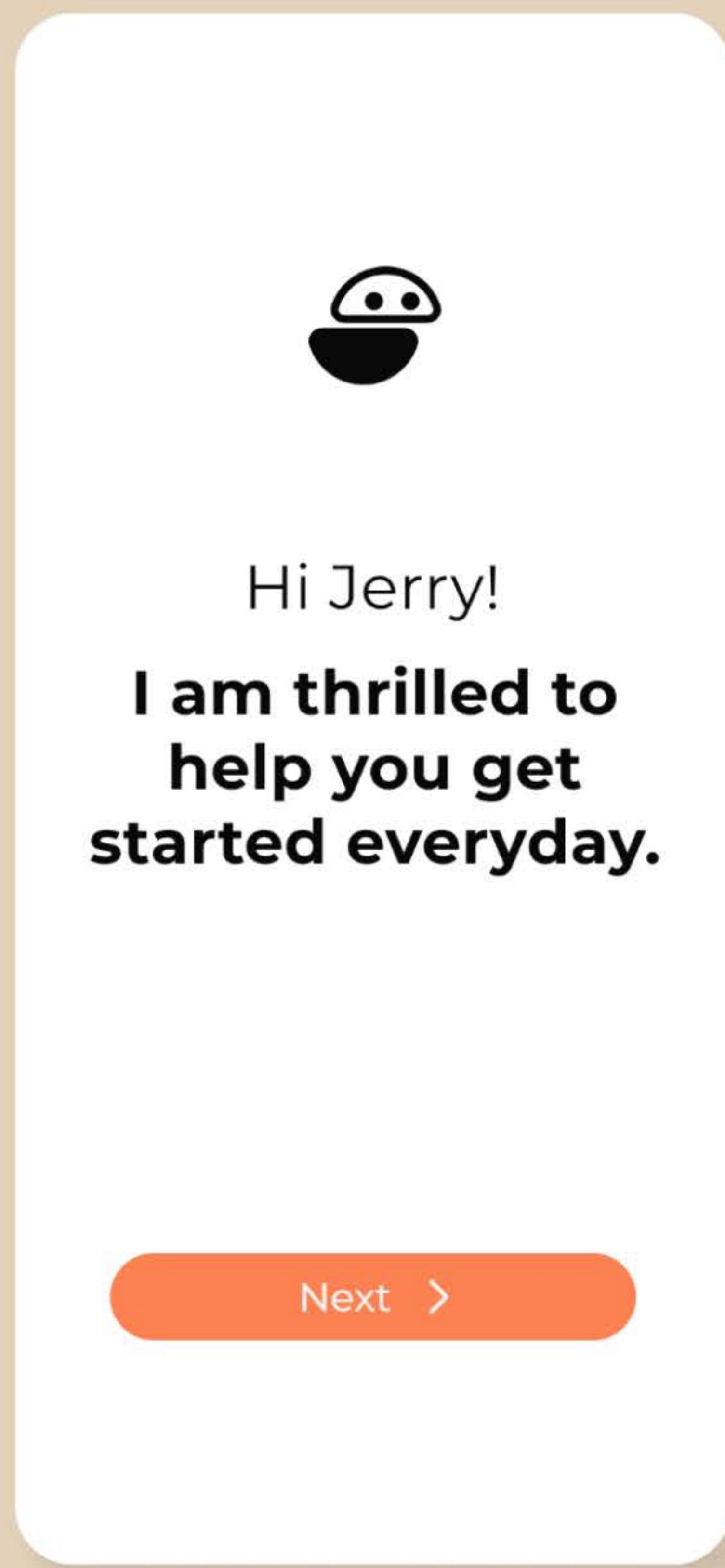
In the series entrepreneurship project, I continued exploring key factors for a successful behavior intervention. Leveraging the cute branding logo, I created a mascot called Moti, who is your personal motivation coach. In addition to the accessibility theory proposed in Halfmind Reminder, Moti brings zero interaction load that fully liberate people from anxiety over task paralysis.

## Methodology

Feeding keywords generated from Behavior Change model to LLMs to generate impromptuous persuasion for task paralysis users.

