

Industrial/UX/UI Design

PORTFOLIO

Liwen Liang

2022-2023



Hi, I'm Liwen!

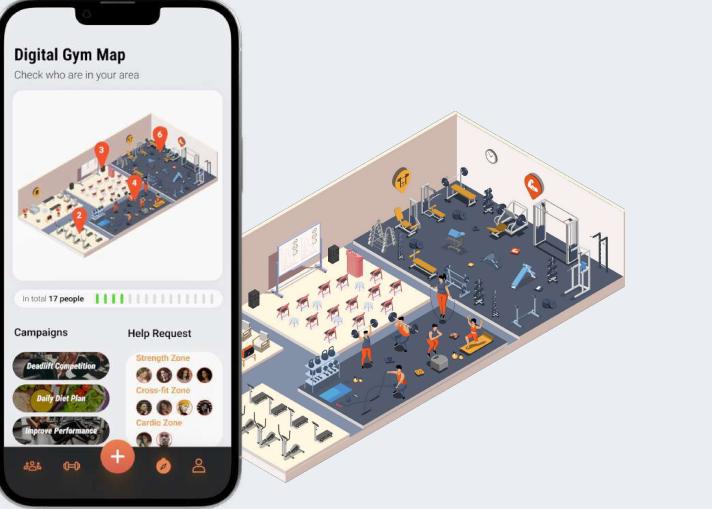
My design ethos involves integrating technology into daily life for a more convenient and inclusive experience. I believe technology goes beyond function, providing richer experiences. I focus on merging sports and technology to enhance athletic performance and promote healthier lifestyles. Additionally, I explore using technology to assist those with special needs, emphasizing the value of inclusive design. My design journey extends to technology research, pushing boundaries and integrating cutting-edge technology into my work.

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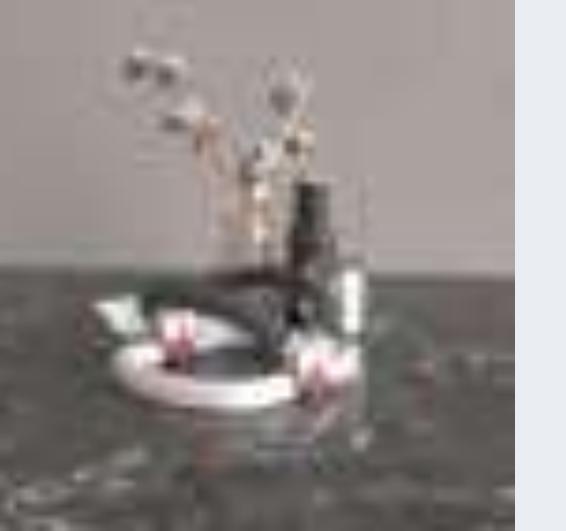
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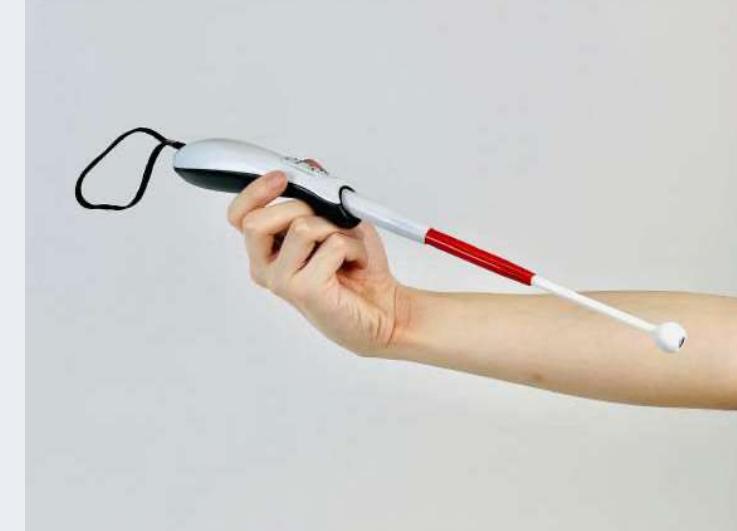
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EmpowerFit

This is a gym where **Everyone Can Be A Coach**. The project aims to improve the communication and interaction to meet the user **practical and emotional needs**.

This project focus on the difference of needs of trainers with different training experience. As training experience grows, the weight of the trainer's emotional needs grows. The project starts from the differences in needs and proposes to have different levels of trainers interacting to complement each other's needs. In terms of outcome, the project provide users with a series of service which promote communication and interaction between gym users. Everyone can find their training partner or be a coach of others. Everyone can host activity or workshop to share their training experience with others. Every user is able to fulfill their needs here, whether they are practical or emotional.



About Gym in University

1. Trainers are mainly young people (Z generation)
 2. Post covid time, people pay more attention to their health
 3. What are the emerging needs of young users for gym and fitness?



Observation

Notable phenomena can be found in Gym

I went into the gym and started making some observations about the environment, and in the process I also noticed some noteworthy phenomena



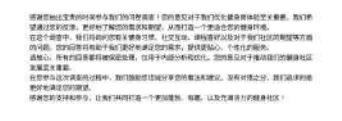
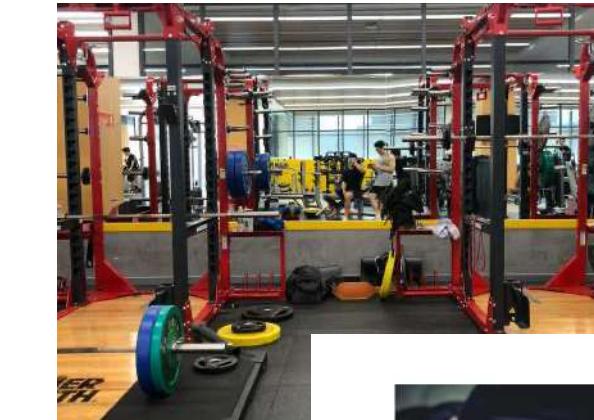
- Fitness buddies and groups are common
 - Fitness groups have a tendency to dominate strangers
 - Trainees are shy about training in front of others
 - Trainees may want to join a fitness group after observing their workouts
 - Enthusiasts will go to the minority trainings
 - Without manner is



Questionnaire

Quantitative data to determine design direction

On the basis of the phenomenon of environmental observation in the early stage, I designed a questionnaire based on these directions in order to get a more intuitive user needs through quantitative data. A total of **32** valid questionnaires were collected.



Gym User Classification



Practical Needs



Emotional Needs



Code of Conduct for Gym

1. People has both physical and emotional needs in gym

Physical Support in Need



Facility Instruction
53.13%



Fitness Plan
62.5%



Diet Plan
59.38%



Exercise Performance
65.63%

Social Interaction



31.25% of participants seek for **social interaction during fitness**

2. Exercising is a way for people to manage their anxiety and increase confidence level

Emotional Needs



Improve Confidence
75%



Reduce Anxiety
59.38%



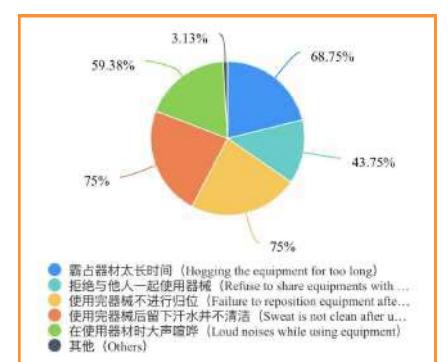
93.75% seek fitness to enhance the sense of self-worth or well-being

3. Uncivilized behaviors affect gym experience

Uncivilized Behavior



— 75% of participants think there is a need to **hold workshop of Gym's manners**



Conclusion

A gym is more than just a place to exercise. There are many people who come to the gym to **socialize and thus satisfy their emotional needs**; there are also trainers who want to **learn other advanced training knowledge**.

Questions came from quantitative research

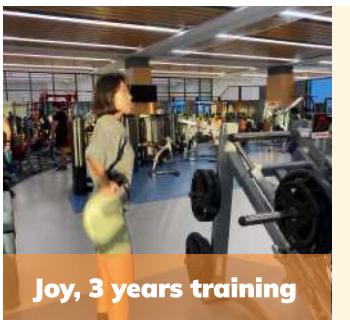
1 How the gym can provide relevant fitness knowledge to support users to have better training?

2 How the gym can be designed in a way that better fulfills the users' emotional needs?

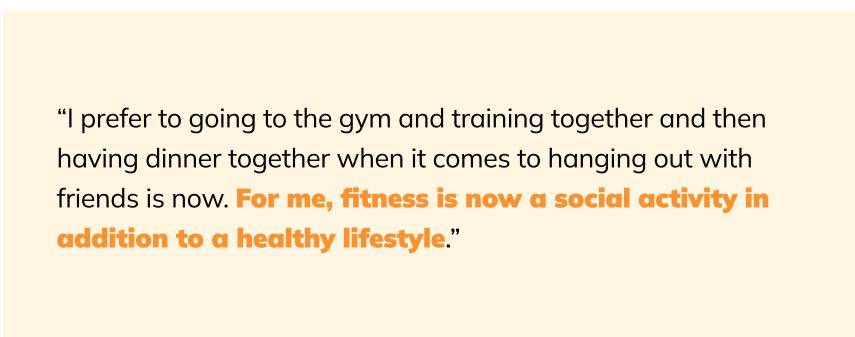
User Interview

Digging deeper into user needs

With the quantitative information obtained from the previous questionnaire survey, I decided to **focus on the practical and emotional needs of the gym users** in the user interviews to further explore their needs. I also designed an interview guide based on these two dimensions.



"I started to get fitness knowledge is through the video platform, but from the paper into the actual thing will still have some difficulties. From the training itself, **I still do not know how to efficiently arrange the training, and the diet plan is not very scientific as well.**"



"I prefer to going to the gym and training together and then having dinner together when it comes to hanging out with friends is now. **For me, fitness is now a social activity in addition to a healthy lifestyle.**"



"I think having a training partner should be very useful for me. He would not only **provide some protection** during the workout but also be able to play a role in **monitoring my workouts.**"

User Journey

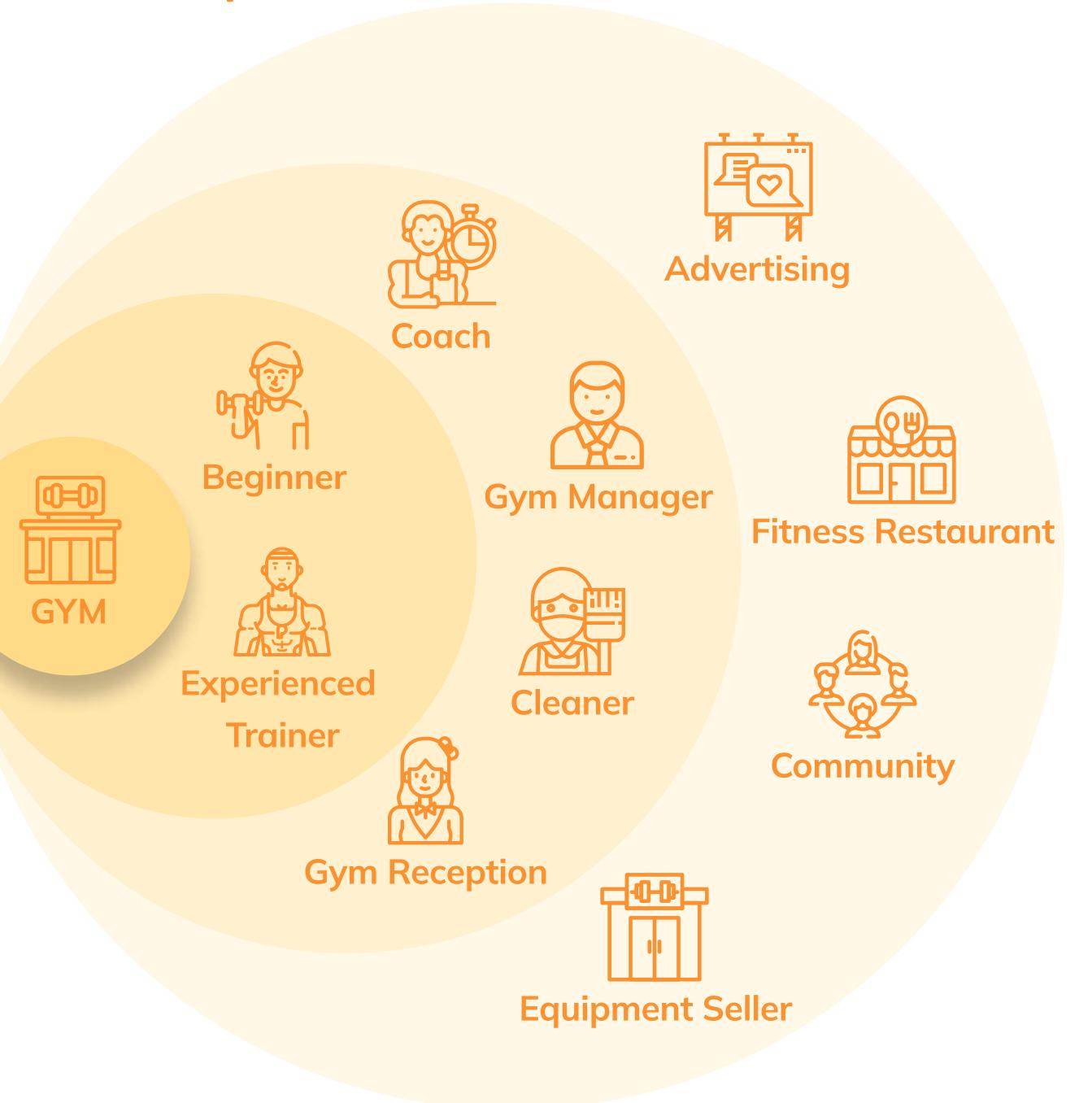
Experience the current gym from the user's perspective

	Before Training	During Training					After Training	
Activities								
Actions	<ul style="list-style-type: none">Get motivatedPre-training micronutrient supplementationAdjust mood	<ul style="list-style-type: none">Articulating jointAvoid injury	<ul style="list-style-type: none">Used large weights for bench press training and got someone present for protection	<ul style="list-style-type: none">Used the training methods seen in the fitness video	<ul style="list-style-type: none">Post-training nutritional supplementationRelax			
Emotions	<p>Going for a tune-up before training lets the mood rise gradually</p> <p></p>			<p>The overall mood was high because of the use of large weights in the bench press and being complimented by the other trainers during the breaks</p> <p></p>			<p>Overall mood slipped because of the loss of stamina during training and the boring cardio</p> <p></p> <p>Post work-out meal can significantly improve mood</p>	

How Might We...

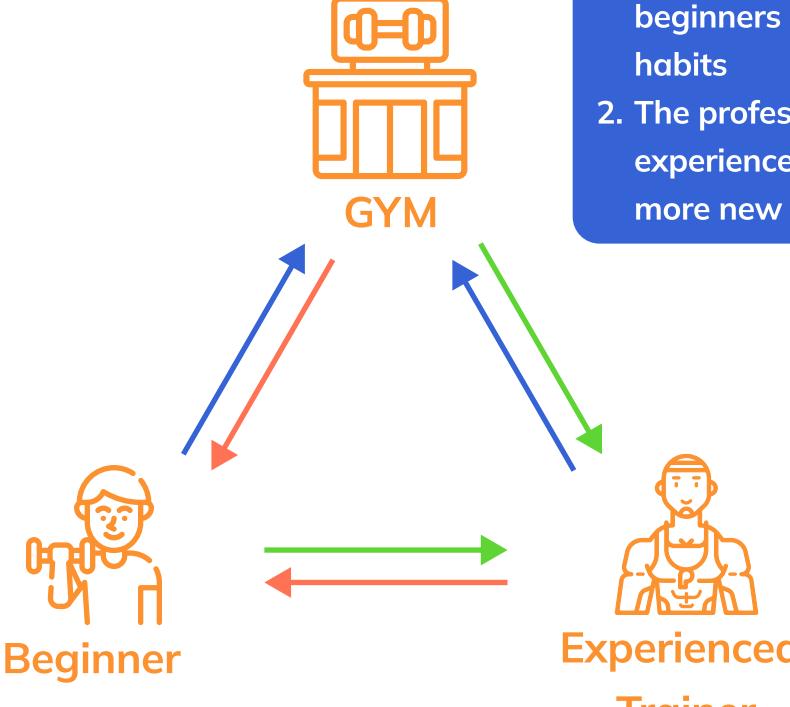
**design a gym to help users
to achieve their physical
and emotional goals?**

Stakeholders Map



Key Stakeholders Value Map

By analyzing the different stakeholders, the exchange of value can be accomplished through a collaborative model between the three main stakeholders: **the gym, the fitness beginners and the experienced trainers.**



1. Gym can generate long-term revenue since beginners can develop long-term fitness habits
2. The professional atmosphere created by experienced trainers can help gym attract more new members to create revenue

1. Experienced trainers can obtain the sense of achievement and emotional value by teaching beginners
2. Experienced trainers can have a place to share their understanding about fitness, which can help them gain a sense of self-actualization

Co-Creation

In the co-creation part, I invited several users and gave them a **couple of scenarios** which are about how to increase communication and interaction between different users. After collecting their opinions they were given a task to **draw and describe the ideal gym** which would best fit their needs

Scenarios



Gym Layout



- How to get fitness beginners to ask for help in unfamiliar environments ?

I think in this case **developing a "couch-learner" relationship** for the novice would be a easier way to get him up to speed on the fitness

- Please build an ideal gym layout according to your needs

In conjunction with the previously discussed value proposition of the gym, I feel that the gym needs to **include areas for different types of exercise as well as a place for users to share with each other**

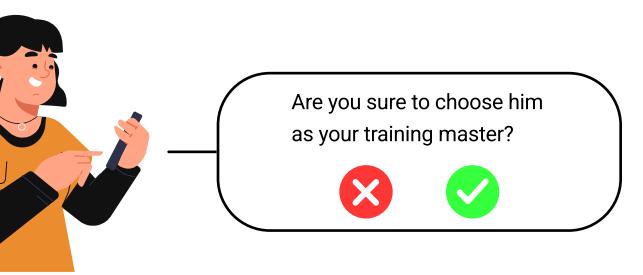
Value Proposition

Everyone Can Be The Coach

Key Scenarios

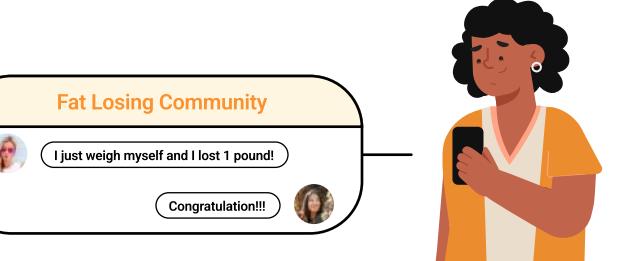
Use App to Match Training Partners

The app will match users according to the preference of each user



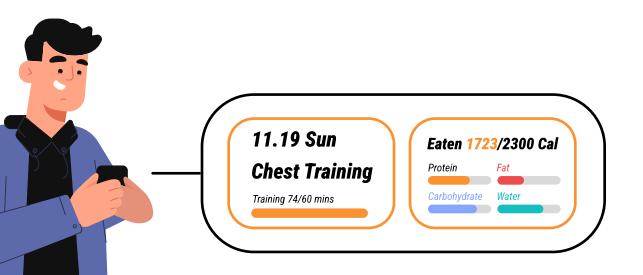
Use App to Join Exercise Communities

There will be communities with different exercise topics where users can have discussion with others



Use App to Get Practical Knowledge

User can use the app to set their training and diet plan and they can receive comments from other users



Trainers of Different Sports Come to Share

To meet the needs of different training purpose, the gym will contain different exercise facilities

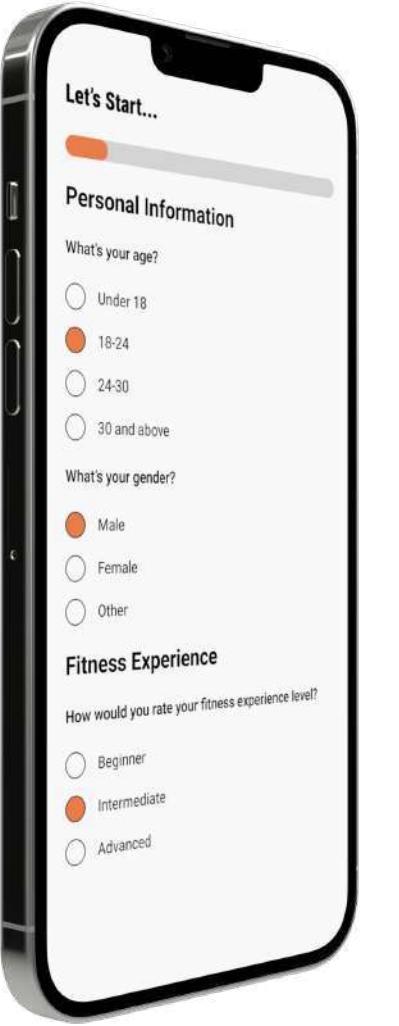


Receive Instruction from Experienced Trainers

After matching training masters or trainees, user can work out with them and get or give instructions

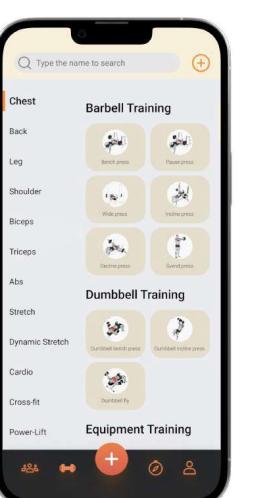
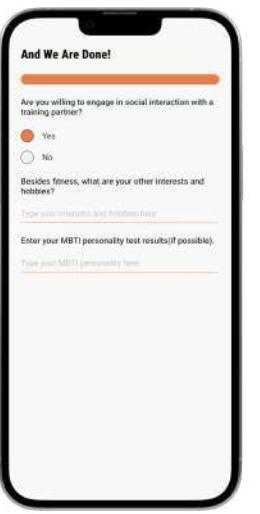
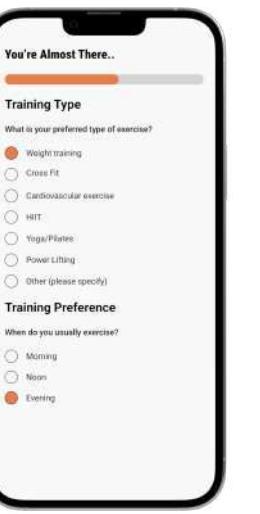
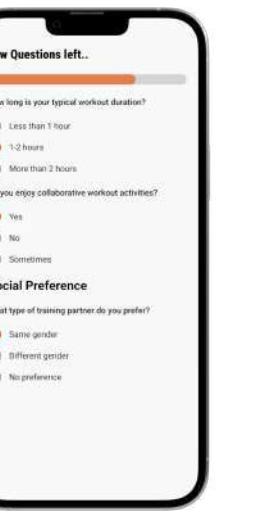
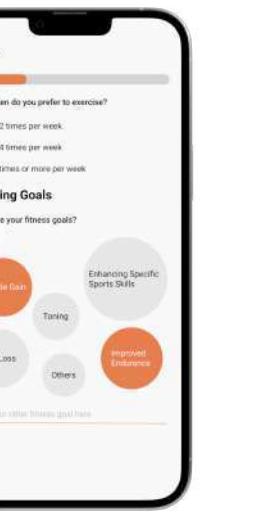