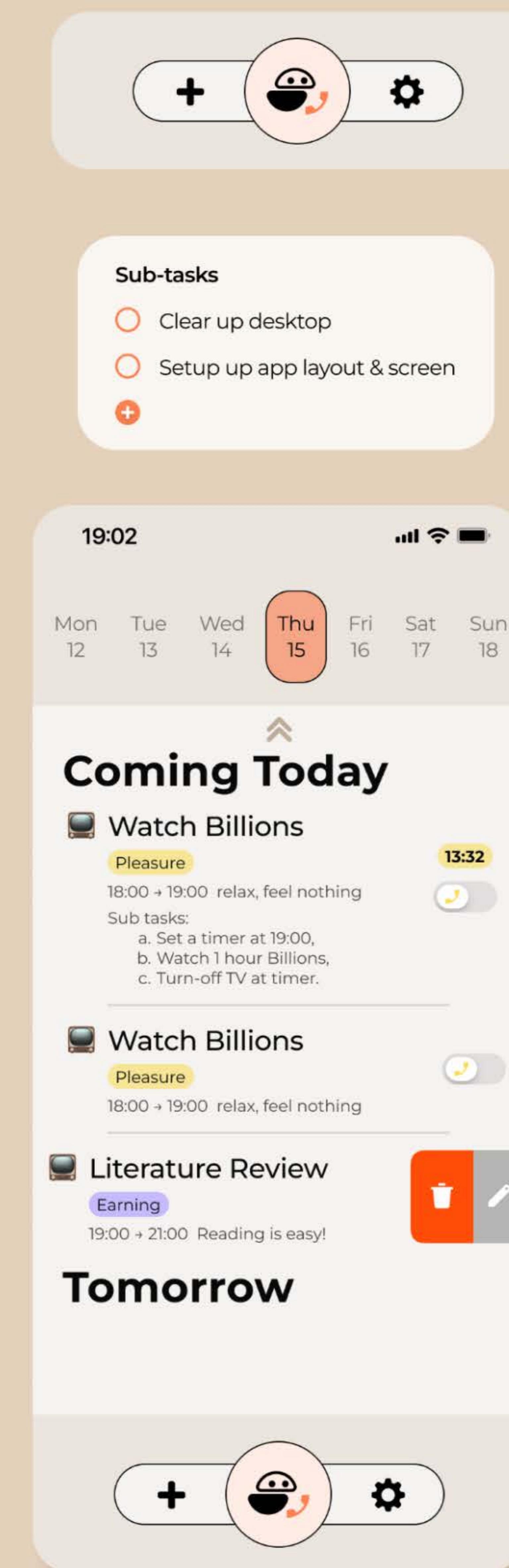
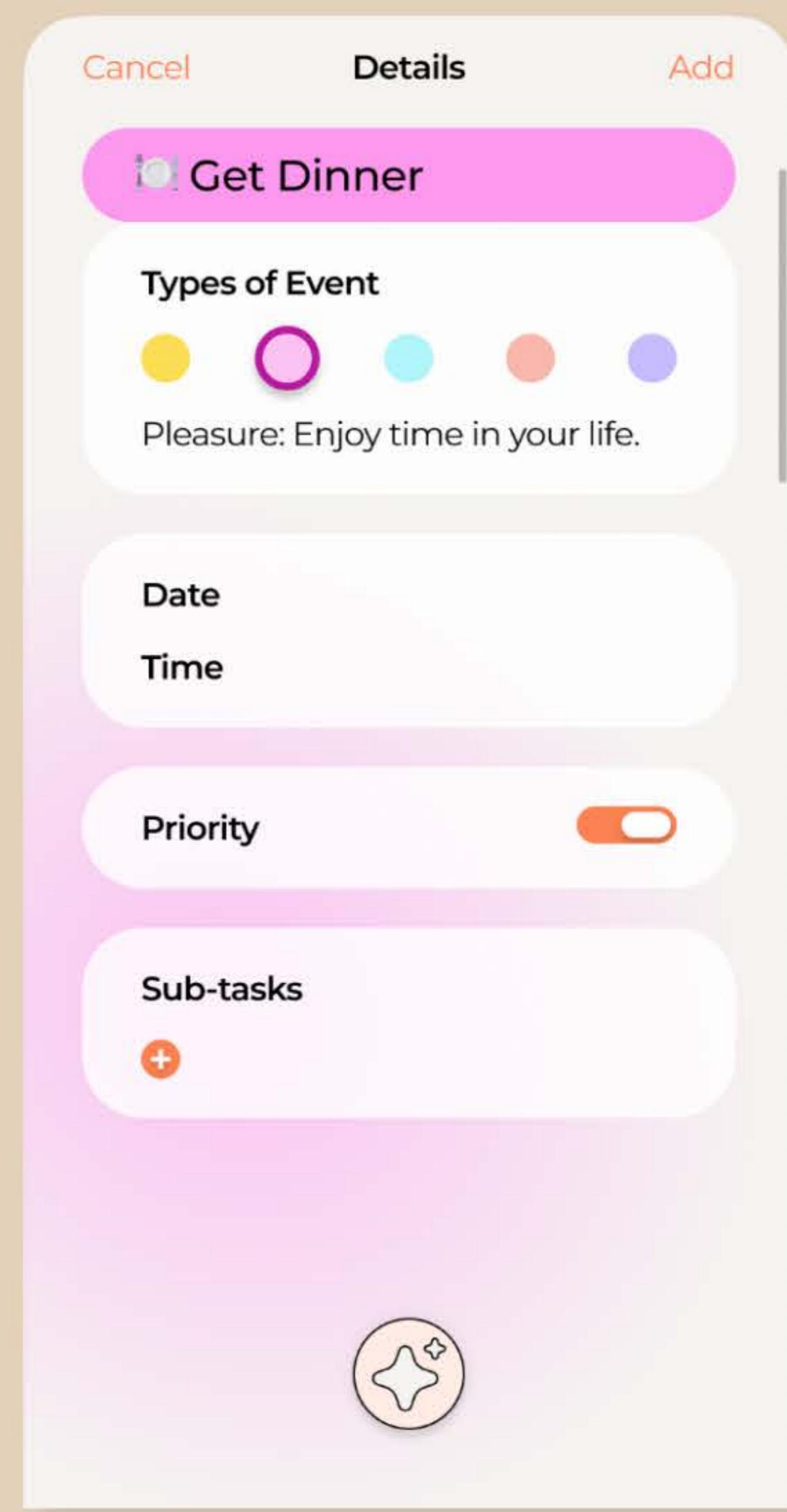
**Individual  
2025**



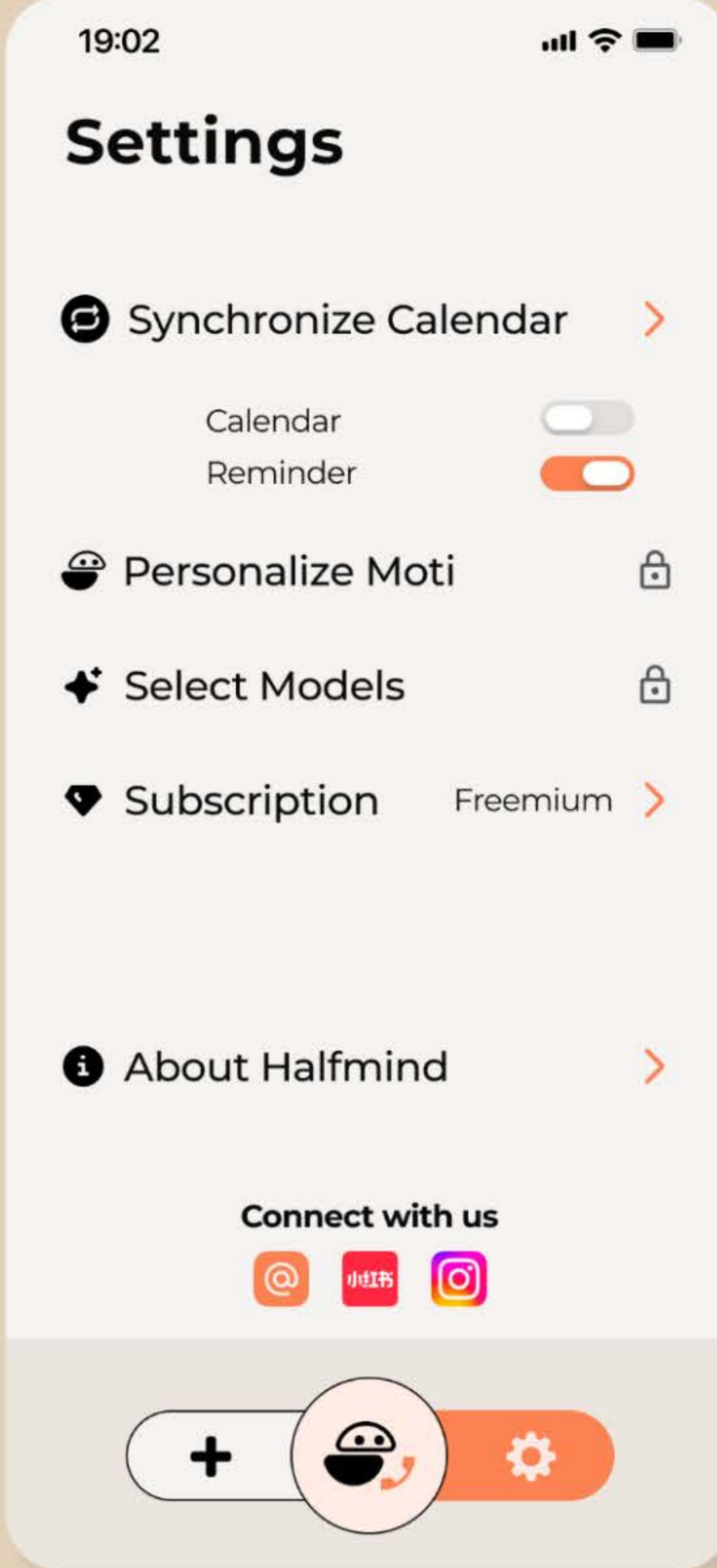
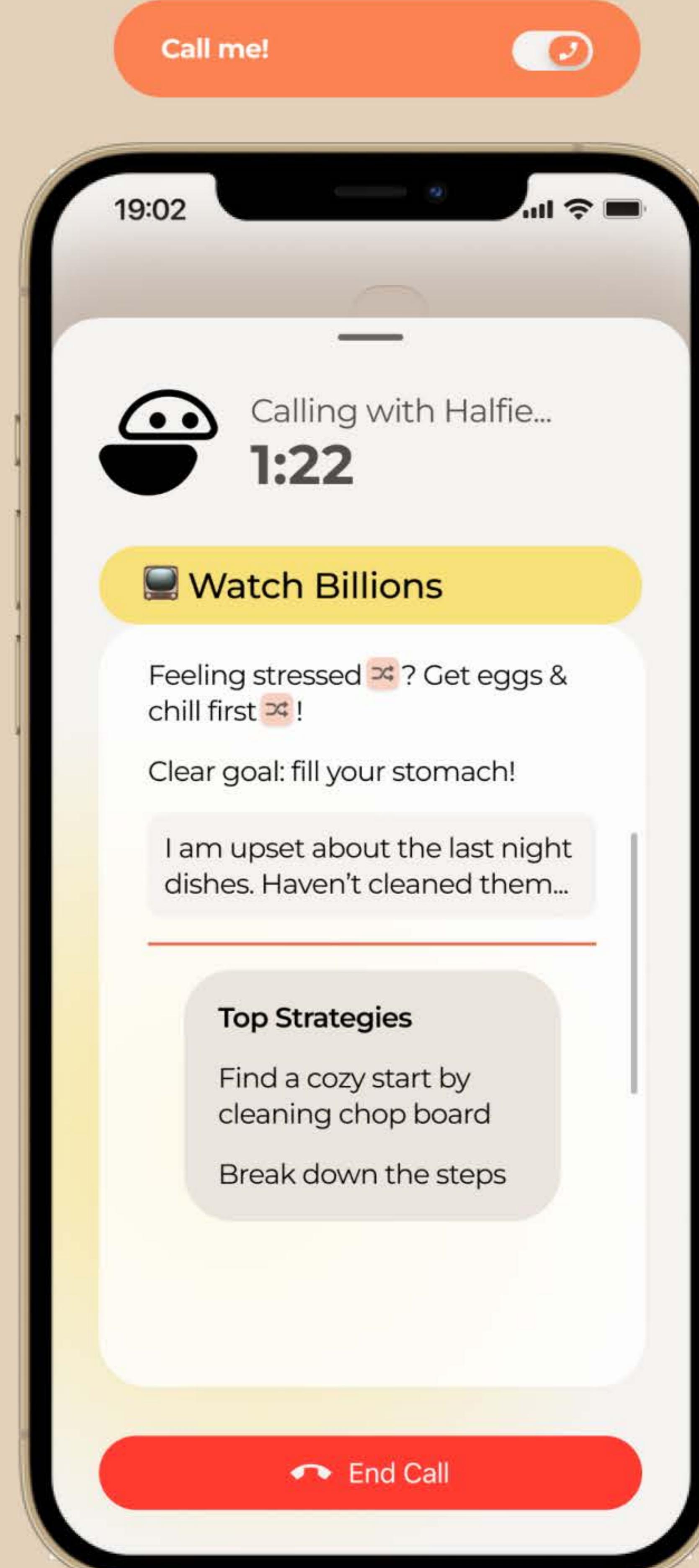


# App Design

Combining factors for a successful persuasion.



**On call.  
Let Moti initiate you.**



In contrast to traditional apps, Moti leverages VoIP calls to initiate you. Simulating friends calling, you won't hesitate a second to get started.

# Electrify Tractors

## Electric tractors paired with power ecosystem

This 6-month project explored possible solutions of electric tractors to be deployed in farmlands. Challenged by the rationality of designing an electric tractor, Kverneland proposed a vision for future machinery, where its economy, sustainability, and usability were left for us to verify. The main issues are: in what scenario can we maintain an electric tractor? In what way can be sustainably operate on it? Who will need this system? What technologies are required to support it?

We introduced an ecosystem including sustainable power harvest, storage and consumption around the rechargeable, swappable battery pack. The outcome would benefit farmers in the Netherlands from leveraging rich renewable energy.

Group of six  
2024

### Around the Battery Pack

The modular battery system consists of customizable, swappable battery units designed for flexibility, scalability, and user maintenance. Farmers can adapt the system to their needs varied throughout the crop year and replace batteries at ease.



**FARMER JOE**

AGE	54
LOCATION	Poland
TYPE OF FARM	Crop farm
SIZE	500 Ha
KEY CROPS	Potatoes, Wheat, Unions
OWNERSHIP	Family-owned farm



**FARMER GEORGY**

AGE	60
LOCATION	Canada
TYPE OF FARM	Crop farm
SIZE	2000 Ha
KEY CROPS	Wheat, Corn, Seeds
OWNERSHIP	Cooperative



### Persona

#### BIO

At the family-run farm, Joe collaborates with his relatives, each managing their own designated areas. In addition to aiming to boost profits, they've established a camp-ground parking lot as a backup plan. They operate a fully self-sufficient farm that utilizes wind turbines and solar panels, generating six times the energy required for their needs.