	Pre-Work Out Phase			Work Out Phase			Post-Work Out Phase	
User's Action	Matching Training Partners	Setting Training/Diet Plans	Hold Activity	Ask for help	Join Activity	Help Trainers	Digital Reward	Socialize
Front of Stage Interaction	Fill the questionnaire to get the personal card and choose the user they want to match with	Use the App to record the body data and choose current exercise purpose	Select the type of activity and related details then send the notification through App	Wait for another trainer and receive help	Sign up for the activity and join it with others when the date approaching	Accept the request then go to the zone to help the trainer	Fill the task blank and get digital reward which can be used to buy digital decorations	Go to the relax zone to chat with others; Use App to chat in the community
Back of Stage Interaction	Calculate the degree of match from the basic information of each user	Give the training/diet plan by using the body data and exercise purpose		Send notifications to people who are at the gym by recording the user's location data	Record the number of people who want to take the activity	Show the request is accepted and send helper's detail to the requester	Record the exercise time and check whether the corresponding task is completed	Fitness food and water supply need to be covered in the relax zone
Support Processes & Systems	The system needs to have a database that can be used to advise users on exercise programs as well as diet plans. The database can also be used to store user information and related data			The app needs to provide the basic instructional videos to avoid a situation where no one accepts the request			Establish the gym storeroom to ensure the supply of consumables for the relax zone	



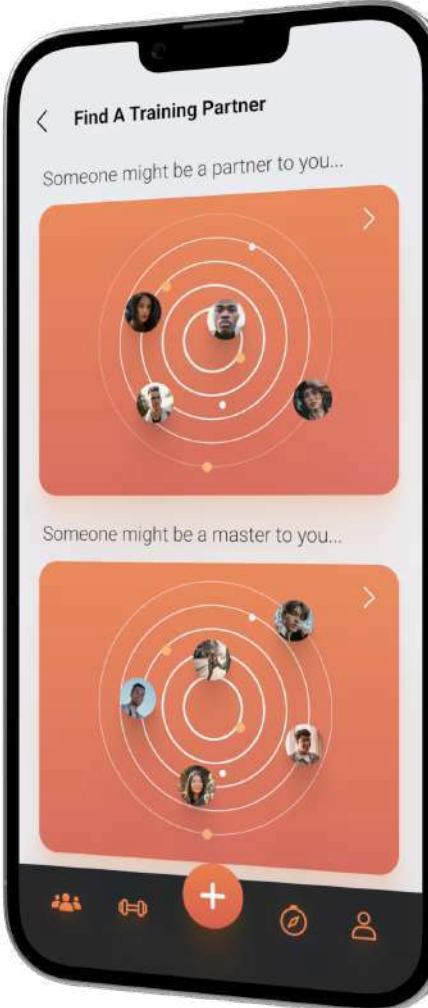
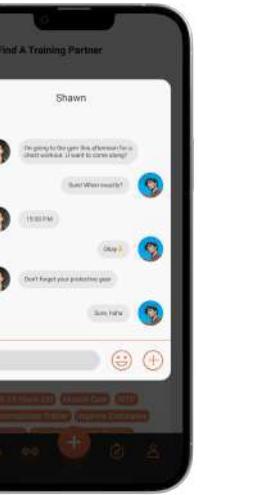
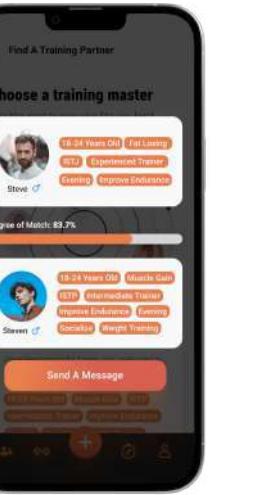
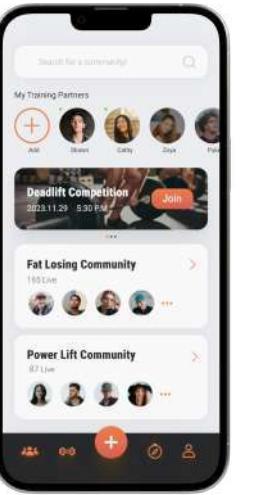
1 Understand the user's training needs and habits

Users need to fill out a questionnaire about their usual training habits as well as their goals when they start to use the App. **After completing the questionnaire they will be given their personal card, which will be used to match training partners.**



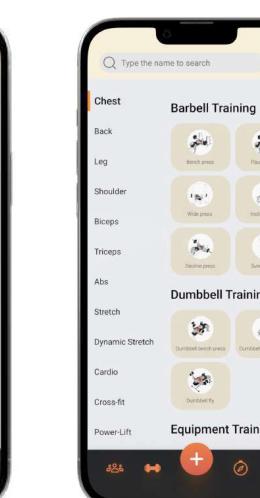
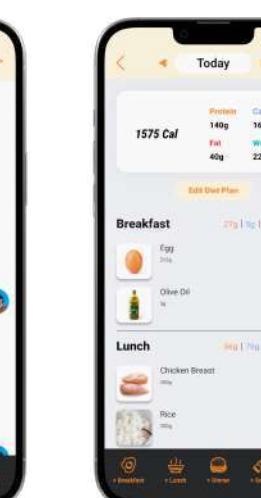
2 Match training masters and trainees

Users can choose their training masters or trainees by seeing how well they match up with other people's training preferences. **Everyone has the opportunity to become a coach to share training knowledge.**



3 Set training plan and share with others

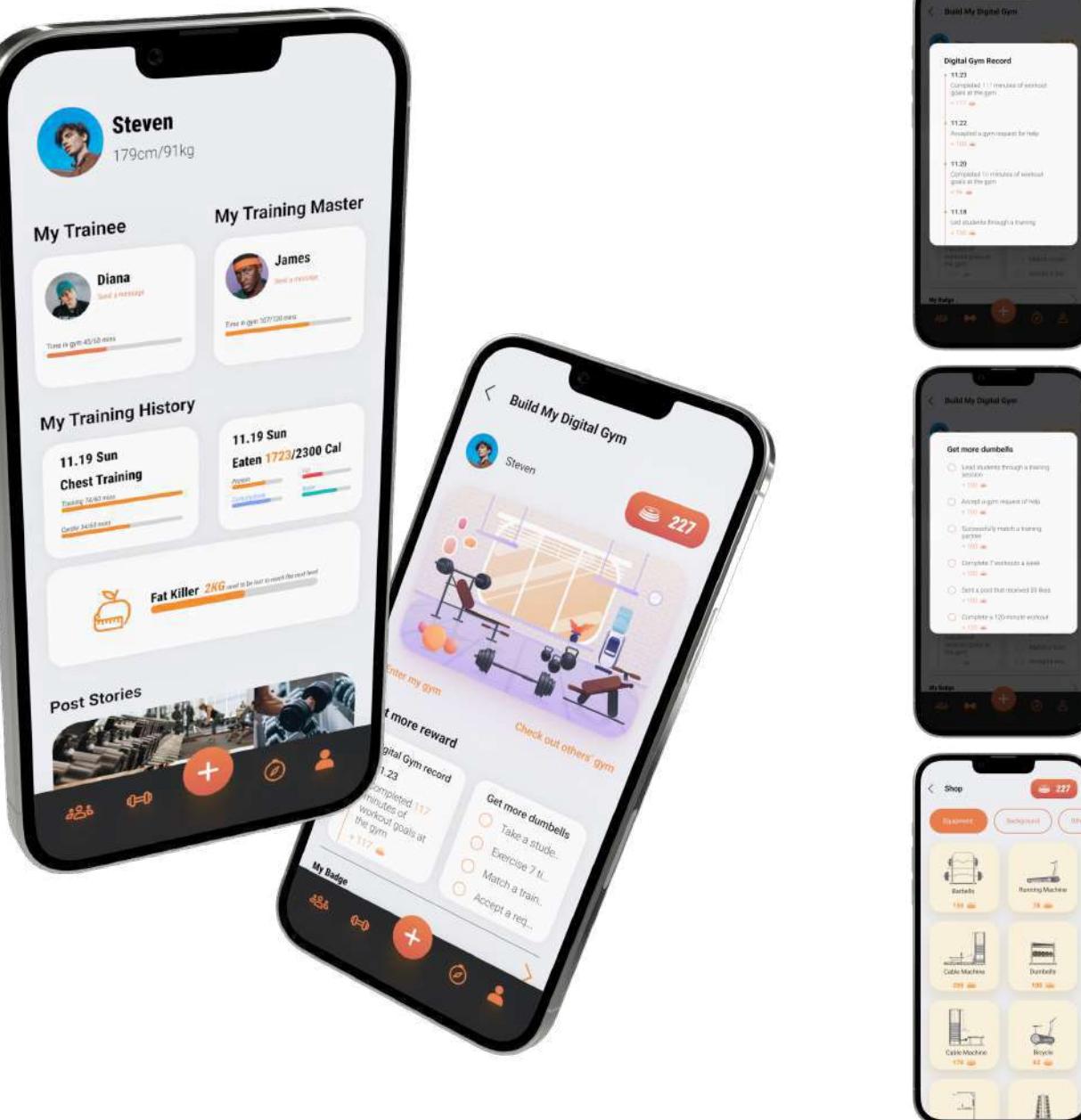
Users can use the app for their daily training and diet plans. **Other users can see the plan and communicate with each other on the user's homepage.**



Record fitness process and get digital reward

4

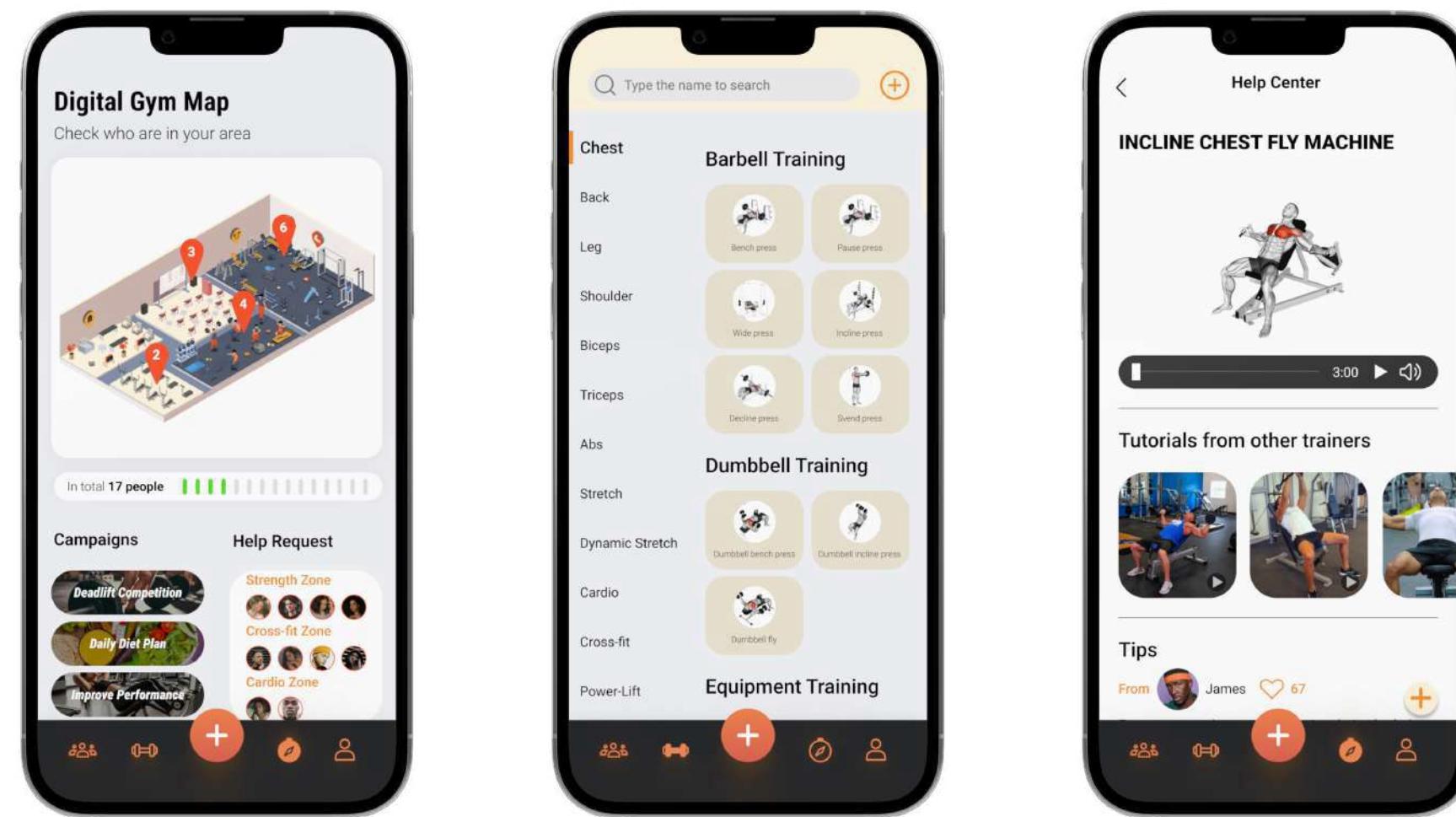
The App has the function that can record the fitness process including user's body data and photos, which will **help users see their progress so that they can keep doing exercise**. Users can get digital reward by completing the given tasks which related to fitness and helping others.



Digital gym map and pre-recording tutorials

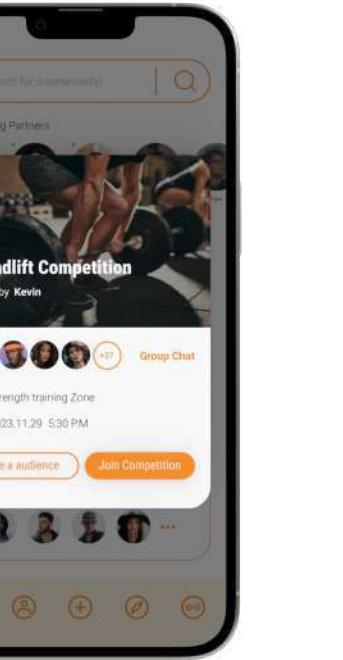
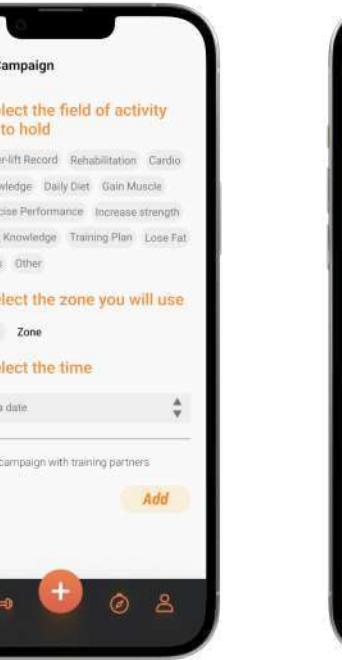
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The App has the **digital map section which allows user to see the real time status of the gym** so that users can arrange their time more easily. And App also **provide the pre-recording tutorials** to user in case user can not get help from others.



Everybody can host an activity

Every user can host a fitness activity by using the App. They just need to **fill the details about the activity then send the notification to the community**. The activity can be small tutorial or large workshop.



Gym Layout

In terms of the spatial layout of the gym, there is a dedicated sharing area and lounge in the gym in order to facilitate communication and sharing between different users. Each user can hold a workshop or experience sharing session in the sharing area. The lounge provides a place for trainers to socialize while meeting their nutritional needs.



Relax Zone

Trainers can social with others before and after training, they can get energy supply here as well



Share Zone

This is the place where users can have workshop or share experience. Everyone can host activity here



Strength Zone

Traditional trainers and power-lift trainers can work out here



Cardio Zone

Contains different types of cardio equipment which can fit different trainer needs as much as possible

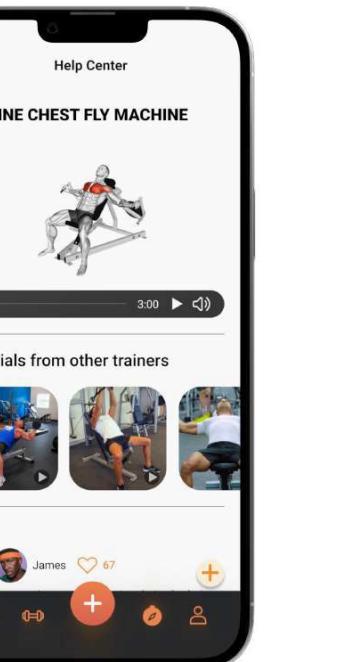
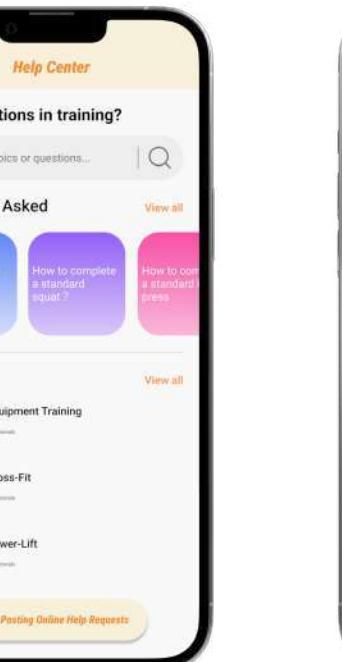


Cross-Fit Zone

Cross-Fit training area

Send help request and watch tutorial videos

Once user encounter problems about fitness, they can send their help request. **Other trainers will come to help when they accept the request.** To avoid the case that nobody accept the request, users can watch the tutorial videos to learn how to use equipment at first.



Reflection

Implementation

A dead-lift competition is held in the school's gym and attract 32 competitors. The overall atmosphere is quite good and this competition let some people who have no understanding about fitness became interested in fitness



On the exterior of the school gym there is an athletic challenge list that students enter by accumulating exercise hours and can redeem for physical badges.

What I've learned from this project:

1. **Value Proposition Aspect:** learned how to create more value for users by facilitating interaction, sharing and cooperation among users. This concept of sharing and interaction fits in with the building of user communities and enhances user participation in the service.
2. **Service Design Aspect:** learned how to build a complete service ecosystem, including front-and back-stage interactions, interactions between users and service providers, and the various processes that support and optimize the service.

What can be improved for this project:

Consider the sustainability of the project, including factors such as economic viability and environmental friendliness. This can be achieved by exploring partnerships, increasing the variety of services, etc.

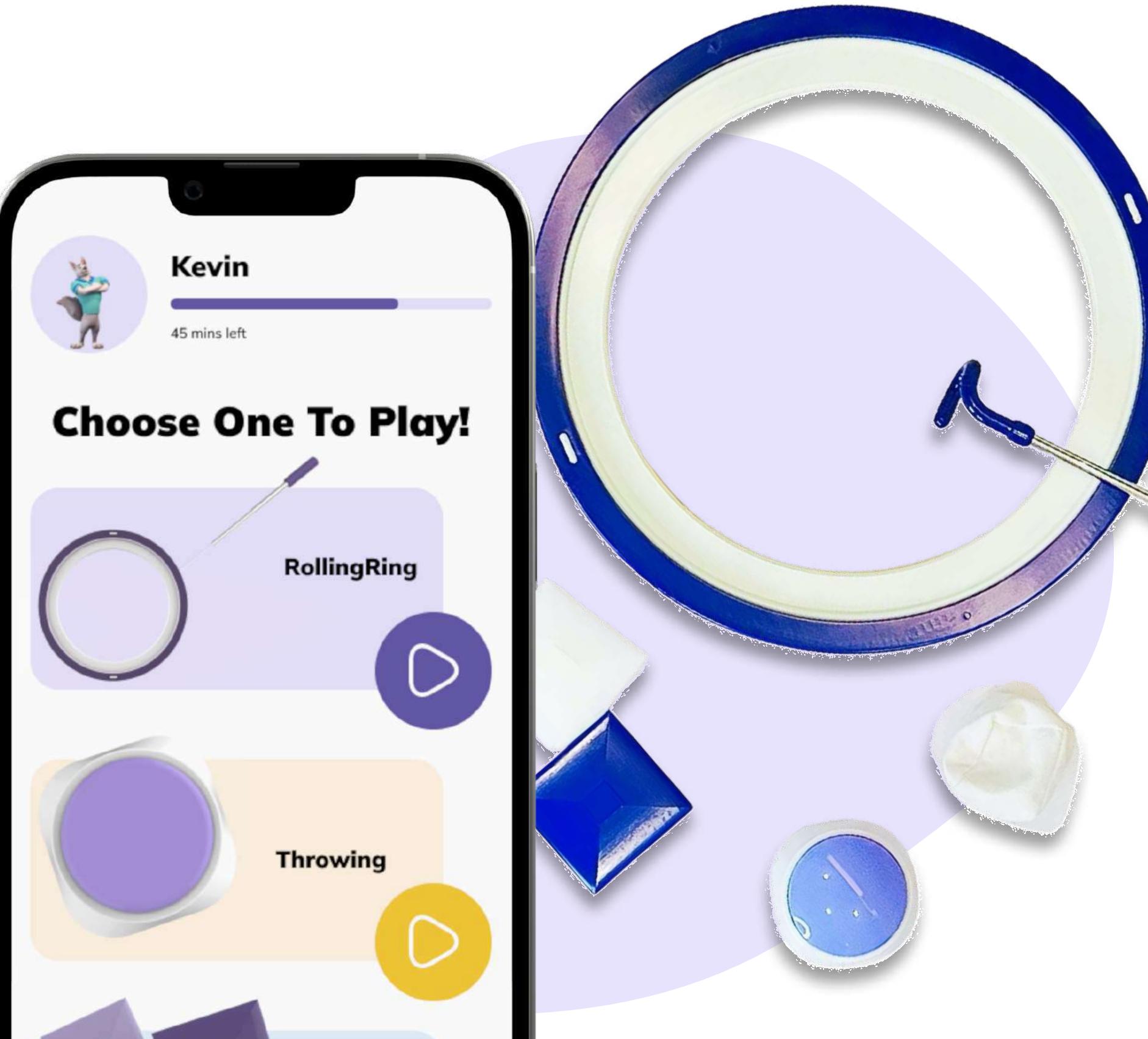
Minds in Motion

Combining traditional Chinese **kids' sports** and **AR tech**, this product boosts **kids' attention** and enhances **family bonding**

This is a project that builds connection between physical games and kids' attention span. The aim is to let children have a good life style and improve their concentration through playing while combines traditional Chinese kids' sports and AR tech. Meanwhile, it also enhances family bonding through physical play. From the idea of creating a tool for concentration, this project has evolved, throughout the iterative design process of prototyping and testing, into a physical toy kit with an APP for concentration improvement and family bonding enhancement.

Interaction Design/ Product Design/ UI Design

Duration: 2 Months/ Aug. 2023-Nov. 2023/ Individual Project



Research Process

Observation

Kids
Environment

Online Research

Data Analysis
Reports
Online interview

Interview

Kids
Parents

Literature Review

Article
Journal
Paper

Background

Kids' Challenge in Digital Age

In today's digital age, the lifestyle of kids is undergoing tremendous change. With the rapid development of technology, children are faced with **unprecedented digital stimuli and choices**. This reliance on electronics is likely to lead to a **lack of concentration** and a **decrease in physical activity** in young children. Developing healthy living habits is a huge challenge for children in this digital age.



Data & Statics

Online research shows that children in this day and age spend a lot of time on electronic devices every day. And it has found that there is a strong link between screen time and attention span.

2 Hours

8 Times

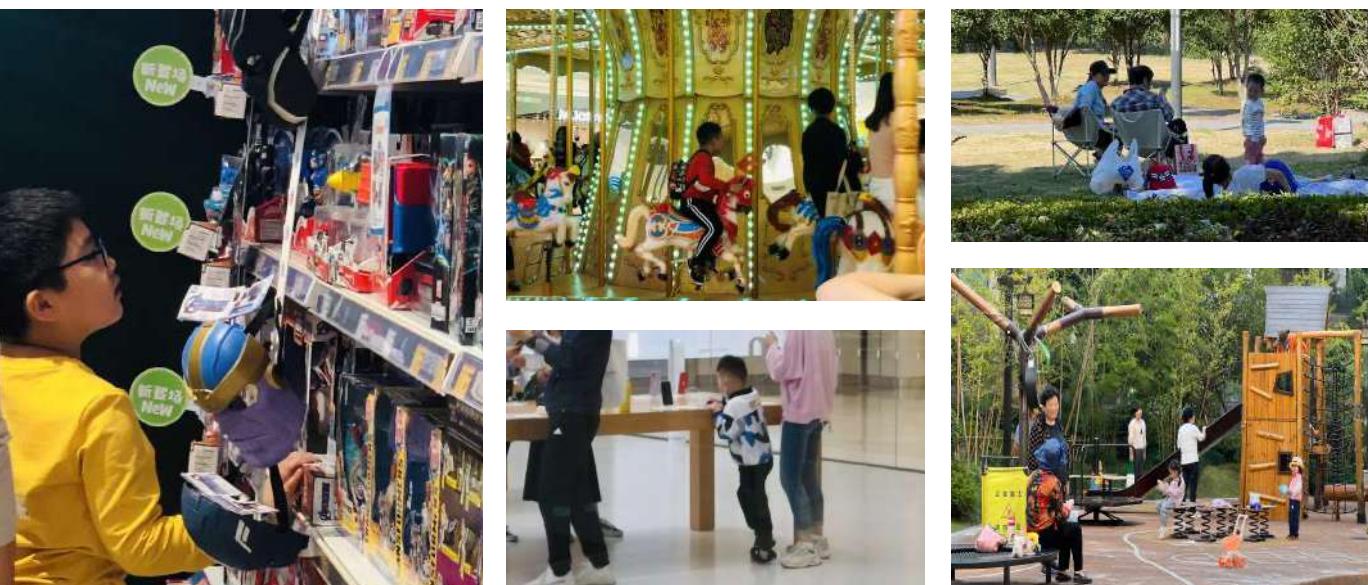
Children within 5 years of age who are exposed to **more than 2 hours** of screen time per day are nearly **8 times** more likely to be diagnosed with attention-related disorders, including ADHD

Environmental Observation

Aspects can be further researched

While conducting the environmental observation, I found the following points that can be further investigated in the subsequent research process:

- 1. Children's excessive use of electronic devices**
- 2. Parents' attitudes towards children's education**
- 3. Parents' ways of managing their own children.**



129 Million

Globally, approximately **129 million** children and teenagers between the ages of 5 and 19 have **ADHD**

3-5 Years

Younger children (three to five years) should **be encouraged to move throughout the day**

User Interview

Interview Guideline Design

In the design of the questionnaire, the main objective was to find out the current **living habits of the children** and their **attention span** of their children's lives. Through these questions, the users' pain points can be found and the subsequent design work can be standardized.

Interview Guidance

Beginning:

Hi, thank you very much for taking the time to participate in this interview. My name is Leung Lik Man and I am currently working on a research project on motor and attention development in young children. In this process, I would like to listen to your experiences and perspectives in order to gain a deeper understanding of your thoughts in this area.

The main goal of this project is to explore new ways of exercising for young children aged 4-6 years old in order to improve their ability to focus their attention. We know that the development of attention in early childhood is crucial for their future learning and growth. At the same time, movement is part of a young child's life. Therefore, through this project, we hope to learn more about children's experiences in sports, family support, and the effects of different types of sports on attention.

In this interview, I will discuss some of the questions with you in depth and hope that you will share your views, experiences and ideas. Your answers will be crucial to the development and optimization of the program, as we want to create sports experiences that really help kids.

Our interviews will be roughly limited to about 45-60 minutes, so please feel free to express your opinions without having to stick to the perfect answer, as every opinion helps our program.

Basic Information

- How old is your child? Is he or she a boy or a girl?
- Approximately how much time does your child spend exercising each day?
- What kind of sports does your child do on a regular basis?
- Can you list some for me?
- Do you have any of your child's sports equipment at home that you can show me pictures of?
- What is his/her favorite sport?
- Why?
- Does your child have any favorite activities other than sports?

Parents

- Do you encourage your child to play sports? Why?
- Have you enrolled your child in a sports program?
- What kind of sport?
- Why did you participate in choosing this one sport?
- What support and challenges have you encountered in encouraging your children to participate in sports?
- How have you coped?
- Are there any expectations or willingness to participate in sport?
- Under what circumstances are they usually more willing to participate?
- What are some of the factors that may affect your child's attention span?
- Does your child usually have trouble paying attention?
- When do most of them occur?
- Are there strategies you use to help them stay focused?
- Under what circumstances is your child's attention to a focused state?
- Are there particular topics, activities, or areas that children are particularly interested in and are able to show better concentration in?
- Do you observe whether children's interest shifts from one area to another during activities?
- Does this affect their attention span?
- Do you think a child's ability to concentrate can be improved through exercise?
- What kinds of sports specifically?
- How do you usually engage in sports activities with your children at home?
- Does this interaction affect their attention and concentration?
- Has it been positive or negative impact?
- Have you designed a home exercise program for your little ones?
- What sports do you think are beneficial for their attention development?
- Based on your experience, what do you think could be more effective in helping children improve their attention and concentration?
- Would you be happy if your child participated in it?

Child

- Does your body become more energized after exercising? Does your mood become happier?
- Do you have any favorite sports characters or games?
- What do you think is your favorite part of these characters and games?
- Is there any sport or way of playing that makes you feel especially fun and not thinking about other things?
- Is there anything particularly fun about playing sports with friends?
- Have you ever thought of any interesting ideas while playing sports?
- Would you feel happier if you listened to music while exercising?
- Is there some exercise that makes you feel smarter and better?
- If there was a really new and fun game, would you want to try it?
- What fun exercises do you like to do when you are at home?
- Would you want your mom or dad to play sports with you?
- Can you draw a picture of you playing your favorite sport?

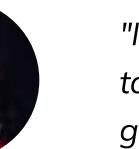
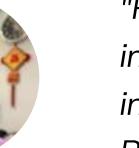


Quotes & Insights

"Duo is enthusiastic about electronics. We manage his screen time, but sometimes he gets deeply engrossed and becomes upset when we try to take his devices." -- Duo's Dad

"Potato is typically drawn to new experiences, which pique her focus. For instance, when she started practicing calligraphy, she was dedicated for the initial days. However, her interest waned, and she hasn't touched it since." -- Potato's Dad

"If Mei wants to try other sports, her dad and I are still supportive. I usually take her to some parks so that she can play with other kids, after all, it is great for kids to exercise more at this age." - Mei's Mom



Interview Learning

The main conflict is between children who are addicted to the novelty of electronics and parents who want to control their children and keep them focused.

Quotes & Insights

Parents

- 父母希望孩子自己做运动，但有时孩子沉迷于电子产品，父母希望孩子专注于运动。
- 父母希望孩子一起运动，但有时孩子沉迷于电子产品，父母希望孩子专注于运动。
- 小孩沉迷于电子产品，父母希望孩子专注于运动。
- 家长对孩子的注意力进行控制，但有时孩子沉迷于电子产品，父母希望孩子专注于运动。
- 家长在孩子出现注意力不集中的现象时会感到焦虑。

Kids can't hold their attention for very long

Children can be rebellious after having their electronics taken away

Parents would love to increase their interaction with kids

kid

I love electronic devices! Cartoon, games, videos!

I can always get new things from digital experience

I don't want you to control my screen time



We would like to have more interaction with you

We have to control your screen time!

Stay focused when you doing something!

Parents



User Persona

Considering that the age gap between children can be too big, resulting in a wide gap between the physical and mental levels, I limited the target users of this program to **4-6 year olds and their parents**.



Shawn

• 5 Years Old
• Male
• Kindergarten
• SuZhou

Personality

Introvert → Extrovert
Busy → Time rich
Analytical → Creative
Independent → Team player

Interests

- Playing soccer
- Playing with other children
- Watching cartoons and playing games on iPad
- Going out to play with parents

Motivations

- Cartoon, Game Characters
- Electronic devices
- Sports/games that interest

Pain Points

- Parent-child interactions are not liked by children
- Electronics are highly addictive to children.
- Children's attention is often distracted

Needs and Expectations

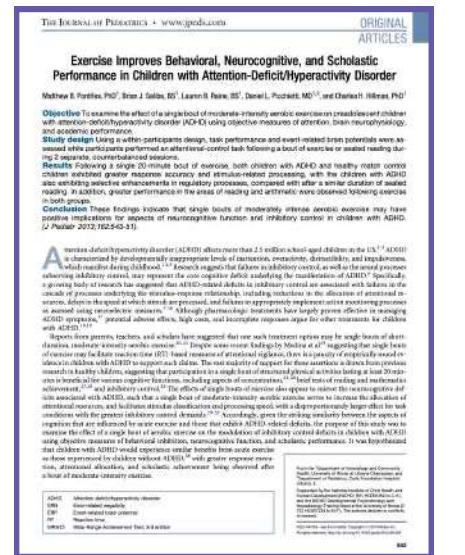
- Child's need: wants to be able to play as much as they want
- Parent's needs: increase interaction with their child and exercise their child's ability to concentrate

Literature Review

Theoretical basis of sports can improve attention

In the previous interviews, parents indicated that they needed to have some **theoretical support** for adopting new sports games to exercise their children's attention levels.

So I searched for papers on the **effects of exercise on children with ADHD** that proved that exercise can improve the attention span of children with ADHD.



A studies have demonstrated that **running improved attention span and impulse control and decreased the number of classroom disruptions** by half, for 2 to 4 hours.



The physical activity aspect of **sport participation may have a beneficial effect on mood and anxiety symptoms in children with ADHD**.



A short moderate-intensity aerobic exercise **improves inhibitory control, attention allocation, stimulus classification, and processing speed** in both children with ADHD and healthy control children.

How Might We... improve children's attention span and enrich the parents-kids interaction through physical play?

Inspirations

The sports games parents played when they were young **could engage both parent and child to interact. These games in turn work on concentration from different dimensions.**



1. Roller: Players need to control the balance of the iron ring through the iron bar and roll it as far as possible



2. Throw and Catch: Players need to throw the parcels up and pick up the parcels on the table



3. Card Tapping: Different players need to tap each other's cards until the other player's card is knocked over



4. Sandbag Throwing: Two players throw sandbags and attempt to hit the players in the center, who needs to dodge

Benefits



Muscle Control



Motor Coordination



Balance Control



Physical Agility



Sensory Perception



Hand-eye Coordination



Attention Training

The benefits of these sports games are not only that they can **engage kids and parents to interact in a funny way**, but also that they can **expand kids' attention level** from different aspects by way of sports games.

Design Direction

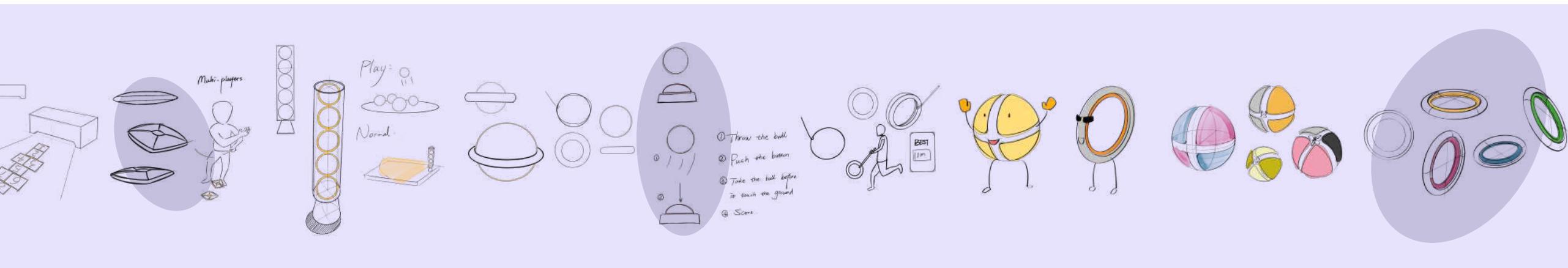


Redesign traditional sports games in a way that **enhance physical play with a digital experience**, making them more engaging and interesting.

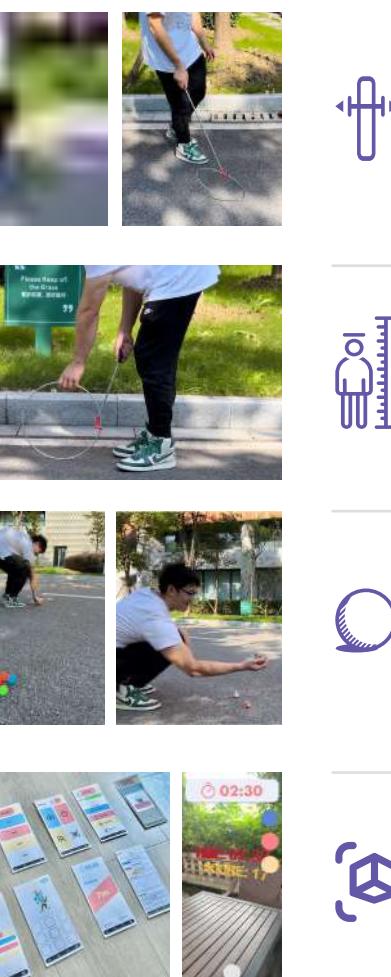
Story Board



Initial Ideas & Rough Sketches



Test & Adjustment



1. The traditional **iron ring** is too thin which makes it **difficult to handle** and not so easy for kids to get started



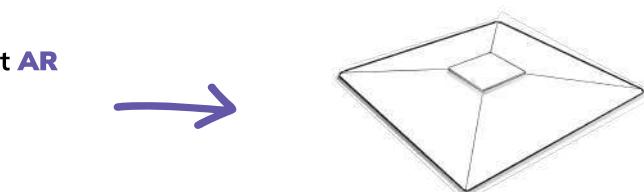
2. Due to the difference in height between children and adults, the **fixed handle length may cause inconvenience in operation**



3. In game “throw and catch”, the **sphere will run around anywhere which will interrupt the game process**



4. In the process of trying out the game, I thought **AR gameplay can be added to increase user interaction**



#Difficulty Grading

1. The ring takes a **split structure**, and together with a low degree of difficulty in getting started, with increased proficiency users can choose to separate the ring

#Adjustable

2. The telescopic structure of the handle ensures that it **can be used by users of different heights**

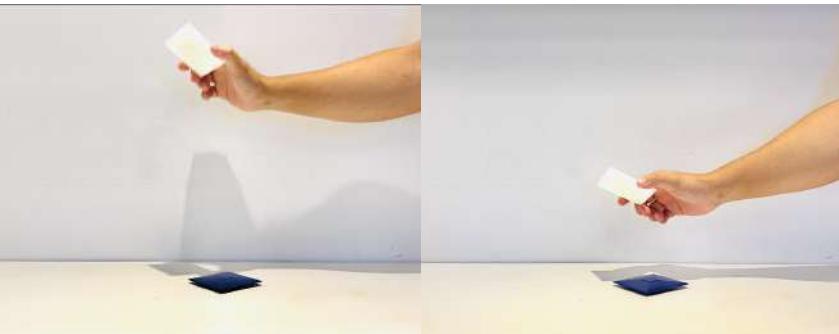
#Physical Feedback

3. Buttons are used as the feedback in the game “Throw and Catch”, **giving the user feedback** by sound after the user taps the button to **enhance the experience**

#Multi-Players

4. In the game “Tapping”, three cards allow three users to play the game at the same time, **involving more family members in the process**

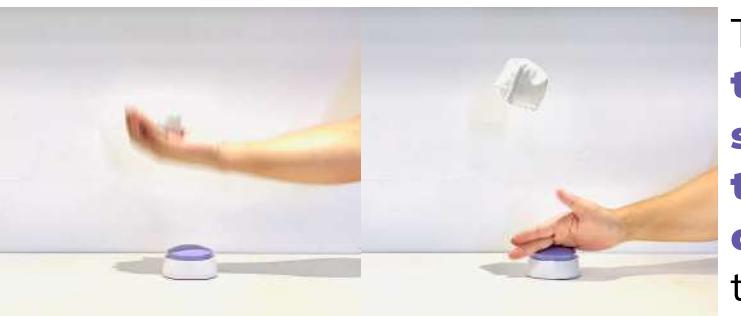
Tapping



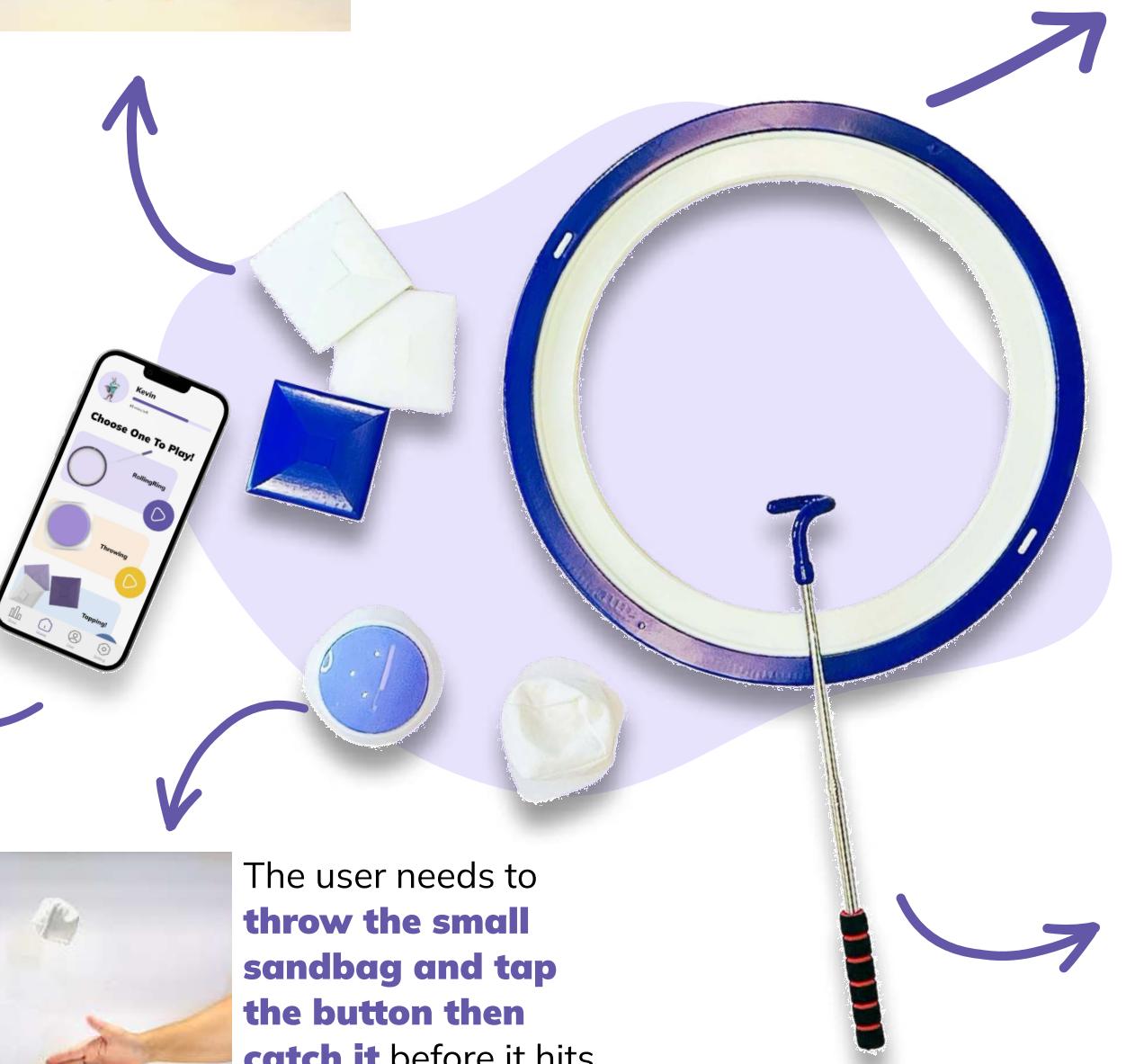
This is a turn-based game. Each user is assigned a card and scores points by **knocking the opponent's card over** with his own card

The app **provides interactive guidance and instant feedback** to users, enabling parents and kids to play together. And data will be recorded to **track children's long-term progress**.