#### FRUSTRATIONS

- Round spreading pattern leaves area's untreated
- Lot of task documentation
- More restrictions from the EU regarding to farming
- Ground compacts under the weight of heavy machinery driving over the land


#### BIO

Georgy is a Canadian farmer who with two compagnons on a vast expanse of land. With 2000 hectares his focus lies on cultivating wheat, corn and various seeds. From March to September his attention is dedicated to nurturing the crops. During winter time, Georgy shifts his focus to maintaining and repairing machinery in preparation for the upcoming year. Given the scale of his farm, efficiency is paramount in the crop care processes, minimizing time consumption wherever possible.

#### FRUSTRATIONS

- Fields far away from farm
- Land use restrictions from government
- Machinery maintenance
- Decreasing water resources, due to climate change

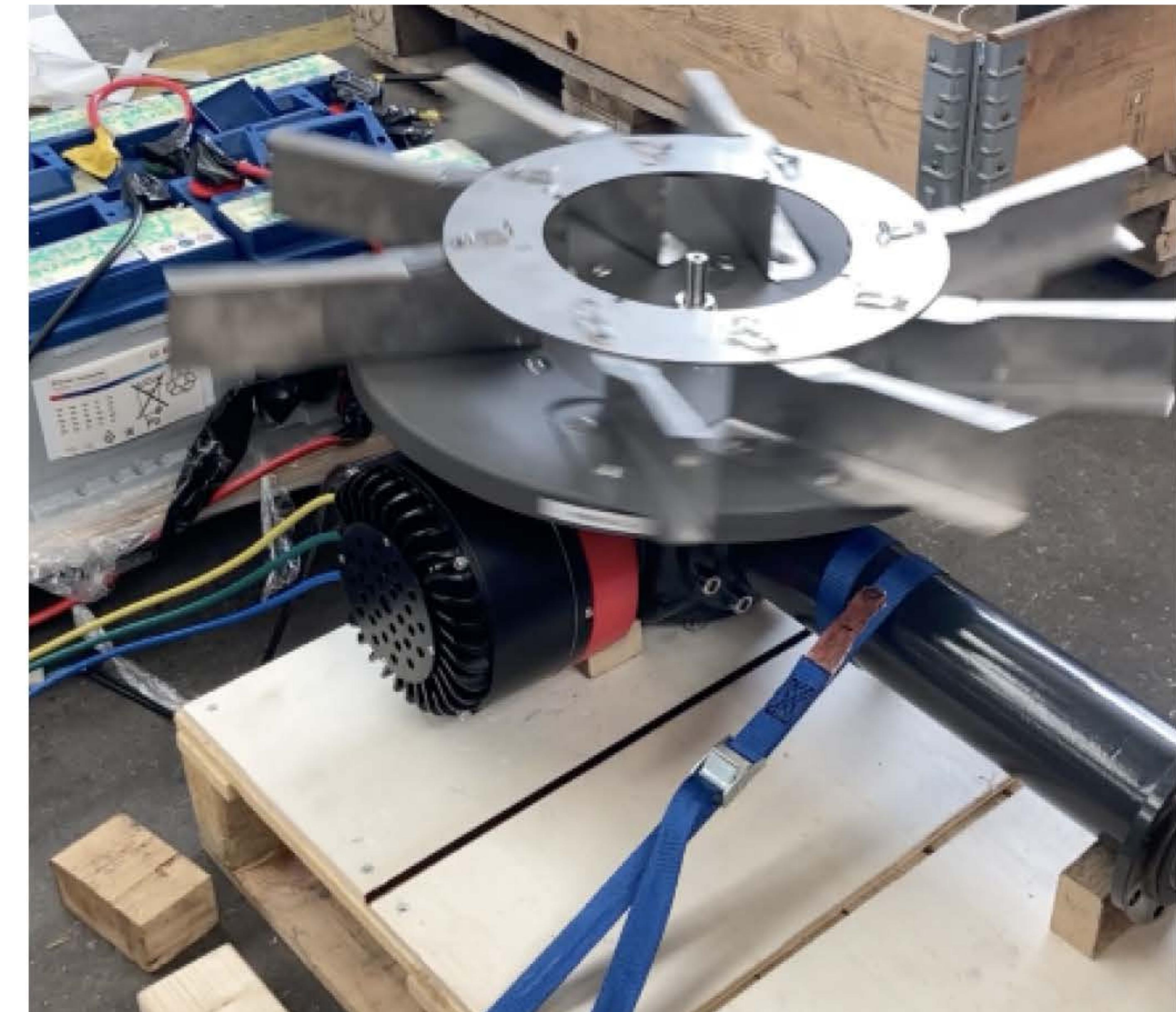
# Concept



Focusing on the mobility of the battery pack, we developed a power-swapping solution for agricultural tractors equipped with standard ISOBUS connectivity. This approach unlocks the full potential of an energy self-sufficient farm by enabling any electrical appliances to be powered directly by the battery packs, eliminating the need to first feed generated wind and solar energy back to the grid. This reduces all power waste through transmission and ensures robust power safety even at off-grid scenarios.