Throwing



The user needs to **throw the small sandbag and tap the button then catch it** before it hits the ground



Rolling Ring



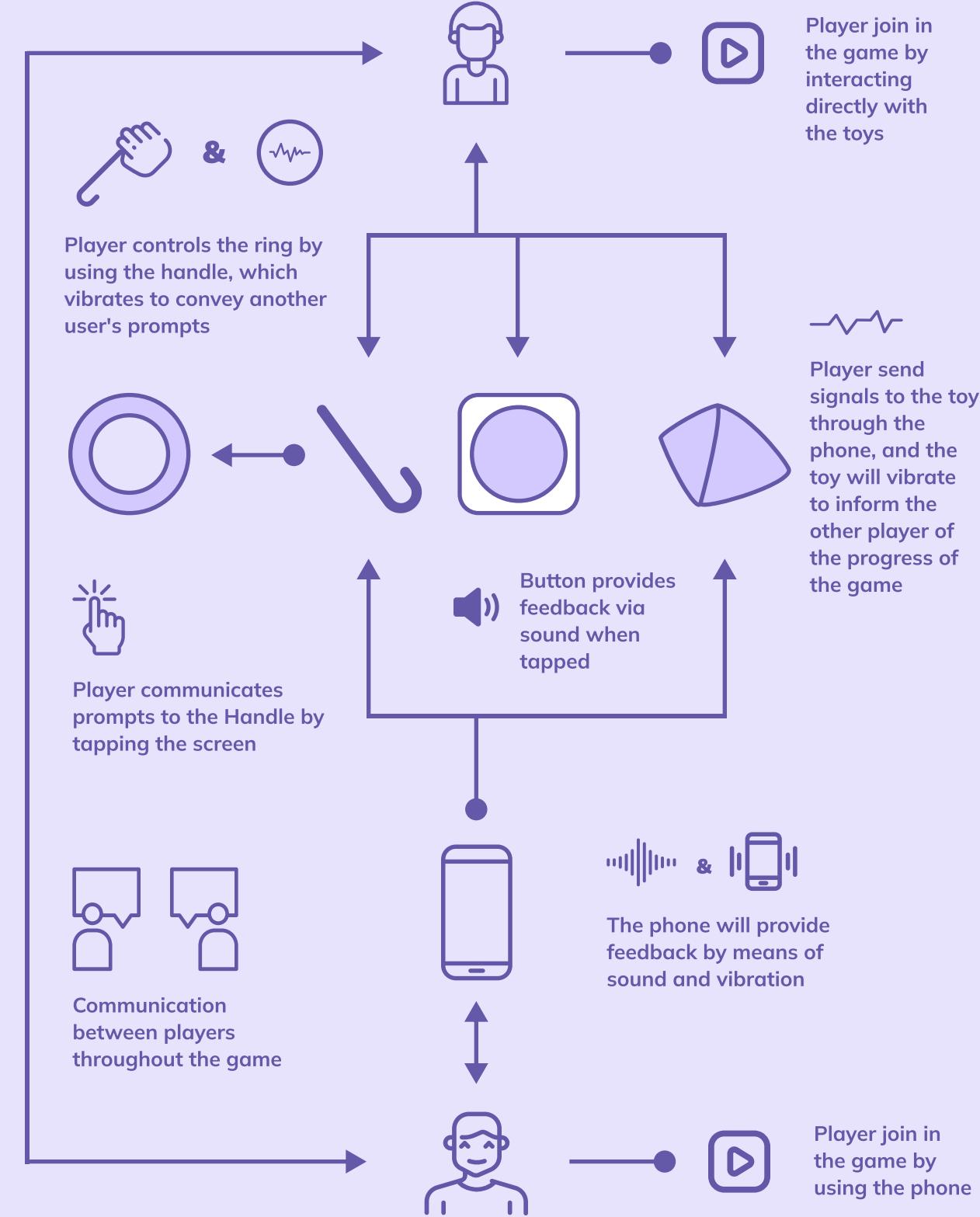
The ring is designed to be adjustable so that users can change the operational difficulty by **separating or combining the ring**

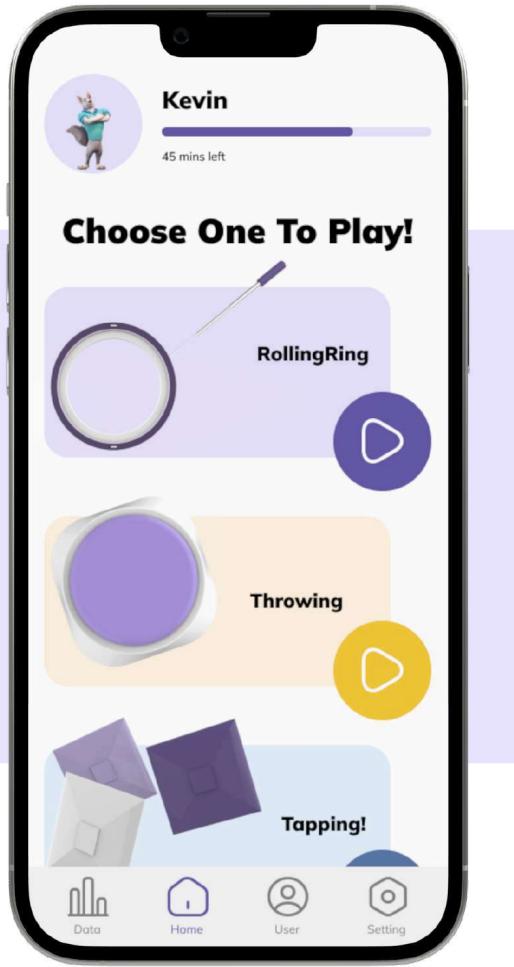
Handle



The handle is adjustable so that users with different heights can **adjust the length** of it without effort

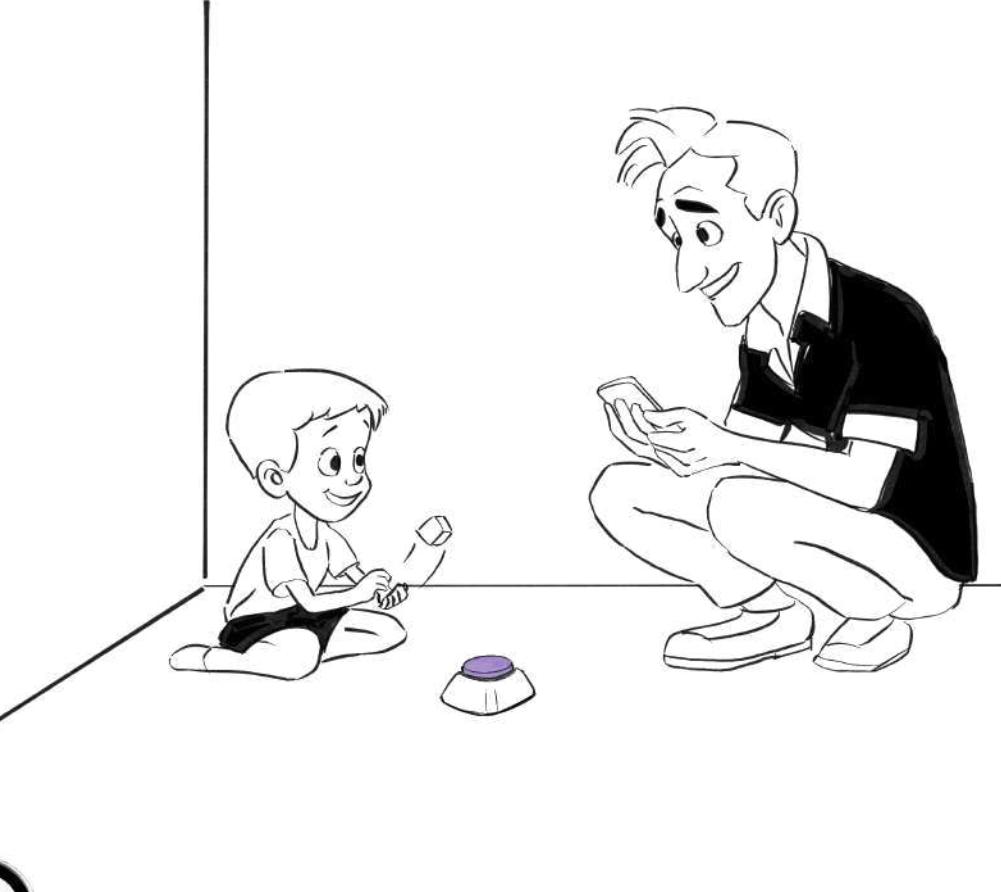
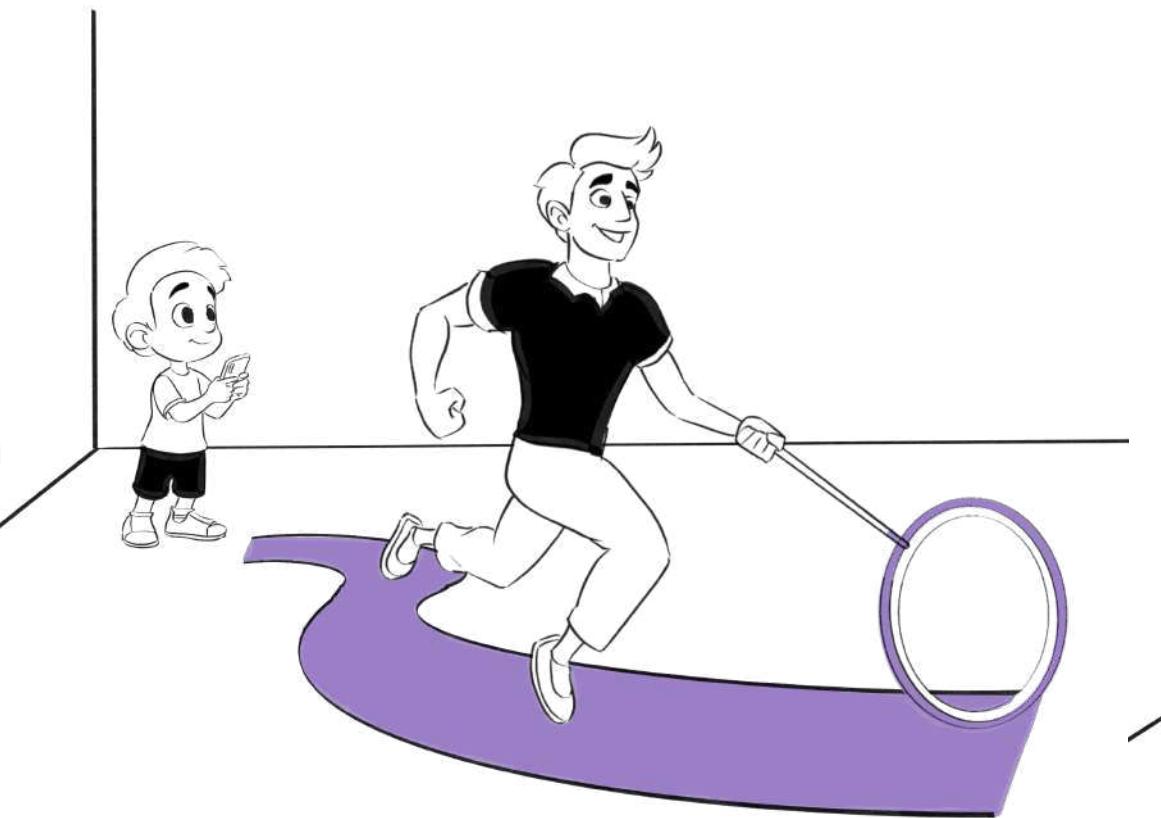
Interaction Guide





Multiple Games

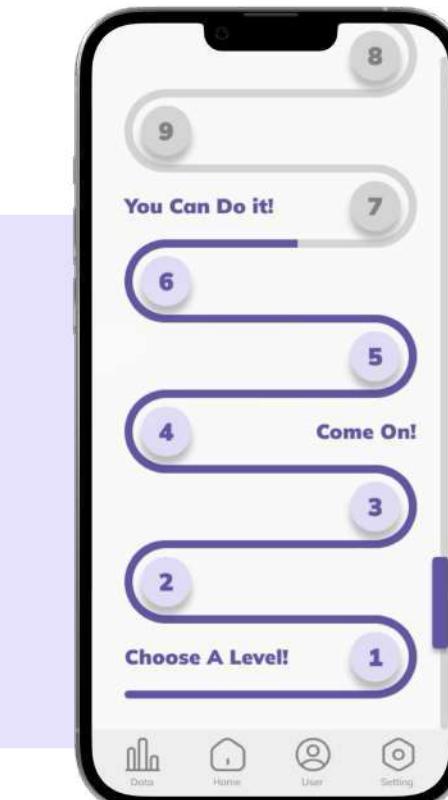
Parents and children can choose from different games through the app



AR Game Mode



These games are also equipped with AR gameplay, which allows parents and children to play together, gives instant feedback and engage kids to complete the game through AR gamemode



Long-term Using

As the user's proficiency increases, the user can select AR levels of different difficulties in the APP interface



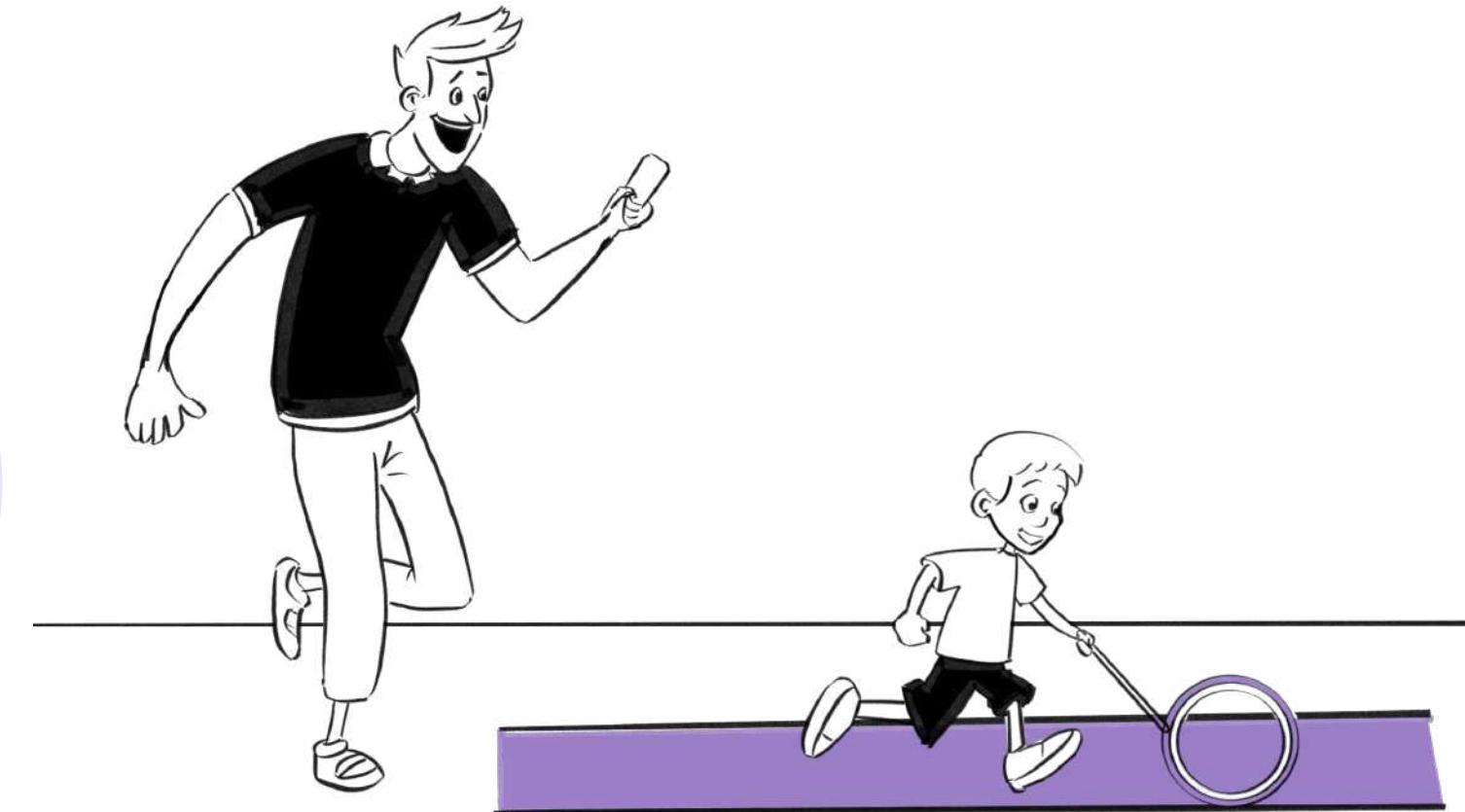
Users can draw on the toys to make them look the way they like!



Levels of varying difficulty

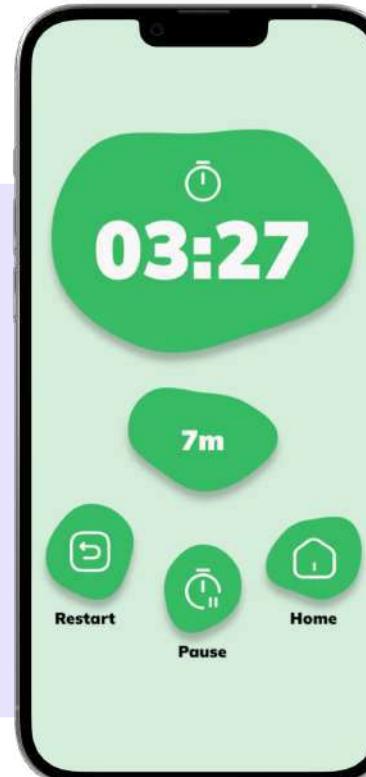
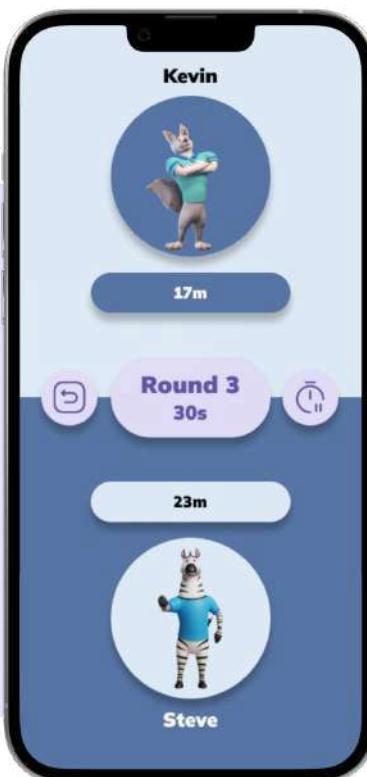
3

The journey will be longer with more curves and obstacles in the way.



Multiplayer mode to add more fun

In other conventional modes users can also use the phone to record the game records of different players, and users can compare game scores with each other.



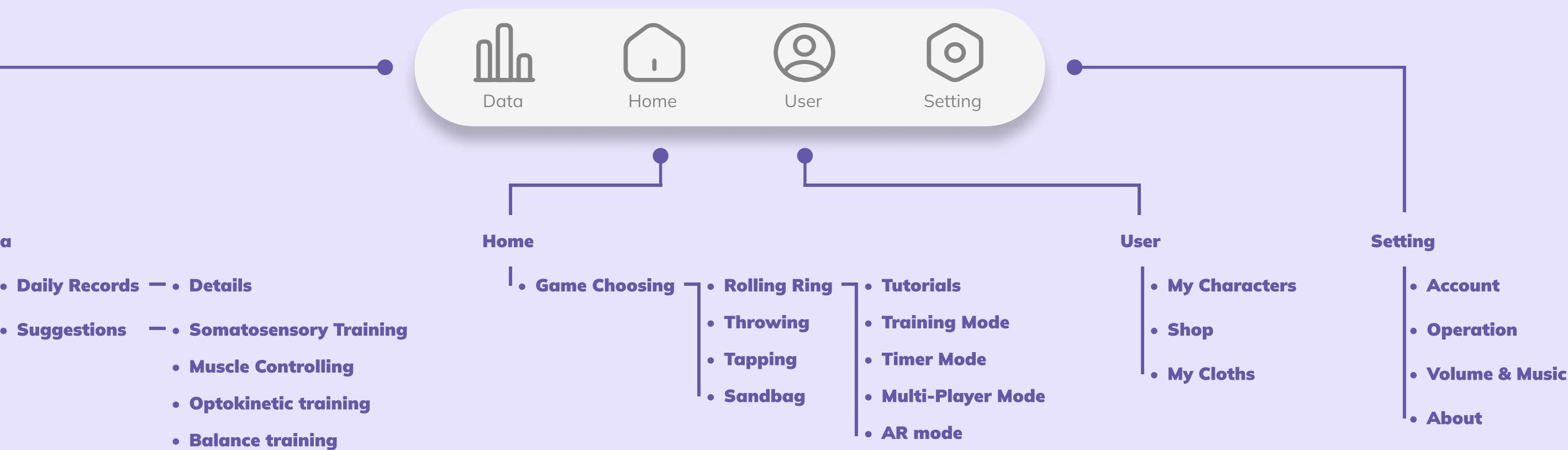


Avatars and progress tracking

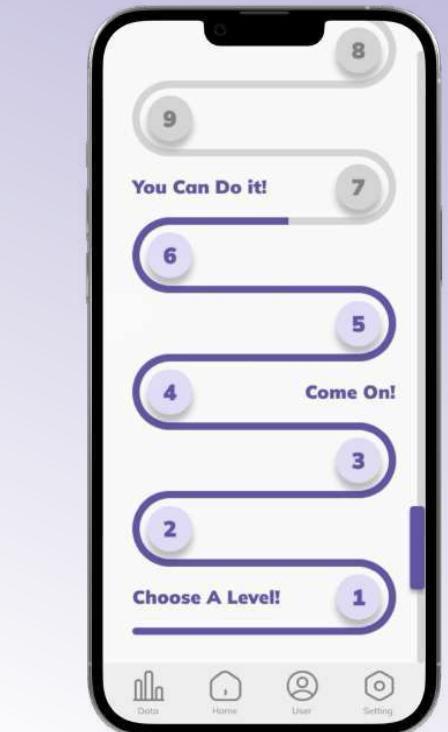
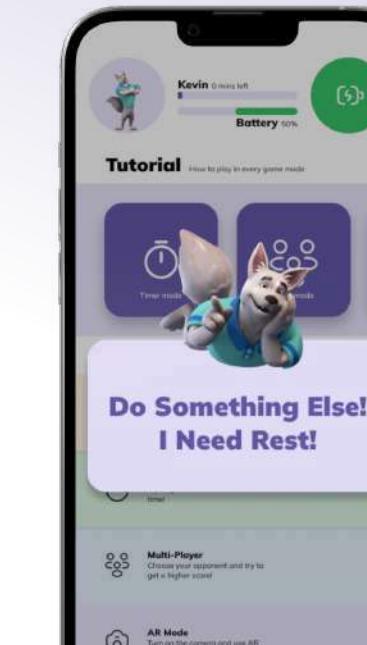
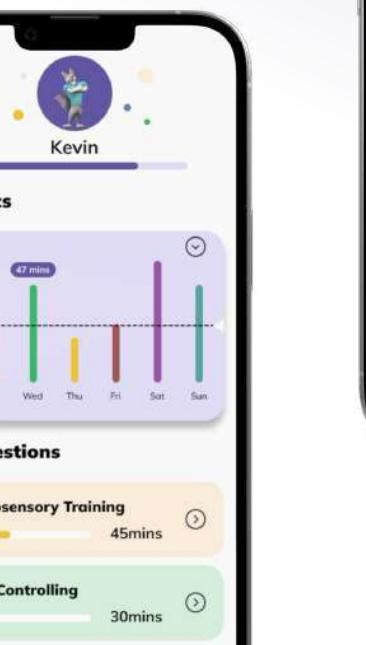
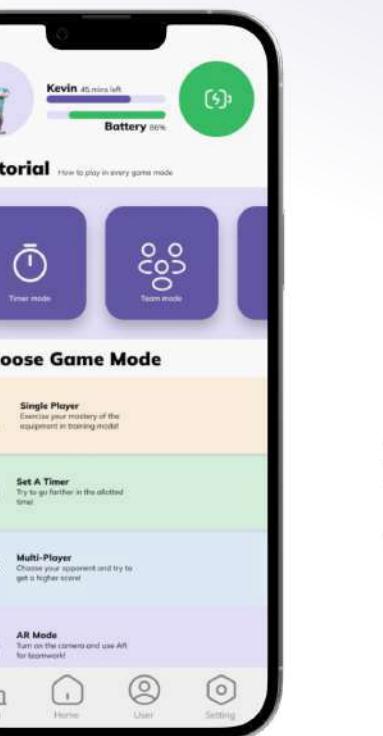
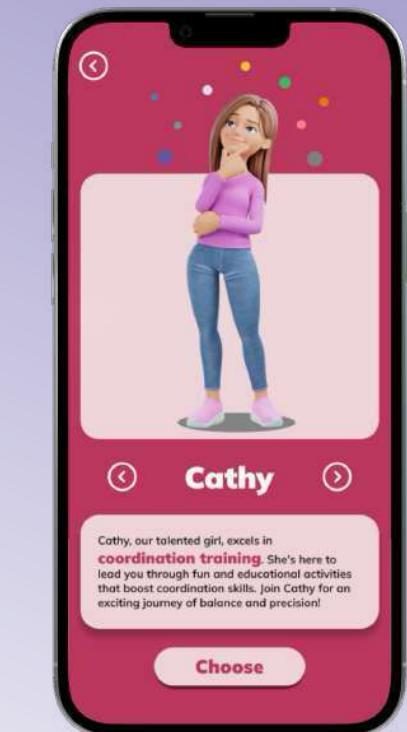
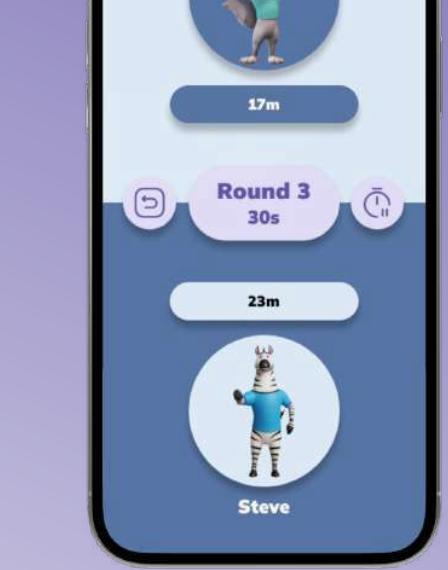
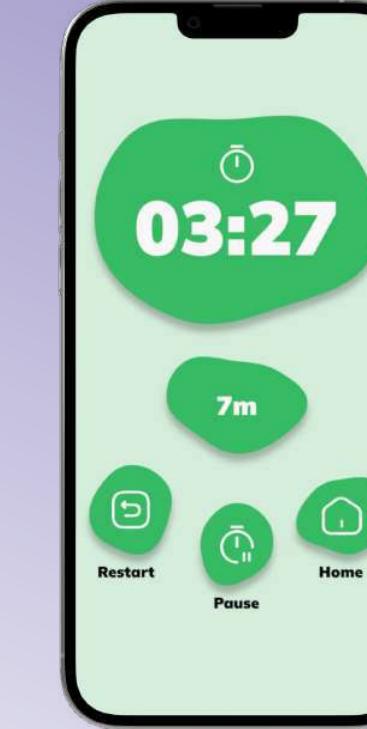
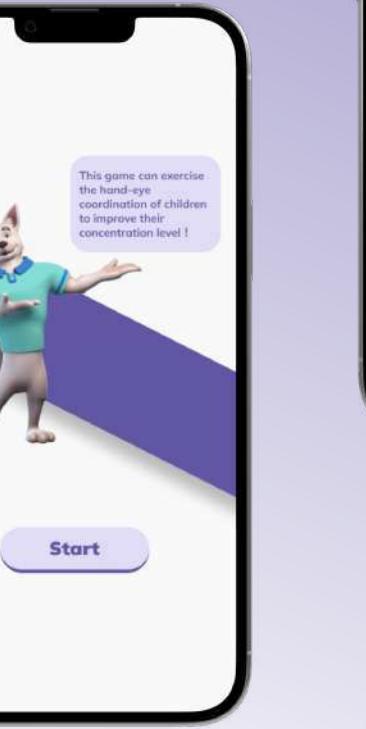
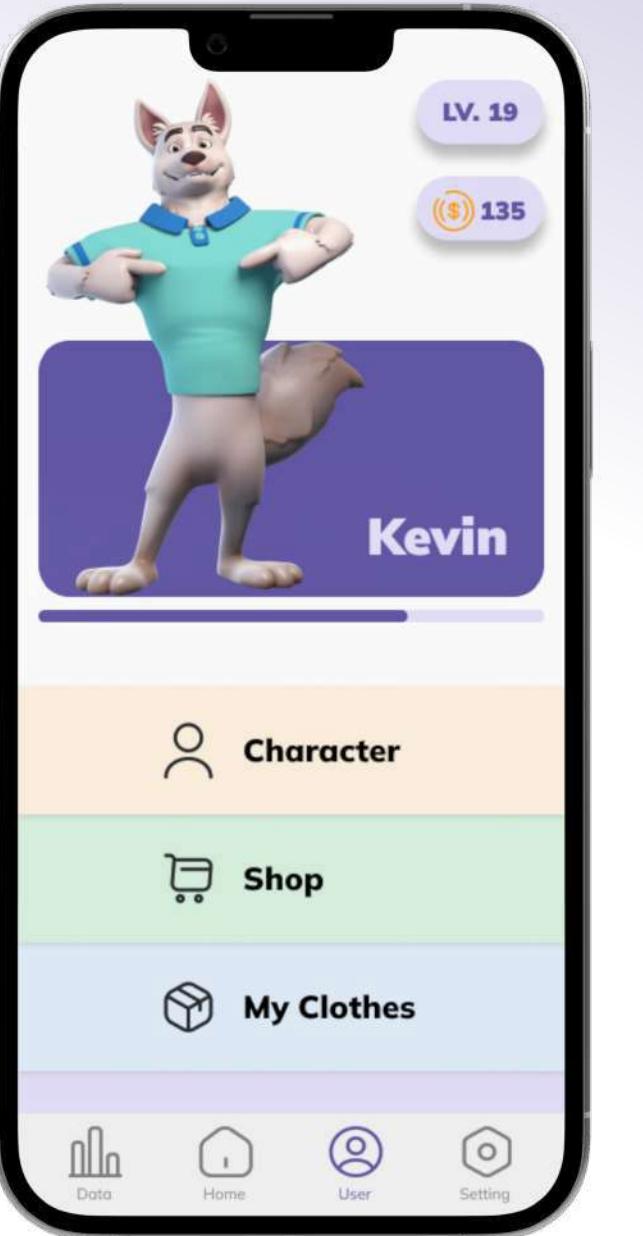
In the selection of avatars, each character represents a certain aspect of the attention level and the app also has a record of the duration of the child's attention training and suggestions.



Information Architecture



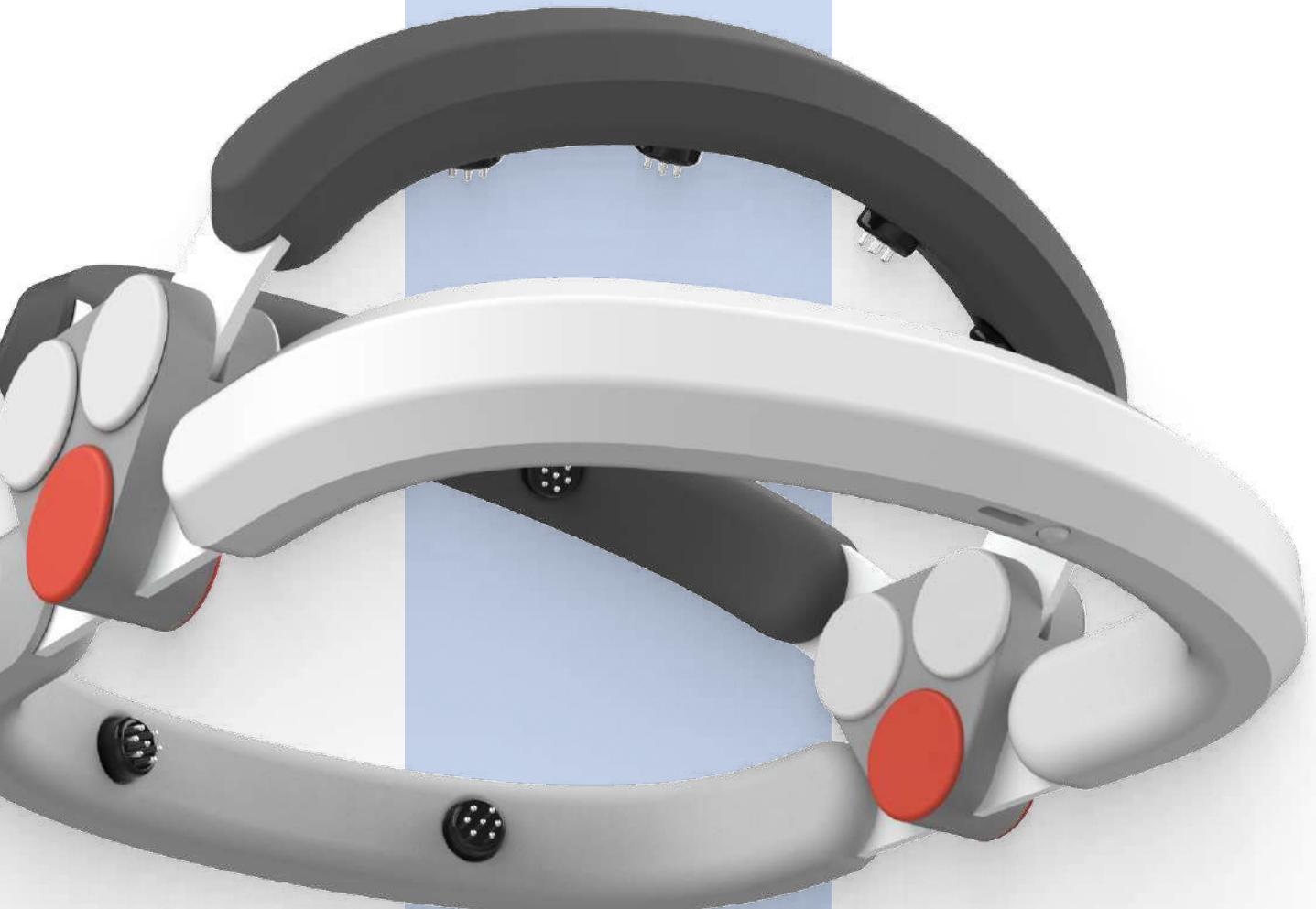
User Interfaces



Motor Imagery Rehabber

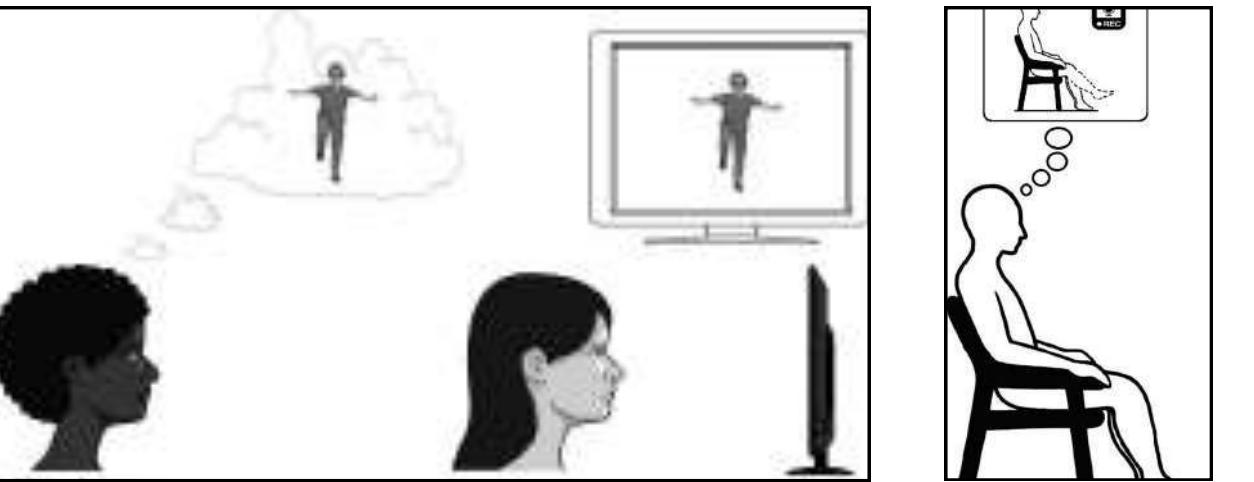
This is an EEG cap which focus on **Motor Imagery** field. This project improved the user acceptance towards EEG cap by **optimizing its structure and appearance**

This project explored a minority field of Brain Computer Interaction(BCI) which is Motor Imagery, and this project aims to improve people's acceptance about current EEG cap. To better understand user preference and their needs, user study was held twice during the project. User acceptance towards EEG cap was evaluated by introducing Technology Acceptance Model(TAM) into user studies. Finally, the EEG cap was optimized from structure and appearance aspects according to the result of user studies.



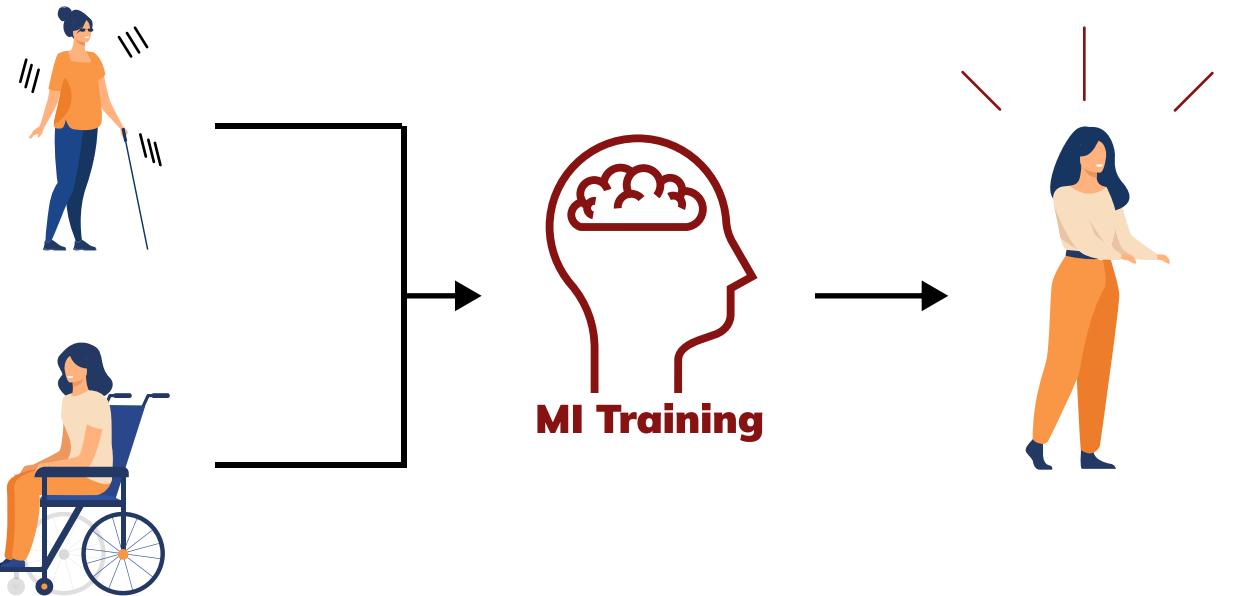
Background Introduction

What is Motor Imagery(MI)?



Motor imagery(MI) can be defined as **a dynamic state during which an individual mentally simulates a physical action**

MI is a **rehabilitation technique** that offers a means to restore lost motor function in stroke patients when used in conjunction with conventional physiotherapy procedures



MI rehabilitation for brain injury patients

Brain Computer Interface - Hardware Foundation for MI



A brain–computer interface (BCI) is a direct **communication pathway between the brain's electrical activity and an external device**

EEG (electroencephalography) caps are devices that record the electrical activity of the brain, which is the **hardware foundation for MI**.

Aim

As the brain cap is not productized at this stage, the overall experience of using the brain cap is not very good. This has led to the fact that the use of EEG caps for MI rehabilitation is not very widespread.

The aim of this project is to increase acceptance of EEG caps for patients who need to do MI for rehabilitation.



How can it be more acceptable?

User Persona



About

James lost some of his physical mobility after a stroke. He is now in a rehabilitation hospital and is actively working on his rehabilitation. His family is very concerned about him and hopes that he will recover and resume his normal life soon.

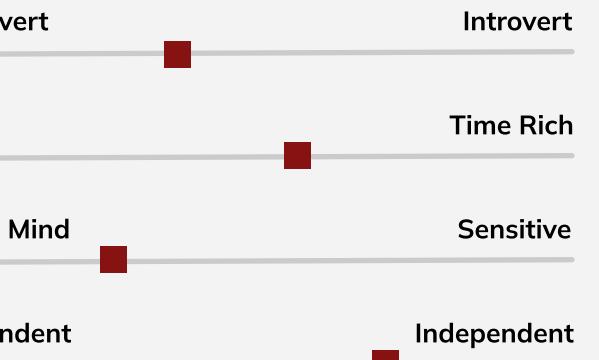
Goals

- Rehabilitating physical movement
- Hope that rehabilitation training can be more convenient and effective
- Hope to receive guidance and support

User Features

- Needs effective rehabilitation training.
- Not too familiar with professional rehabilitation training methods and tools.
- Receive guidance and support

Personality



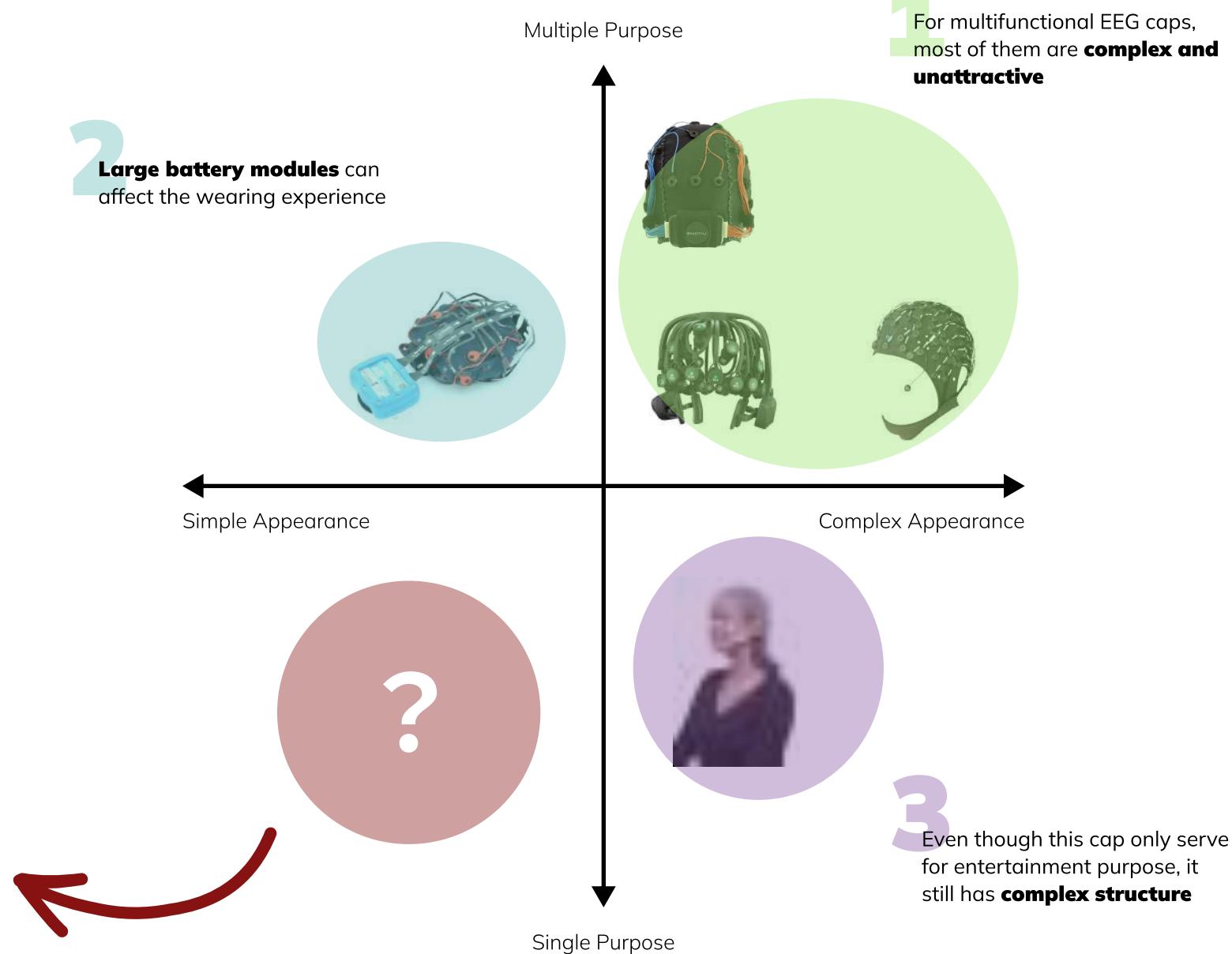
This project focuses on a group of users who basically **have little understanding of EEG caps** and who have an **urgent desire for rehabilitation** because of their brain injuries.

4 Market Gap

1. There are no EEG caps on the market specifically for MI
2. Products at this stage are still in the experimental stage, and not many companies have embarked on the productization of EEG caps

Market Analysis

I conducted a market analysis of existing brain caps on the market. In this market analysis I **summarized the characteristics** of each of these products and **identified a gap in the market**.



1st User Study

User Study Process

The 1st user study focus on general experience of EEG cap

The 2nd user study dig deeper on specific directions based on 1st user study

1st User Study

- Aim
- User Study Procedures
- User Interview
- 1st Round Ideation

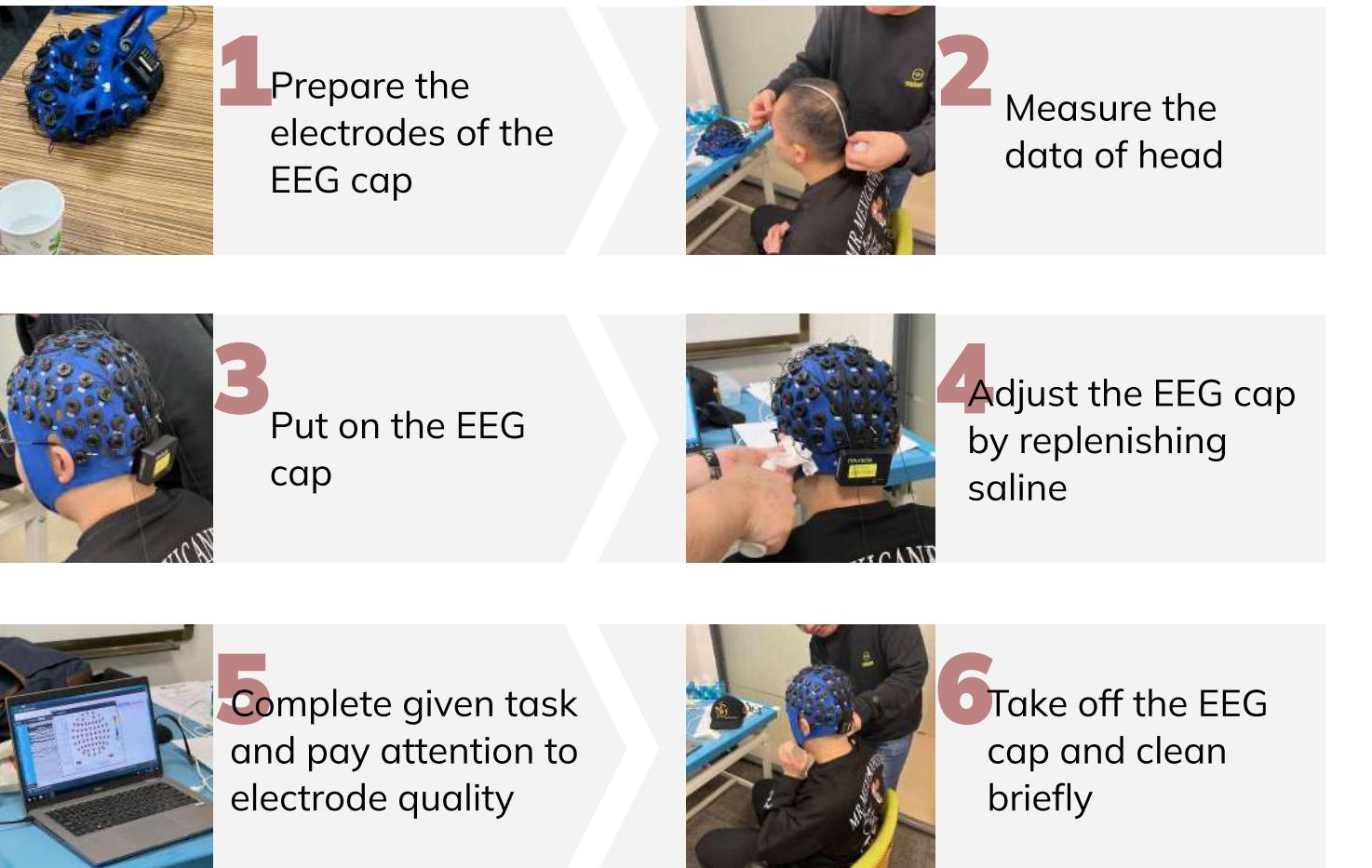
2nd User Study

- Improvement
- Questionnaire Design
- Data Analysis
- Result

Aim

The aim of this user study is to **investigate the users' acceptance of the current saline EEG cap** and collect their views and opinions about the EEG cap.