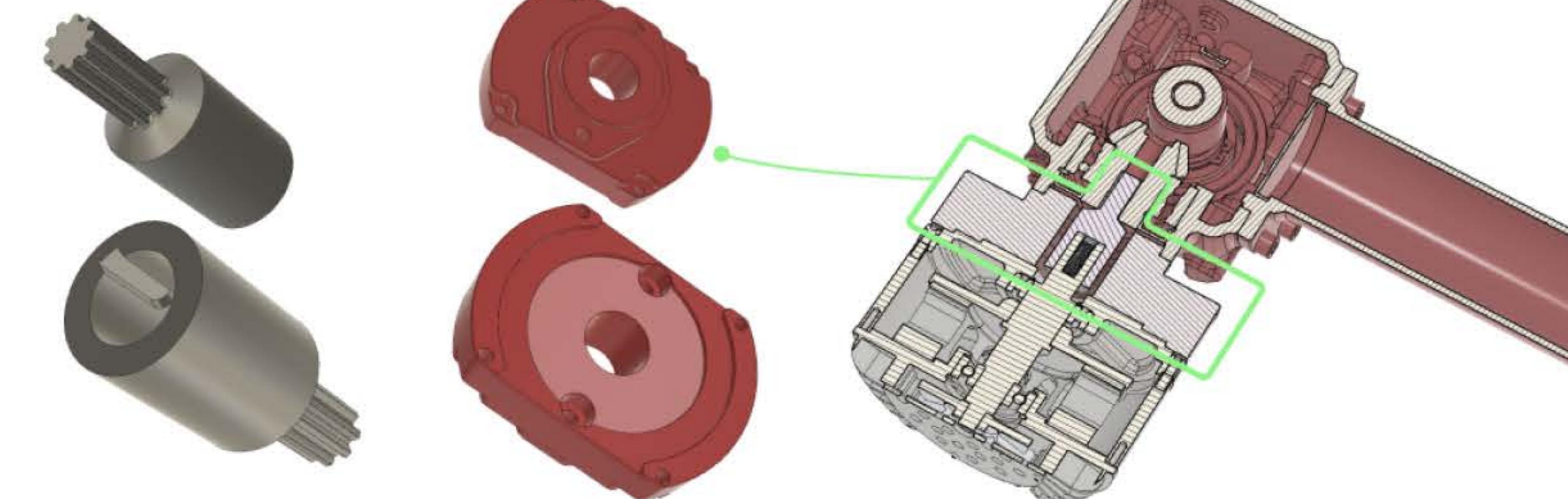
# Prototype Testing

**Whip it in the fields.  
It's ZEKER durable.**



## Battery Frame

We collectively designed this battery frame and simulated material failure performance in SolidWorks. Then we welded it out and tested on real tractors for wobbling stability. The results passed requirements.



## Motor for Agricultural implements

I designed and validated the power load of agricultural implements for an electric tractor in digital twin, and used a car battery and motor system to simulate real-time power demand and efficiency. This spreading system runs at required speed (1700 RPM).

## Adaptors

The drive chain adapter was prototyped through PETG 3D printing. The shaft is also 3D printed due to lack of standard parts.



## Exponential efficiency in lab automation

EXPLAB dedicates to continuous and configurable powder dispensing tasks in the laboratories. Its innovative structure combines the powder dispensing, sample storage and protection lid in a square area less than a laptop computer.

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**U.S. patent application pending  
Chinese patent issued**

**Individual  
2023**

# Powder Dispenser

### EXPLAB Understand Researchers

Lab equipment is professional tool, which require more expertise in both industries to truly provide function integration and convenience to researchers. EXPLAB knows your needs!



# Concept

With two sets of motors, five droppers can dispense up to five different ingredients in the single run, facilitating the experiment in the largest efficiency.



## Five Droppers

Droppers are able to dispense 5 ingredients in one experiment.



## HTE Batch Operation

Take out the whole plate of total 30 samples at the same time.



## Standing Position

Screen can be elevated to fit researchers' standing work.

## NFC Supported

Tap your card to load back your workflow preferences.

## Protection Lid

Prevent cross-environment contamination. Easy to open.

## Detachable

Almost all parts are detachable for thorough cleaning.

# Prototype Highlights

Space-saving and efficient choice in lab.



## UI Design

The set of glassy UI helps users to spot the most useful information at the first glance.



Tap your NFC  Card to resume workflow.

## NFC

Though the machine may be shared in lab, your personal workflow can be saved in any NFC card. Tap to save and reload your own recipe!