Procedures to Wear an EEG Cap



Interview

I interviewed each of the five volunteers after completing the brain cap experience for them. The interviews were **mainly about the experience of wearing the EEG caps and their suggestions for improving the caps.**

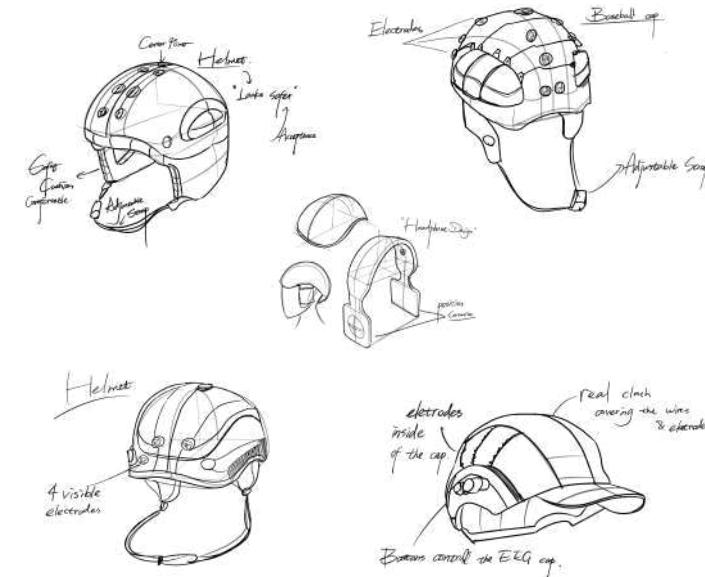
Questionnaire:

1. Your first impression of the name "EEG cap" (for participants with Chinese nationality)
2. What are your expectations for the EEG cap (what features you imagine the cap should have)
3. What are your main concerns about wearing the EEG cap?
4. Do you think the EEG cap is easy to wear?
5. Do you think the EEG cap is easy to remove?
6. What is the psychology of wearing the EEG cap in public?
7. When did you feel uncomfortable (or painful) wearing the cap?
8. Are you comfortable with the placement of the electrodes for the test (if not, please list the reasons)
9. How did you feel when you were wearing the EEG cap?
10. What is the main source of discomfort?
11. How do you think the EEG cap can be improved so as to increase the acceptance of the public?
12. How long do you think it takes to get rid of the discomfort after wearing the device?

- “**
- The appearance can be optimized; redesign the electrode part to reduce the discomfort of wearing for a long time
 - It will associate with surgery, electric shock and other words that make me feel stressed
 - The electrodes on the forehead area are very painful
- ”**

1st Ideation

Participant feedback focused on the wearing experience and appearance of EEG cap. Firstly, the **head wrapping feeling of the cap is too strong**, which will lead to a certain degree of discomfort; **the appearance of the cap should be more life-like**, as the current appearance will make user feel ashamed and unwilling to use it.



Improvement for 2nd User Study



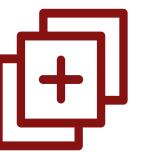
4. Redesign the procedures and questionnaire

The questions in the first round of user study do not have relevant references, which may lead to inaccurate results. In the second round of user study, I **introduced the Technology Acceptance Model(TAM)** to investigate the user acceptance.



Specified directions: structure and appearance

According to the feedback of the first round of user study, people want to improve the EEG cap mainly in structure and appearance, so the second round of user study mainly focuses on the exploration of the **appearance and structure of the EEG cap**.



. Increase the variety of EEG caps

Because the topic of the investigation is the influence of the appearance and structure of the brain cap on user acceptance, I chose **three EEG caps with different structures and appearances** for the second round of the user study.

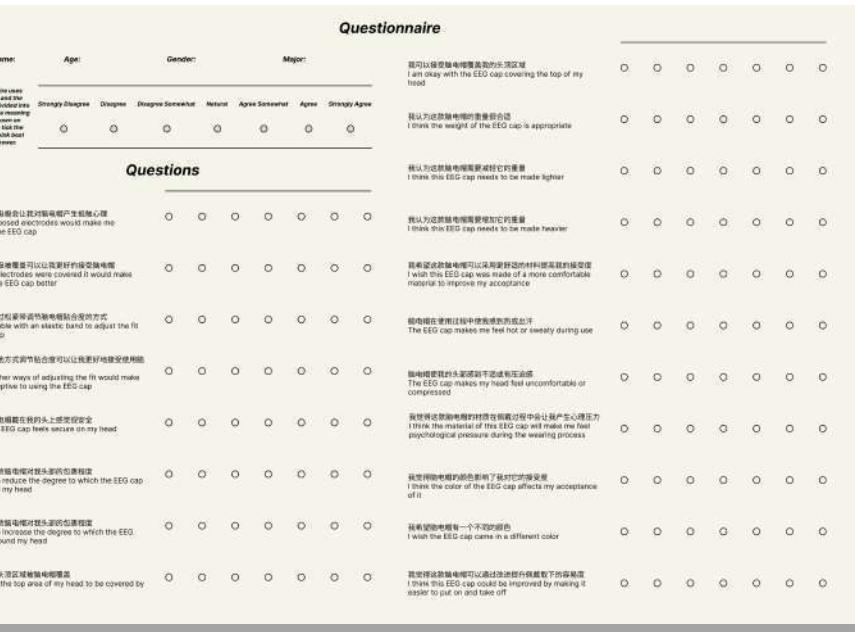
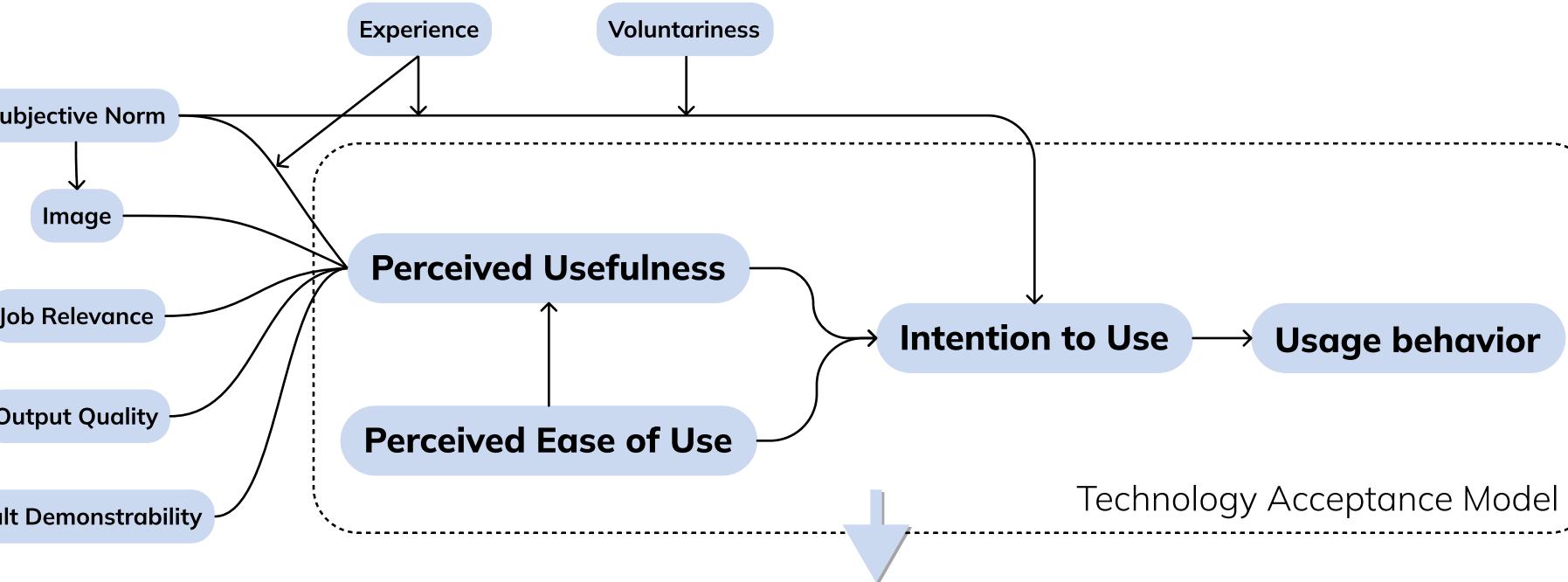


. Increase the sample size

Only five volunteers were sought for the first round of user study to explore. In order to make the results more representative, the second round of the user study sought **24 participants for the user study**.

Introduce Technology Acceptance Model(TAM)

In order to better measure user acceptance, I conducted a round of literature review. Eventually I found Technology Acceptance Model and introduced it into my questionnaire design as well as incoming experiments.



Likert Scale



This questionnaire utilized the Likert Scale as a scoring system in order to facilitate fast completion of the questionnaire by the participants and better data statistics.

Latin Squa



In order to ensure the randomization of the results of this user study and to enhance the credibility of the data, the order of the participants in this user study will be arranged using the Latin Square.

UX Aspect



In this user study, I also added the exploration of user experience, such as the psychological burden of the Chinese name of the EEG cap on the user, as well as the color, material and wearing process of the setup.

2nd User Study

For this round of user study, I chose three **EEG caps with different structures**, which are: customized MI EEG cap, half surrounded EEG cap and full surrounded EEG cap. After preparing the equipments, I invited **24 participants** to take part in the user study.



Data Analysis

I think if the electrodes were covered it would allow me to receive the EEG cap better



75%

Agree

70%

Agree

I think adjusting the fit in other ways would make the use of the EEG cap more acceptable to me



75%

Agree

75%

Agree

62%

Agree

I think this EEG cap on my head feel very safe



17%

Agree

58%

Agree

60%

Agree

I think this EEG cap can be improved by improving the ease of wearing and taking off

92%

Agree

80%

Agree

62%

Agree

I would like to reduce the degree to which this EEG cap wraps around my head

55%

Agree

37%

Agree

50%

Agree



The appearance of EEG cap need to be normalized so that it can be more acceptable



Electrodes are more acceptable to the user when they are more integrated into the cap body



The EEG cap should not wrap too widely around the head, otherwise it will cause unsafety feeling

Key Learnings

How to optimize the EEG cap

1. A New Name for Chinese Users



Chinese participants said that the Chinese name of the EEG cap would cause them some psychological stress because of the word "electricity" in the name, which would reduce their acceptance.

2. Invisible Electrodes and Wires



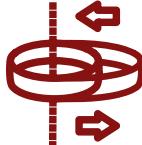
Participants reported that the leaking electrodes and wires of the EEG cap made them feel insecure and reduced their willingness of wearing EEG cap.

3. Non-full Surround Structure



Interestingly, the participants wanted the EEG cap to cover as little of their head as possible, with too much coverage creating a sense of insecurity.

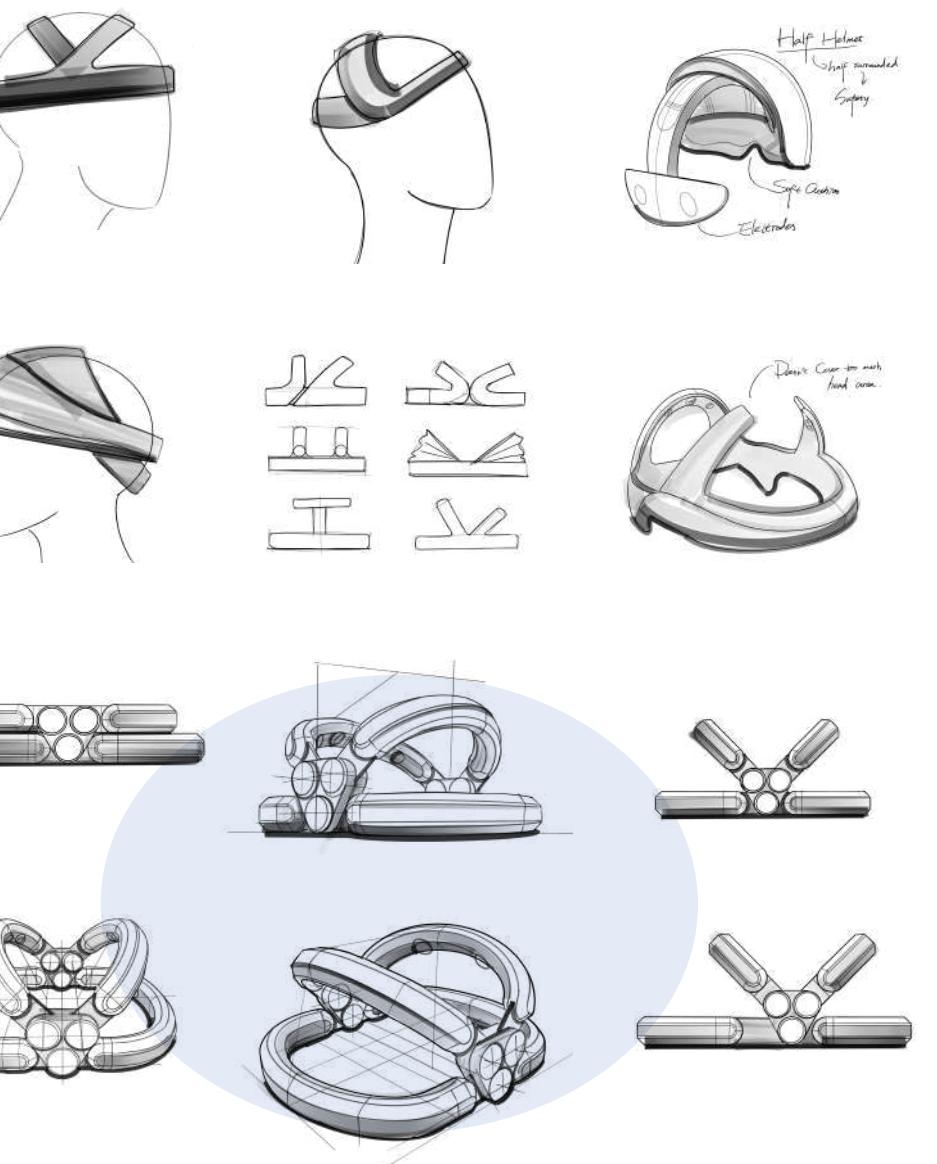
4. Easier Way to Adjust Tightness



Participants felt that the process of wearing all three EEG caps throughout the user study was not particularly smooth, which could negatively affect their confidence when using the EEG caps.

Ideation & Test

After identifying specific improvements to the EEG cap, I conducted a second round of ideation and made some straw molds for a simple wearing comfort test. The finalized EEG cap **eliminates all visible wires and electrodes and it has a foldable structure** which can make the wearing process more easily.



Material

I used different materials to wrap the skeleton and tested the comfort level. In the end, I chose **silicone** as the material to wrap the exterior of the product.



Structure

I also used cardboard to make different models for exploring the structure.



Renders



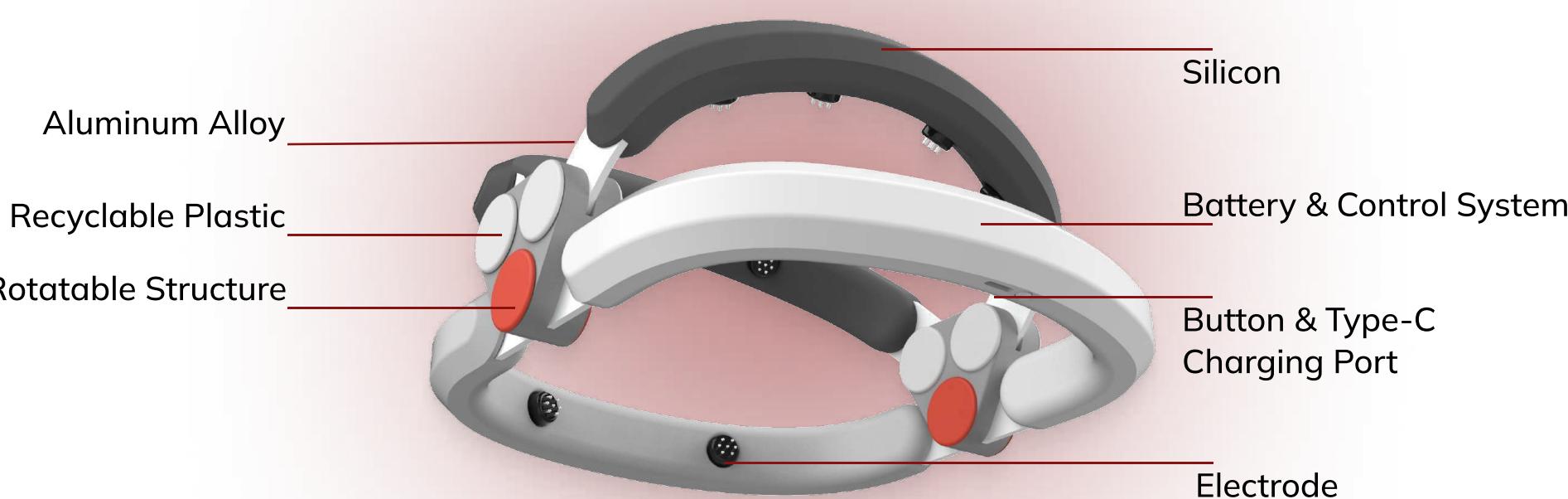
Details

Because this cap focuses on capturing MI EEG signals and **only 8 electrodes are needed** to effectively capture MI EEG signals, this is why this cap **has a minimalist look** that is very different from traditional EEG caps.

The appearance of the cap **hides all the wires and minimizes the wrap around the user's head**.

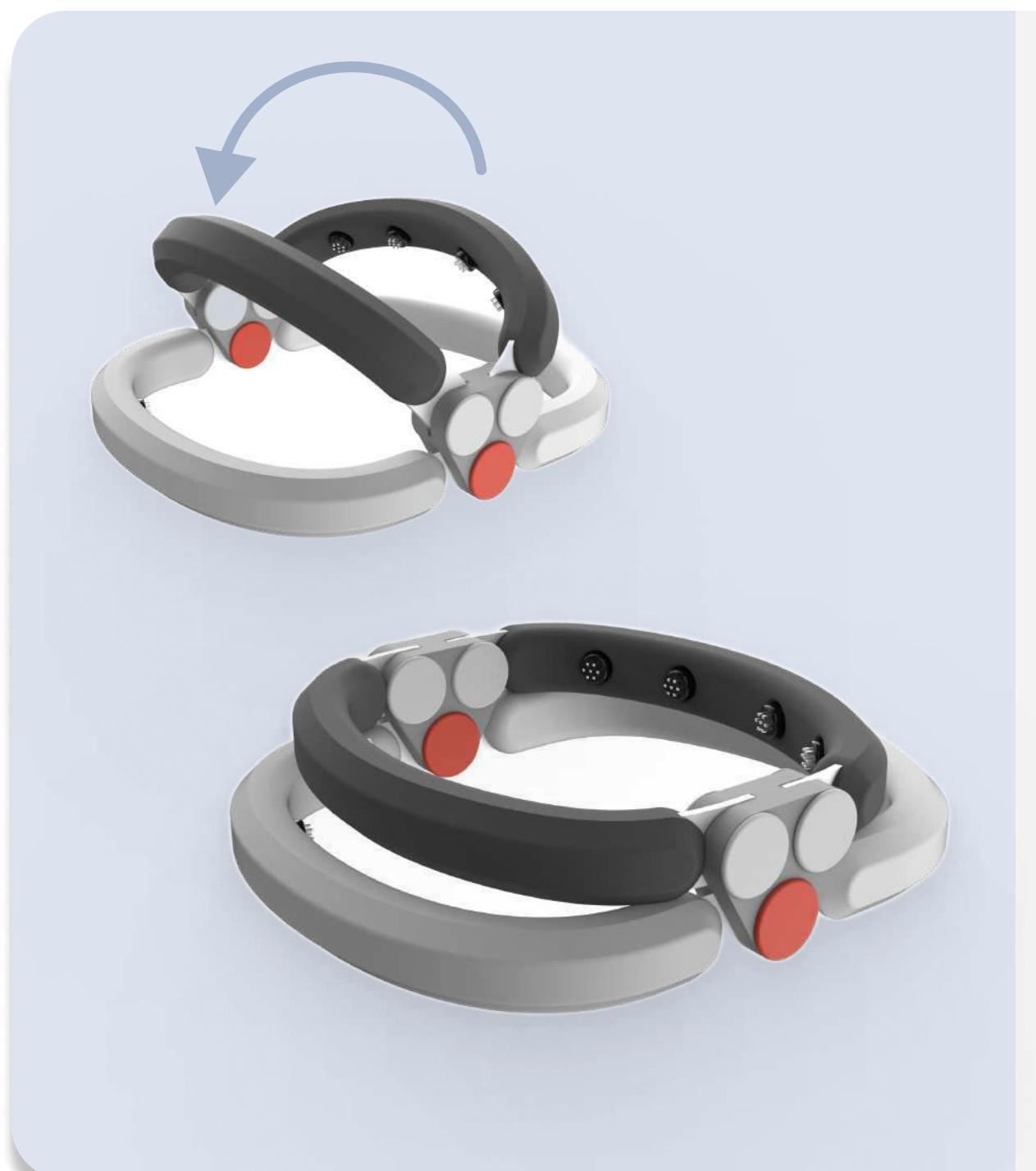
By doing this it can minimize user resistance to brain caps and increase their acceptance.

Additionally, it has **another Chinese name** for Chinese users to reduce their psychological stress brought by the original name.



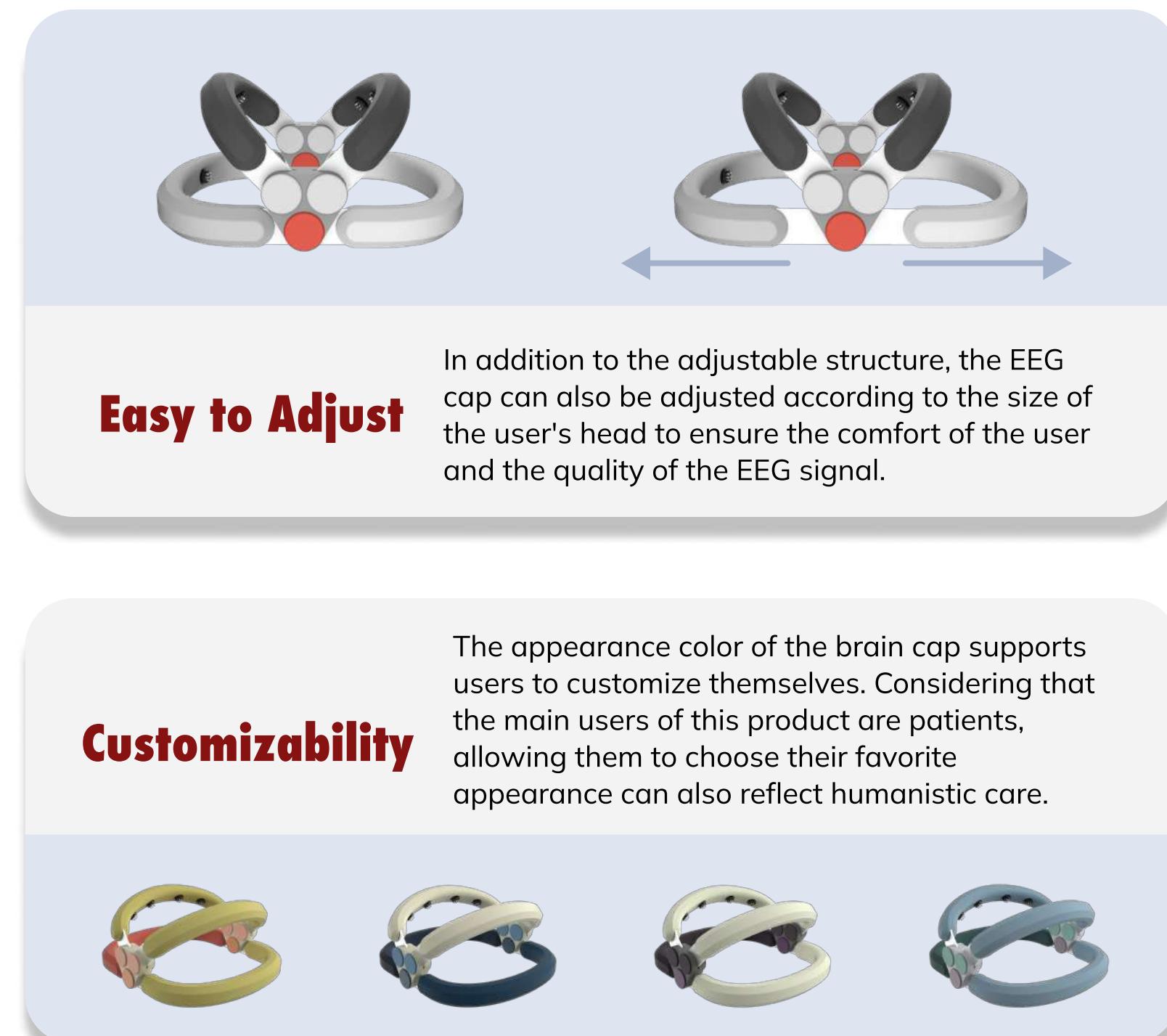
Motor Imagery Rehabber

Details



Foldable Structure

The foldable structure makes this brain cap easy to store and use in normal times, and the simplified use process can reduce the user's learning cost. At the same time, the foldable structure also makes it easier for the user to adjust the position of the electrodes.



Easy to Adjust

In addition to the adjustable structure, the EEG cap can also be adjusted according to the size of the user's head to ensure the comfort of the user and the quality of the EEG signal.

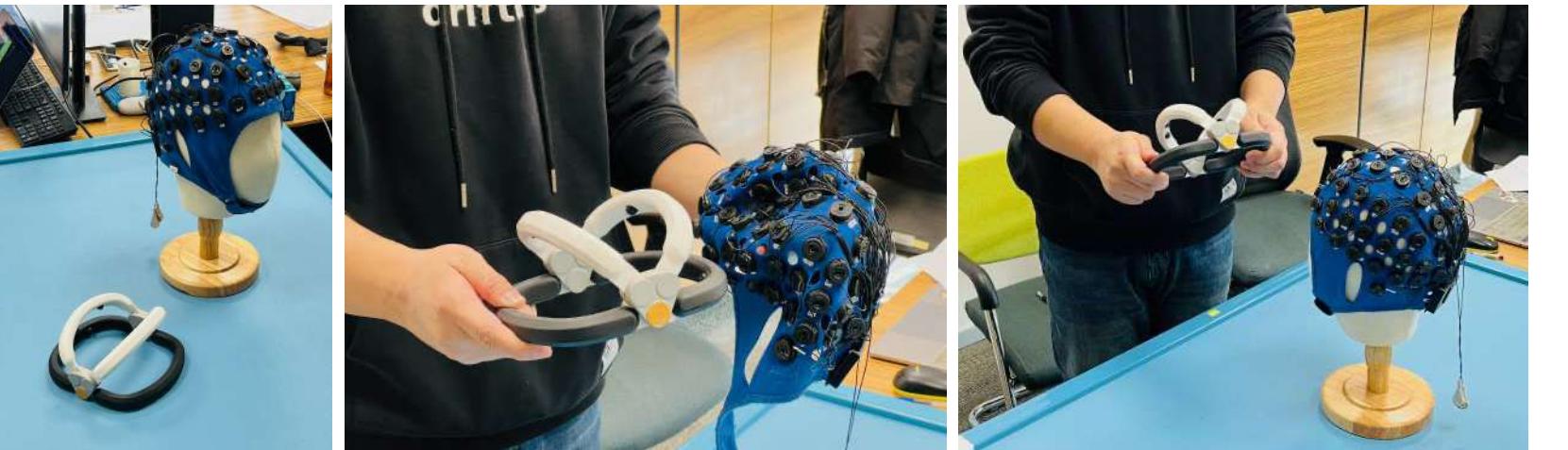
Customizability

The appearance color of the brain cap supports users to customize themselves. Considering that the main users of this product are patients, allowing them to choose their favorite appearance can also reflect humanistic care.

Evaluation

After completing the modeling, I put it together with the current EEG cap and invited several volunteers for a comparative evaluation.

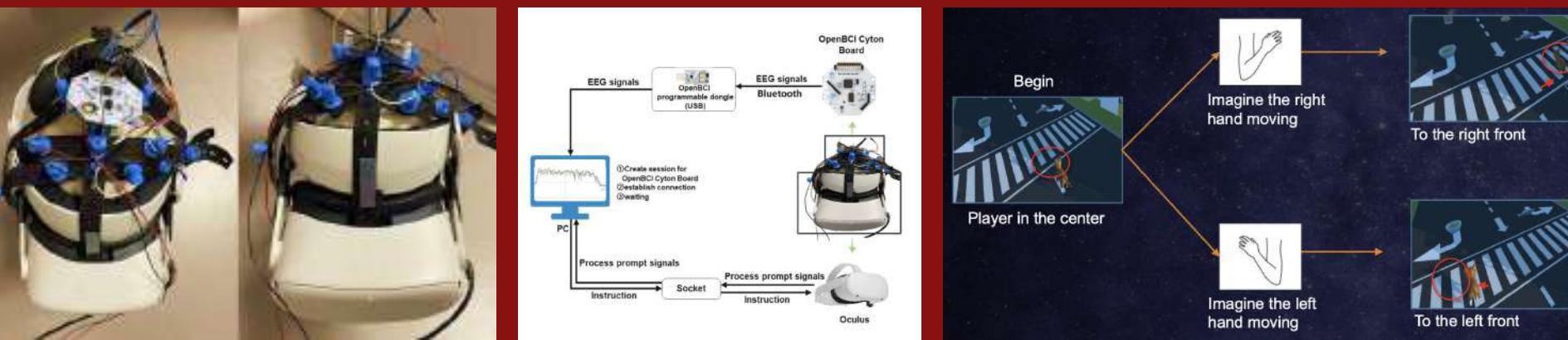
After the comparison, several volunteers indicated that the **new design was optimized in terms of appearance, structure and operating difficulty**. They preferred the new design if they had to choose to wear the EEG cap, which shows that the optimized design of the EEG cap in this project has a good effect on improving user acceptance.



Reflection

Virtual Reality BCI Rehabilitation System

By collaborating with members of other majors, I managed to turn this project into part of a virtual reality brain-computer interface rehabilitation system. In this large system, brain-injured users can complete rehabilitation for MI by using brain-computer interfaces as well as virtual rehabilitation techniques. This rehabilitation system combines technology and design to improve the efficiency of the user's rehabilitation.



What can be done to improve the project

1. Seeking out patients for further testing. Most of the people in the current research are still the general population, and while neither knows anything about brain caps, patients may have deeper needs.
2. Integrating functional prototypes into the new structure. It is possible to determine whether the design makes sense and to see where improvements can be made.

Prometheus

This is a blind cane which designed for **visual impaired** people. This cane can be used for **navigation purpose** when VI user want to take subway.

This project focus on the problem that might be encountered when visual impaired people want to take the subway. It is quite hard to see visual impaired people walking on the street, especially in China. The accessory service and system are not fully constructed that might cause problem for this minority group. From research to prototype, this project has taken different method to define user pain points and finish high fidelity prototype.

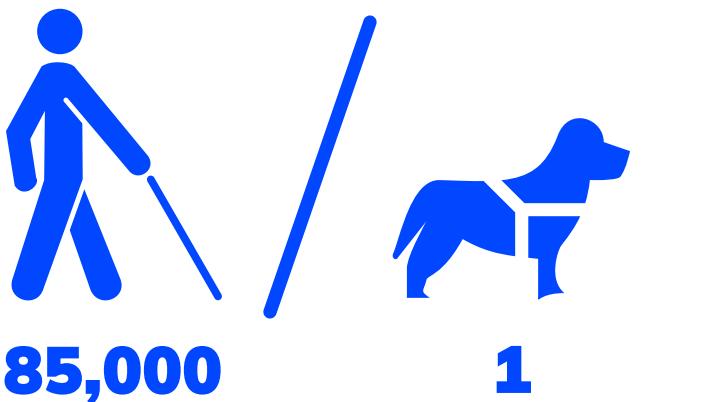


Why do we rarely see visually impaired people on the streets?

Background Introduction



Globally, at least **2.2 billion** people have a near or distance vision impairment. According to the China Association of Blind, there are **17.31 million** people with visual impairment in China.



There are only **200 guide dogs** but **17 million visual impaired people**. That's **1 guide dog for every 85,000 Chinese people** who are visually impaired.



Blind cane is still a normal choice when VI people want to go out.

Online Interview

Victor Andrews, 32, on a morning commute from where he lives in Clinton Hill Brooklyn to 23rd Street in Manhattan.



After learning some basic data and facts about traveling for the visually impaired, I conducted internet research and found an online interview with a visually impaired person taking the subway



It's hard for him to **use the vending machines to refill his MetroCard and check his card's balance**. Instead he goes to the station booth and asks the attendant for help.



Once Vann-LaRusso reaches the platform, **he struggles with finding where the train car doors open**.



Victor Andrews also doesn't use the subway often because he **has trouble navigating routes he's unfamiliar with**.



Victor Andrews also said he barely uses the subway outside of his commutes to work because **service information is often not provided in accessible formats**.

Environment Observation

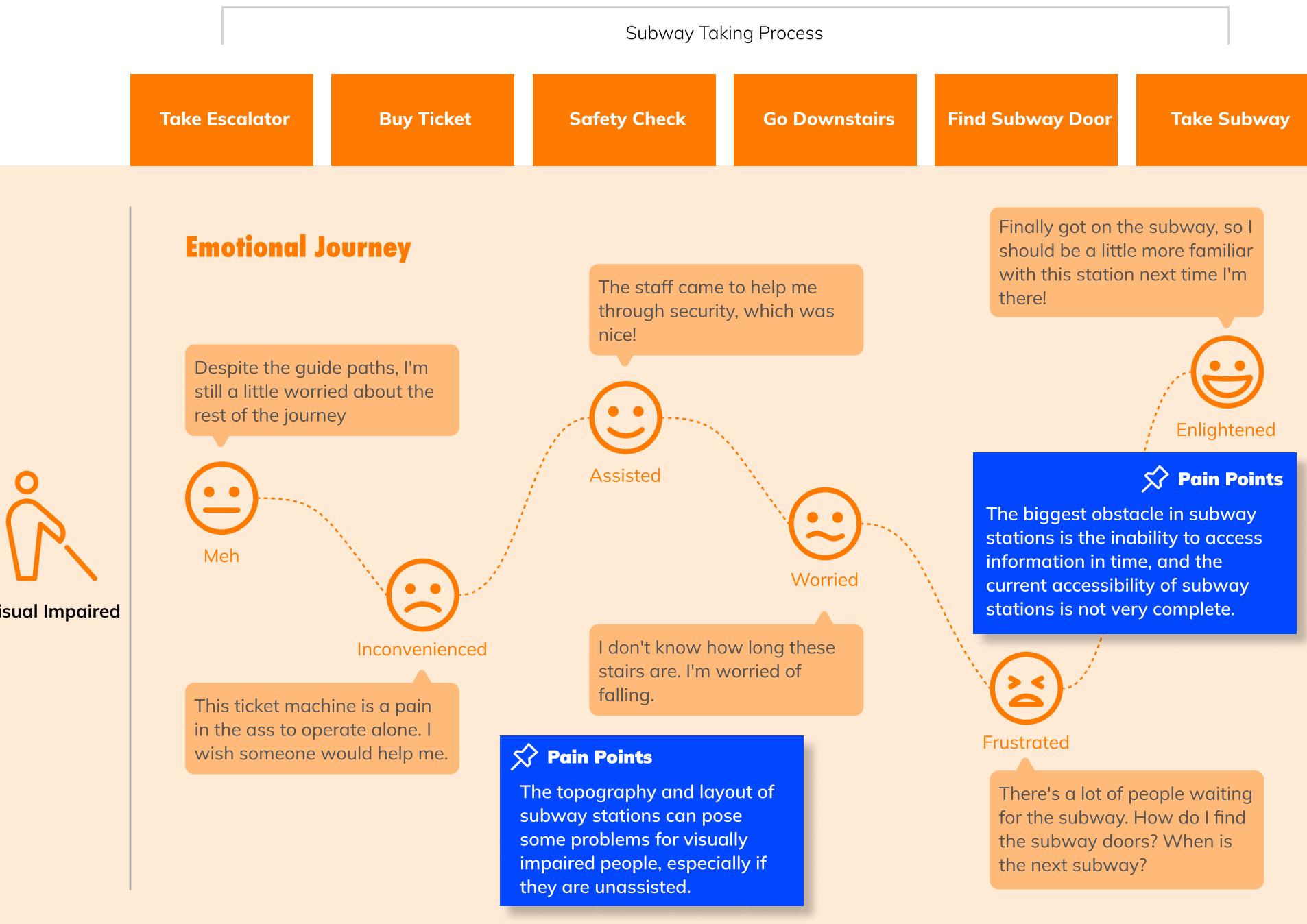
I went to a nearby underground stations and did an environment observation. The aim of this step is to find current and potential problems existed in the underground station.



- Some underground entrances are **not accessible**
- Visually impaired people **cannot find the underground doors** and some subways do not even have blind corridors
- **Crowded and obstructed** at peak times
- There are **too many and complex underground entrances and exits**, and few have Braille accessibility enhancement signs

User Journey

The User journey shows how the emotions of visually impaired people change during a subway ride and what causes these changes. Two user pain points are also represented throughout the process.



Define Problem



The overall layout of underground stations is more complex. **It will be difficult for visual impaired people to distinguish paths** in underground stations, such as the train doors.



Most signages in underground stations do not take into account the visually impaired. **It is difficult and time consuming for these people to distinguish these signs.**



There are **a large number of obstacles** in the underground stations as well as the drop-offs in the terrain.



The current **blind cane is not well suited to the current underground environment**, especially during peak hour. The cane may sweep into other people.

How Might We...

How Might We design a product to navigate visual impaired people in subway station?

Concept Design



To start ideation, I began with the blind cane which plays role in navigation when visual impaired people want to go out. I add some technologies and corresponding hardwares to overcome the problem

Integrate the Braille systems into products to provide information signage for the visually impaired



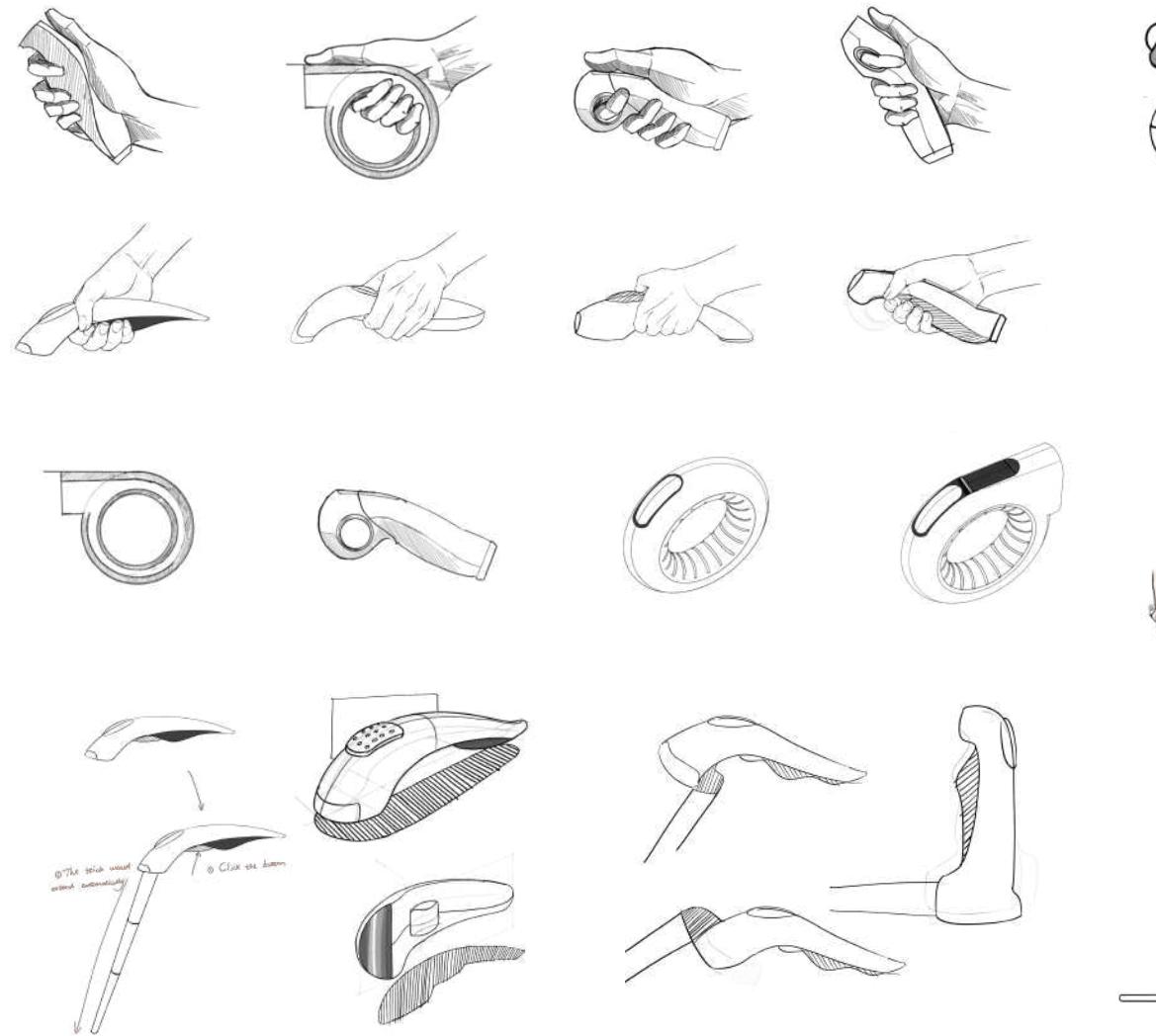
Using multiple sensors to monitor the environment and avoid obstacles in time



Integrate a vibration section in the product to alert the user with the environmental monitoring module

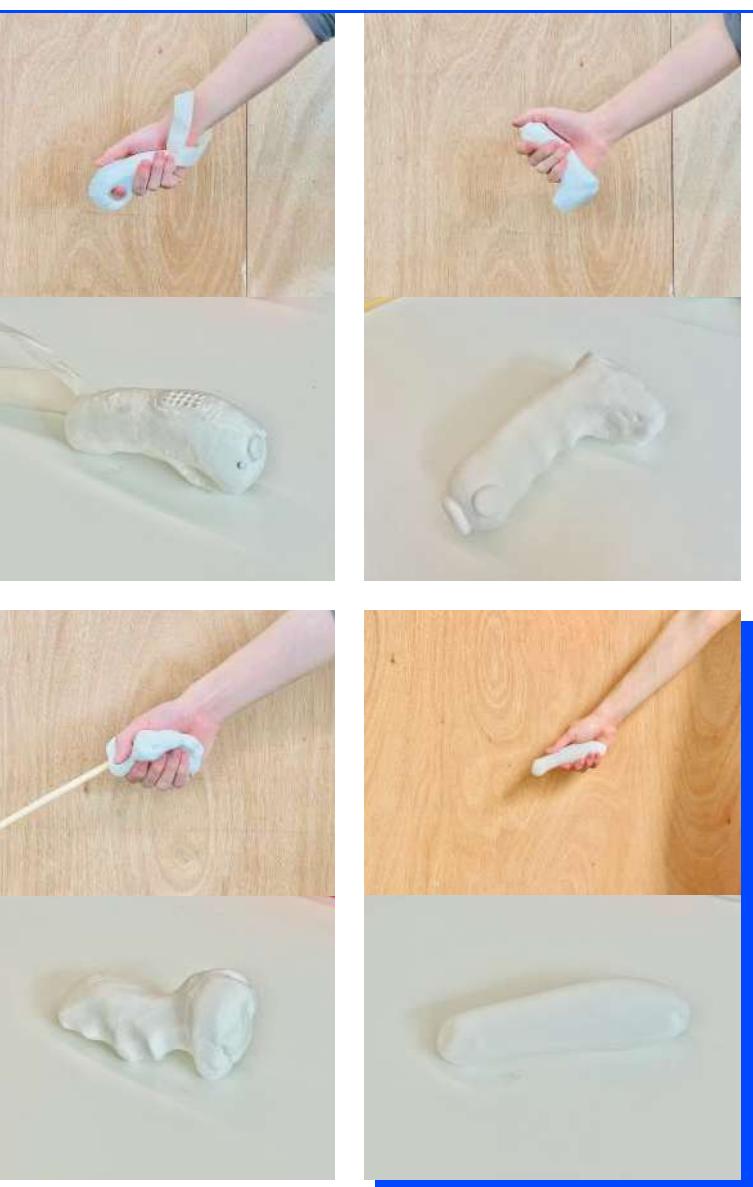
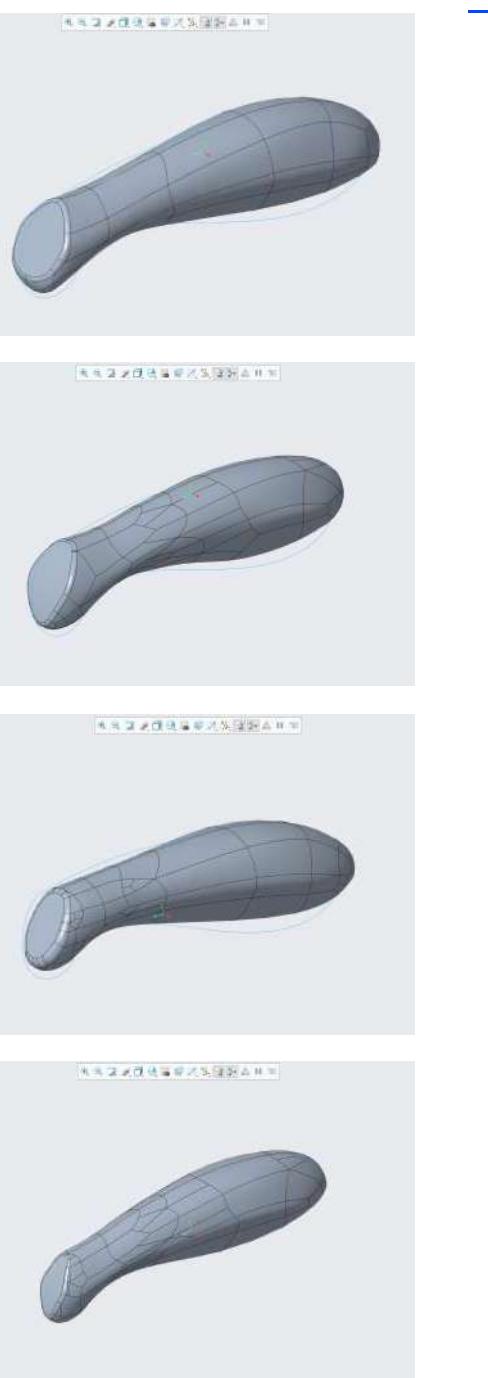


Ideation



In the ideation phase I mainly explored the **ergonomics of the handle section**. I experimented with different gripping positions and grip appearances, and in the next phase I made rough model for testing.