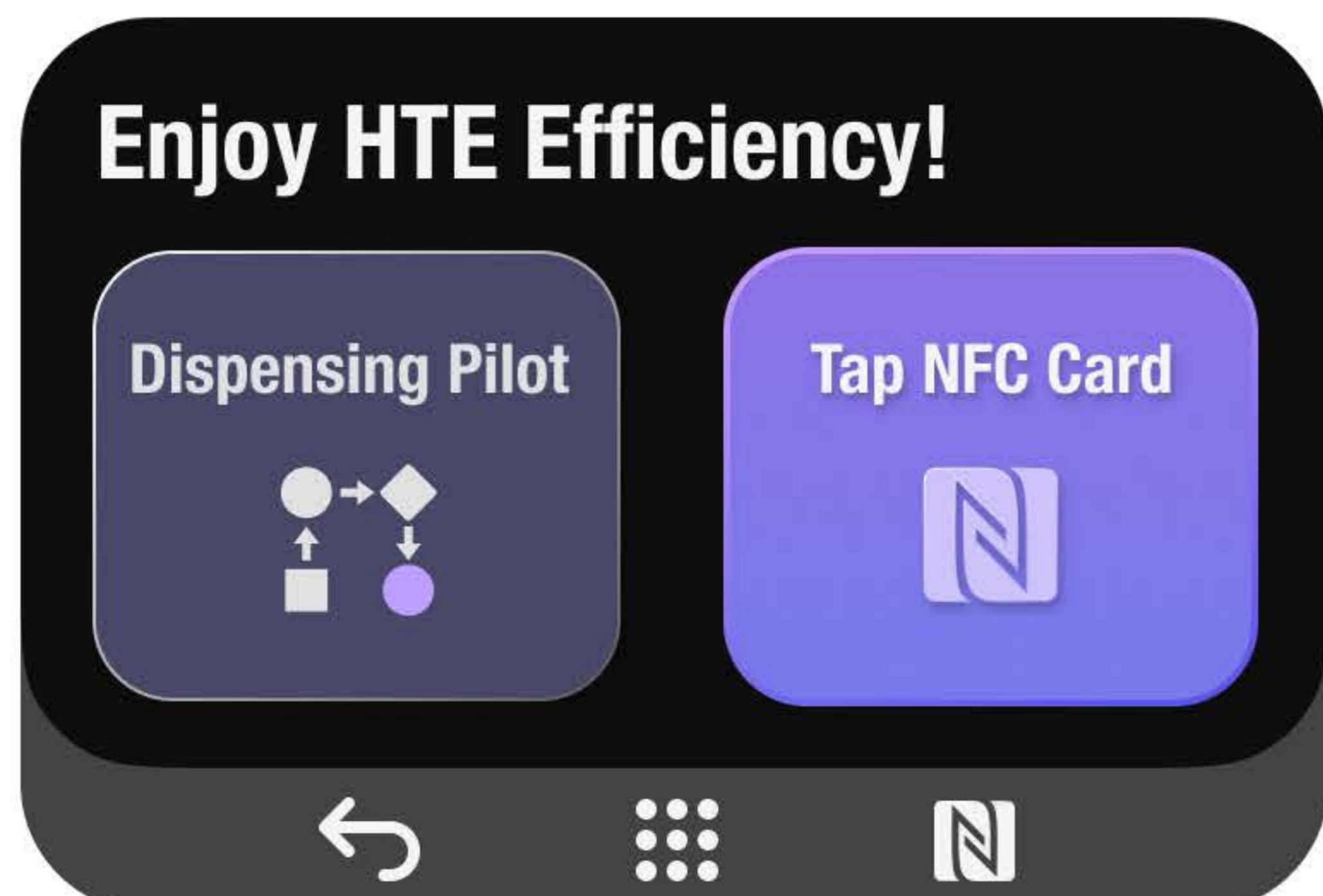


## 2025 Update

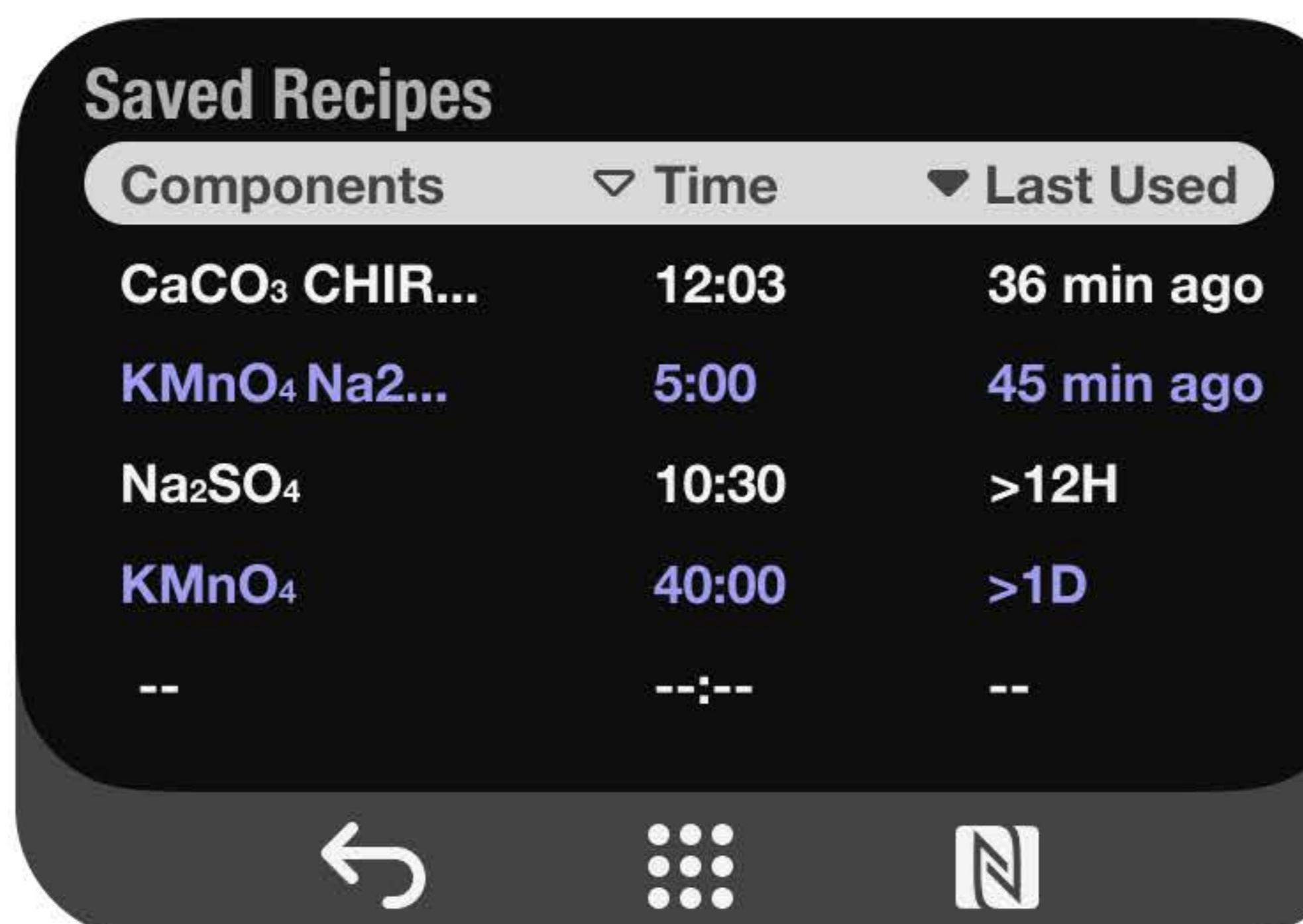
View latest testing prototype currently for QA validation in Carnegie Mellon University.

# UI Journey

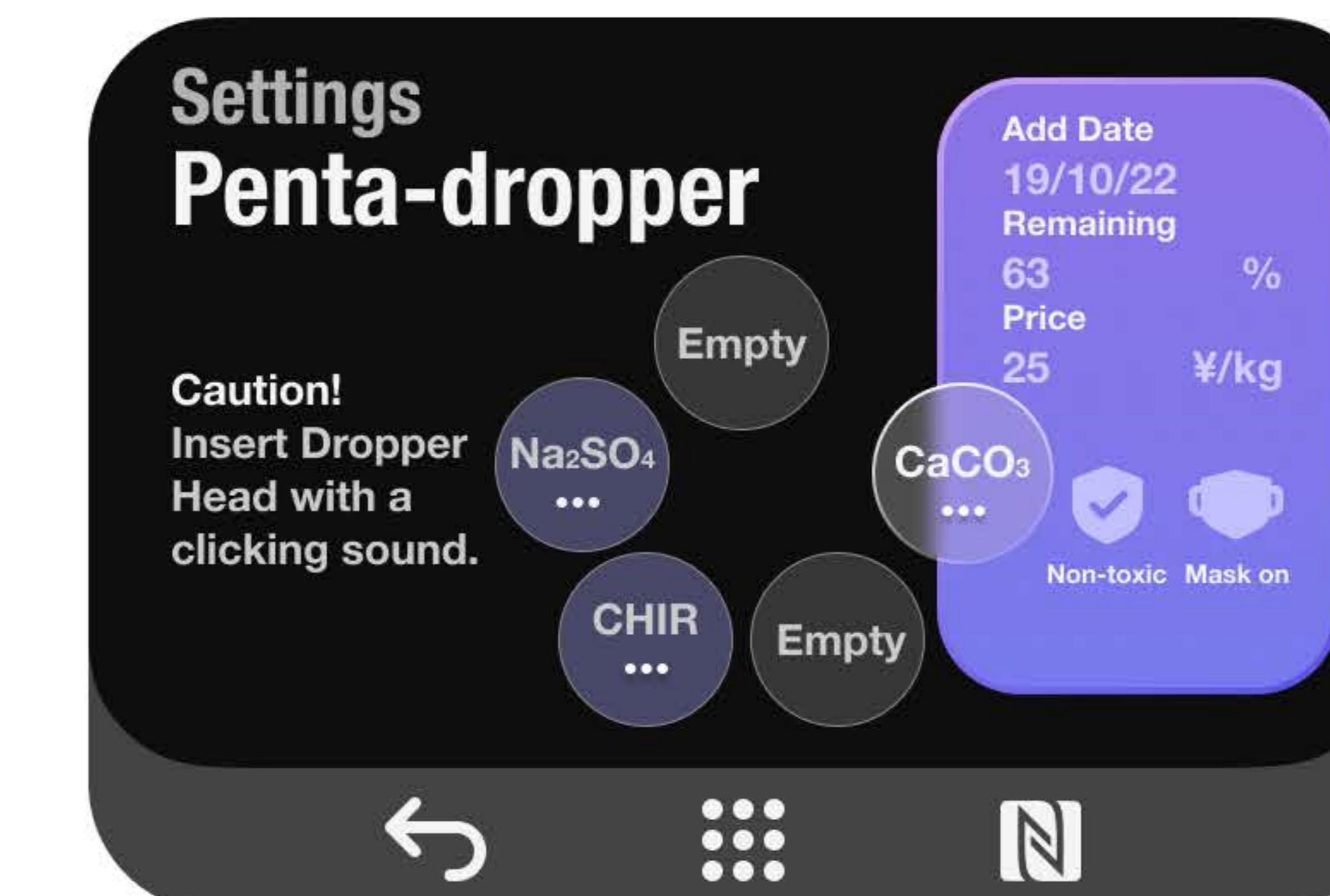
Minimum steps to reload/  
edit your workflow



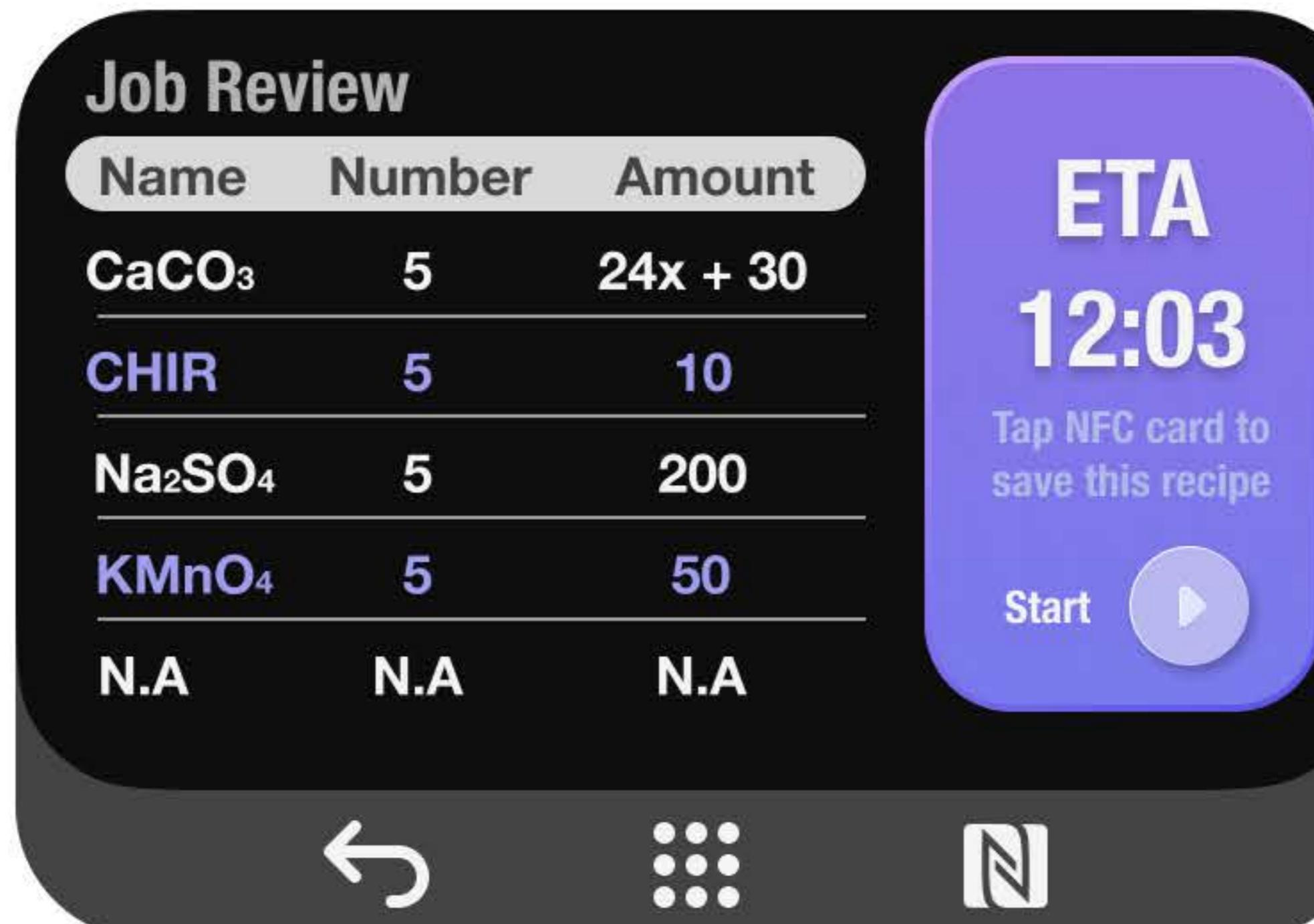
Welcome page



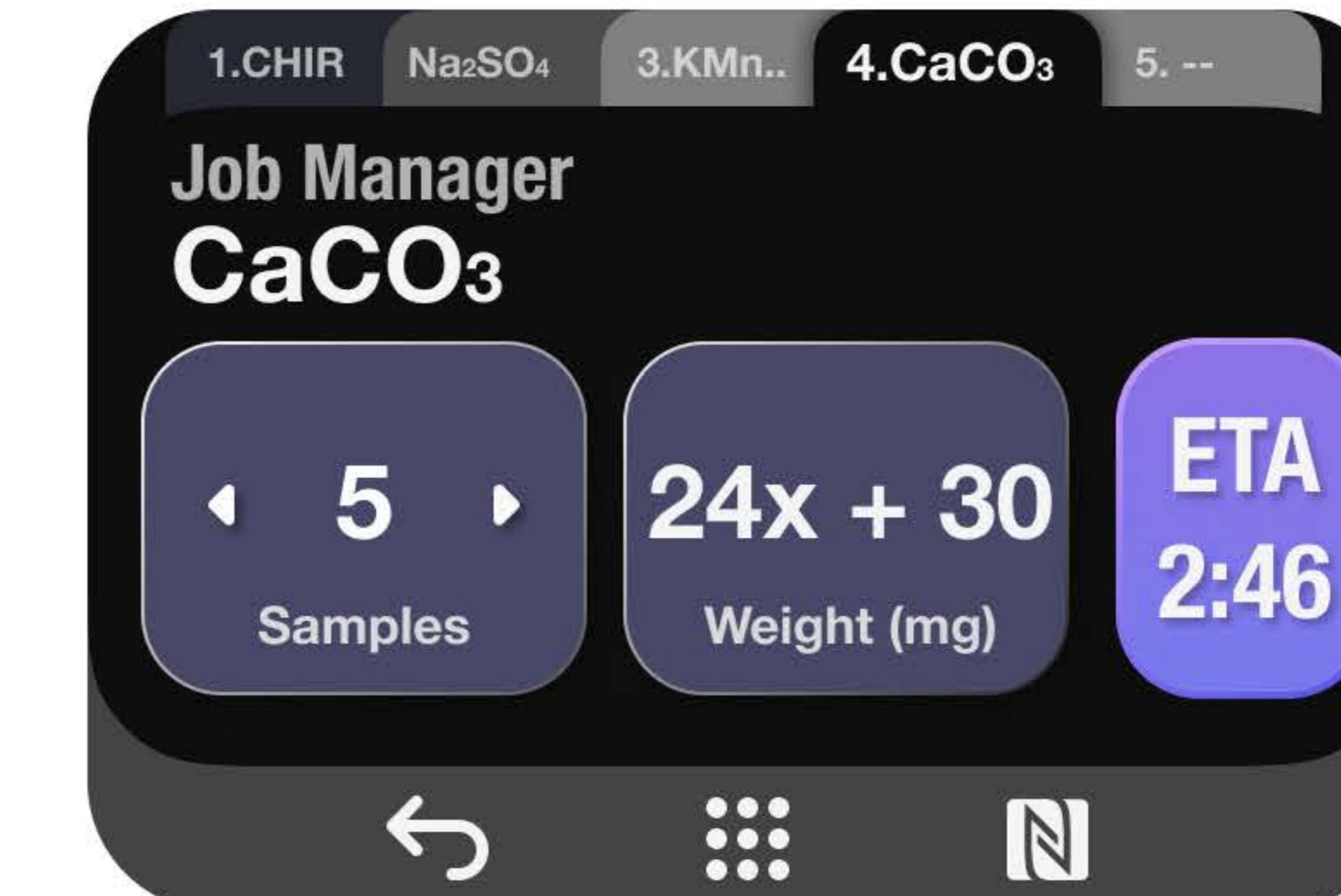
Saved recipes from user



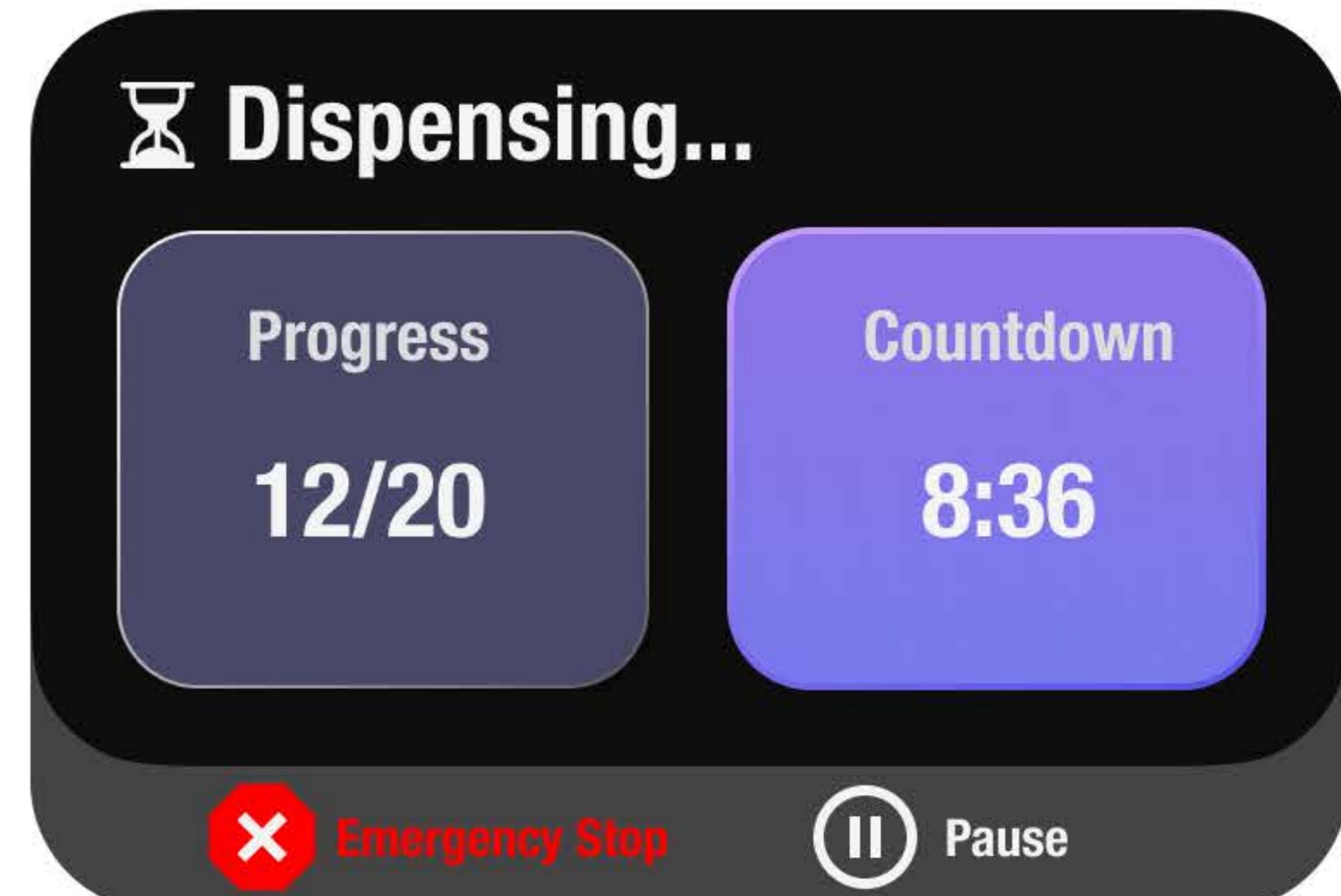
Dispenser config



Retrieve history from NFC memory



Edit recipe details



Dispensing in progress