Prototype & Test



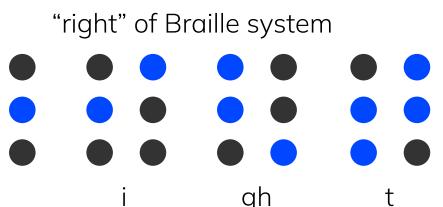
Based on the results of the previous sketch, I used clay to create some rough molds for ergonomics as well as comfort testing. In the end I chose the handles that fit the grip best.





This cane generated 3 basic features in terms of **detecting, informing and vibrating**. These features guarantee that the MVSI could safely take the underground with less problem.

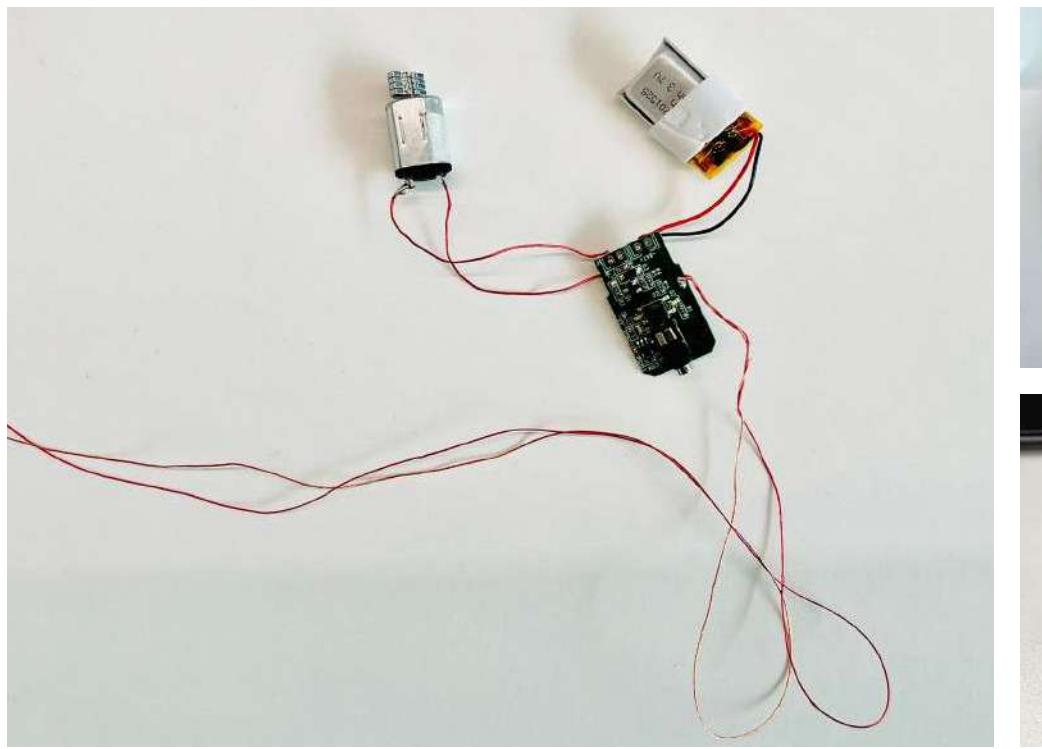
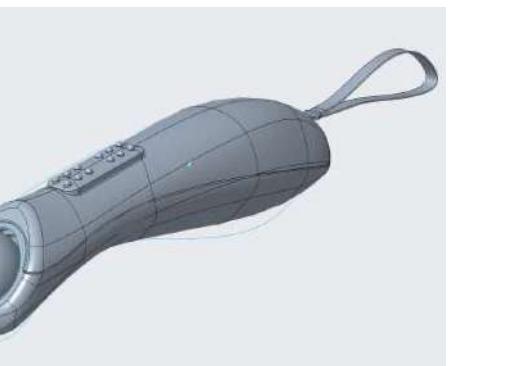
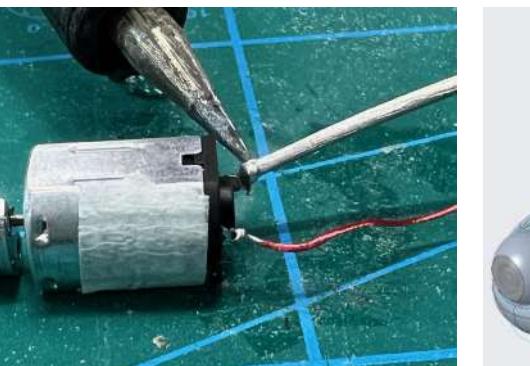
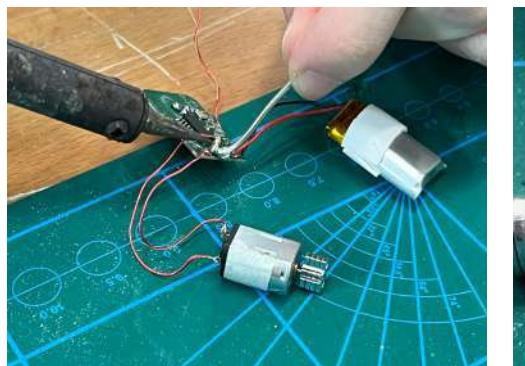
The length of the cane has been reduced as well. The normal blind cane can not work well in underground environment because of the **crowded space**. The reason why I keep the stick part is because the stick could **remind others the blind identity**.



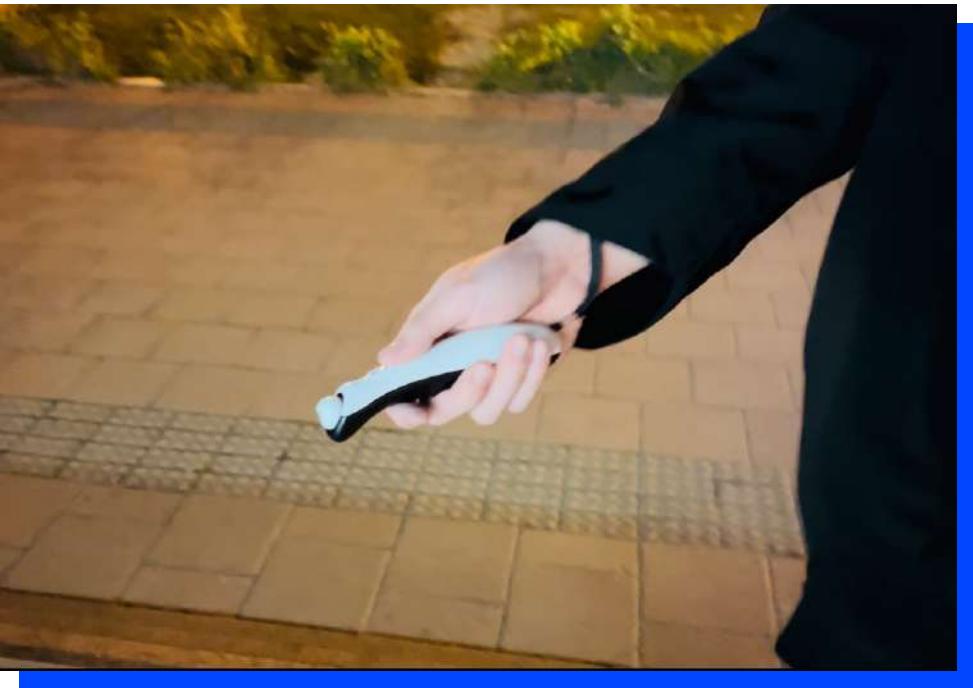
The Braille system is integrated as an information reporting unit. Users could tell the destination to the cane. The AI system could identify the voice and content. **The cane could report the necessary information by this Braille system.**

Model Making

During the modeling process I used **3D printing** to create the external frame of the guide cane as well as the content structure and painted each of these parts. I also installed a **vibration module** inside the cane to provide vibration feedback for functions such as vibration.



Key Features



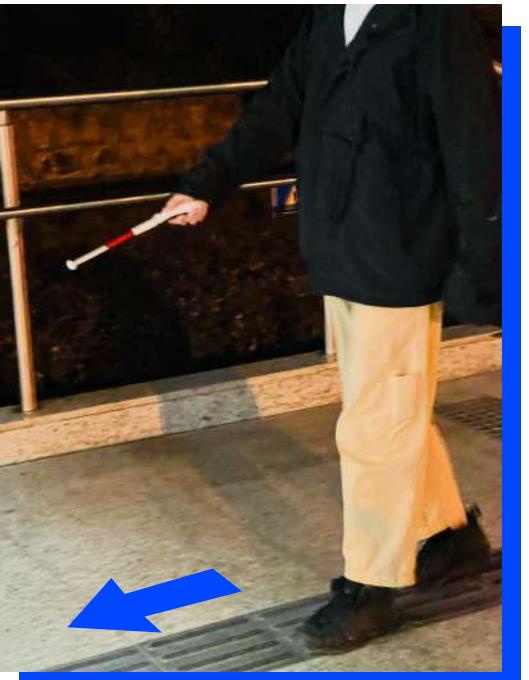
1 Enter the Station

The cane works when the user arrives at the subway station. A camera at the front detects the environment in front of the user and guides him or her in real time.



3 Remind the Barrier

When there is a terrain obstacle ahead, such as stairs, the cane informs the user of the obstacle through the Braille system as well as vibration.



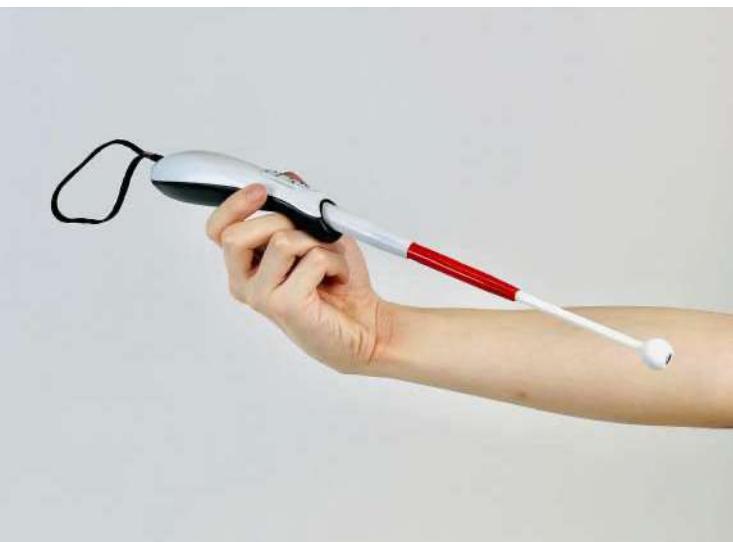
2 Navigation

The guide cane guides the user to the blind alley when it is detected. The guide cane will also guide the user through the subway station via the Braille system.



4 Detecting & Vibrating

When an obstacle is detected in front of the user, the cane will vibrate to alert the user that there is an obstacle ahead that needs to be avoided.

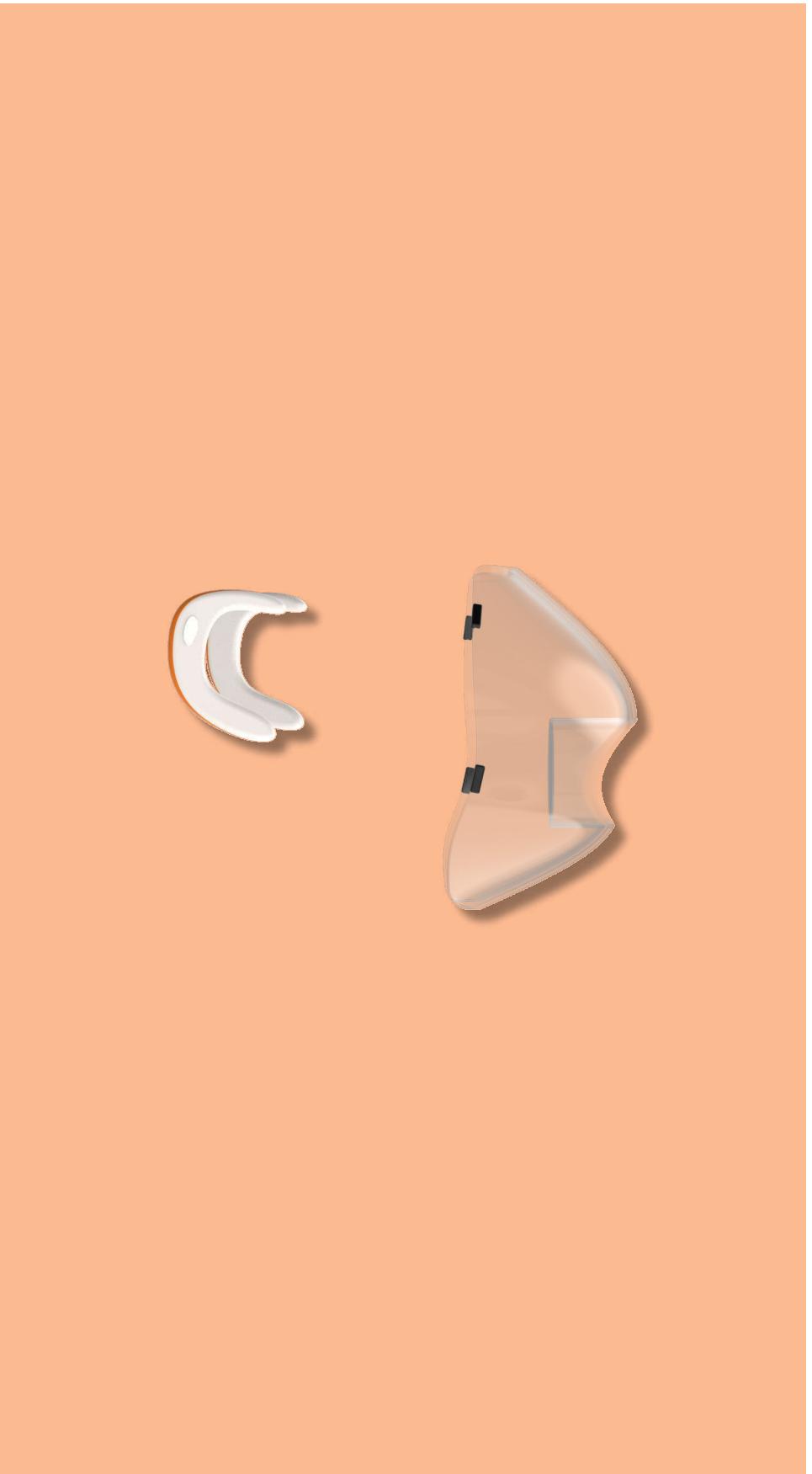


Industrial Design

Portfolio

Liwen Liang

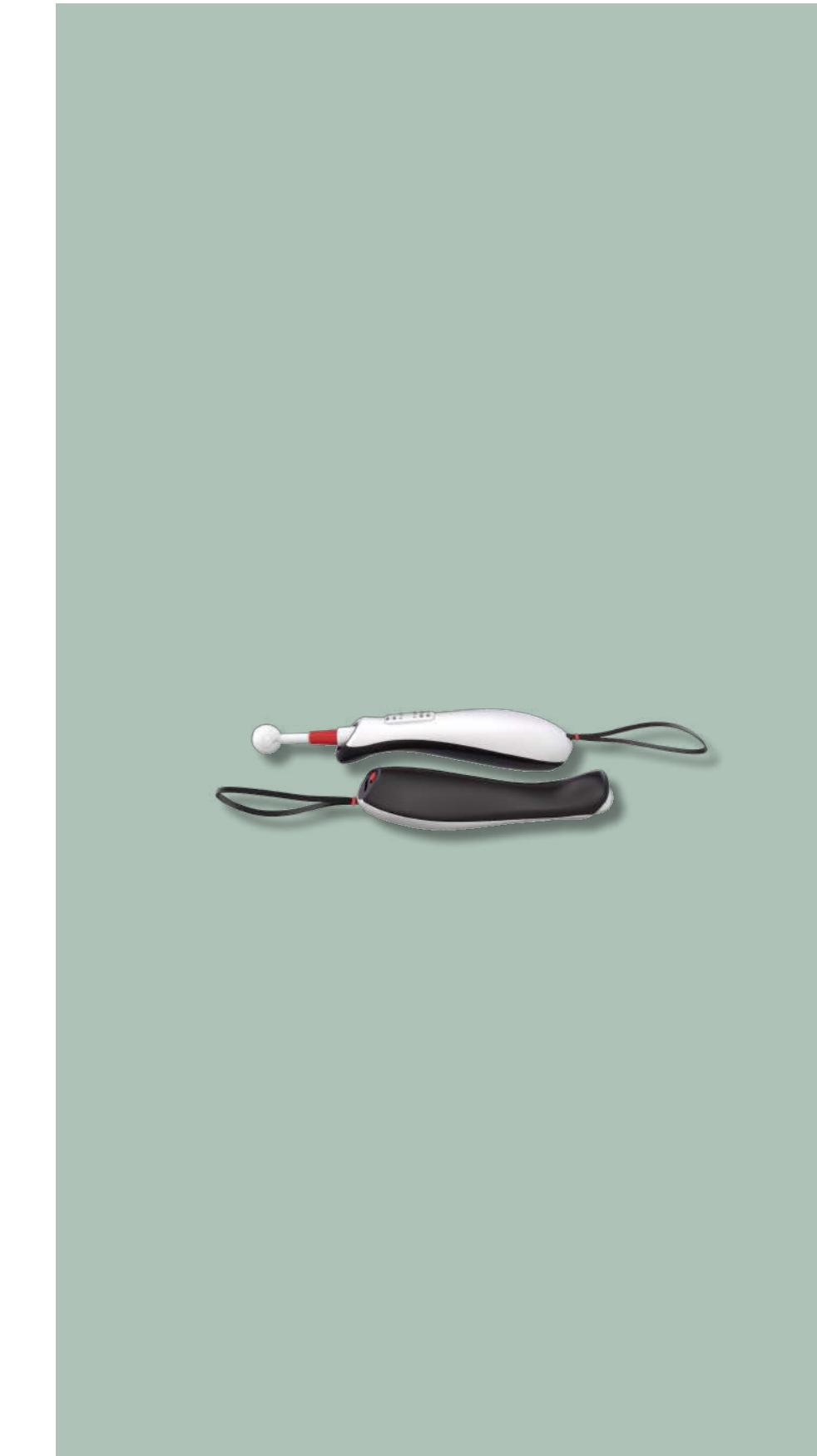
Sections



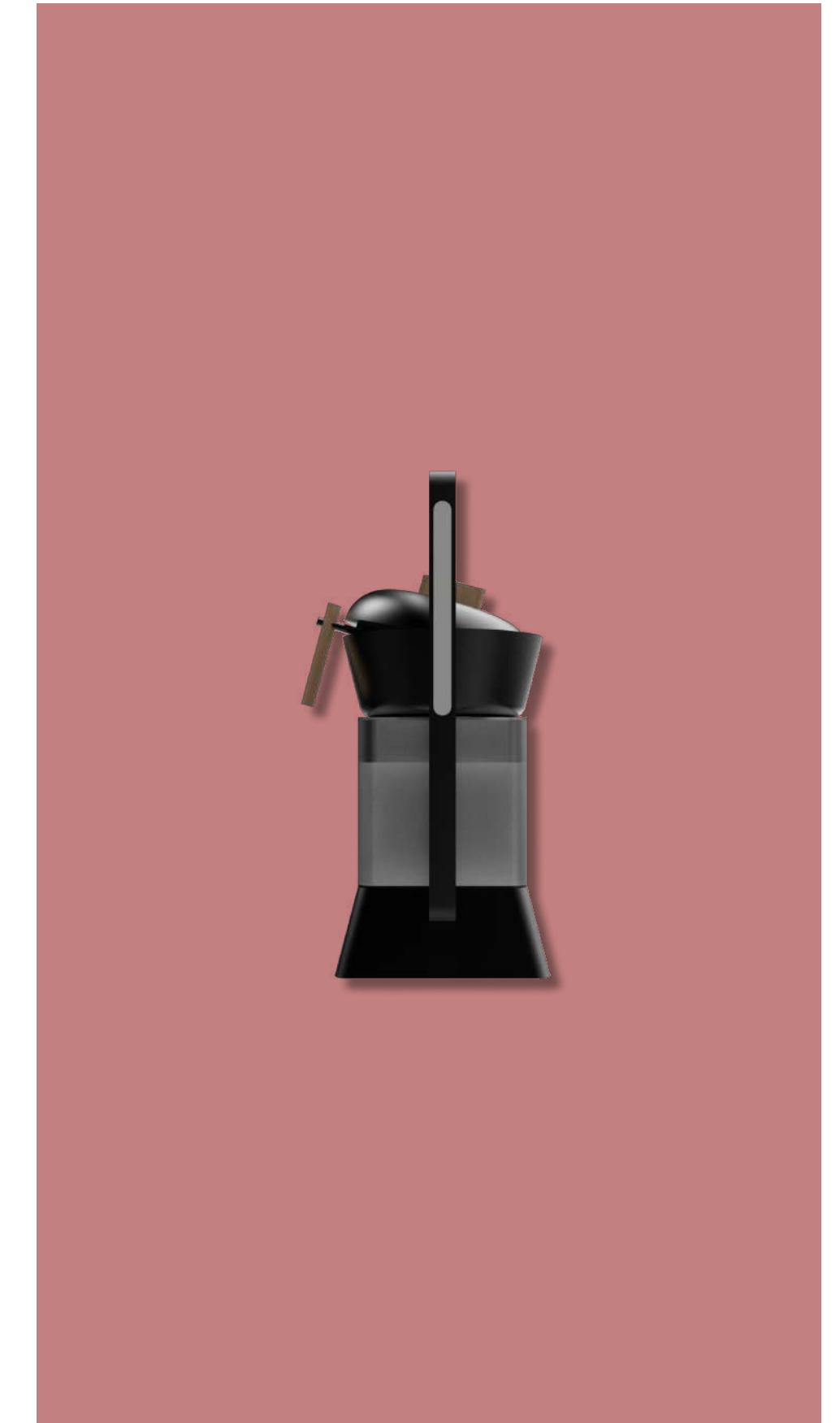
Ready to Talk



Li-wer



Prometheus



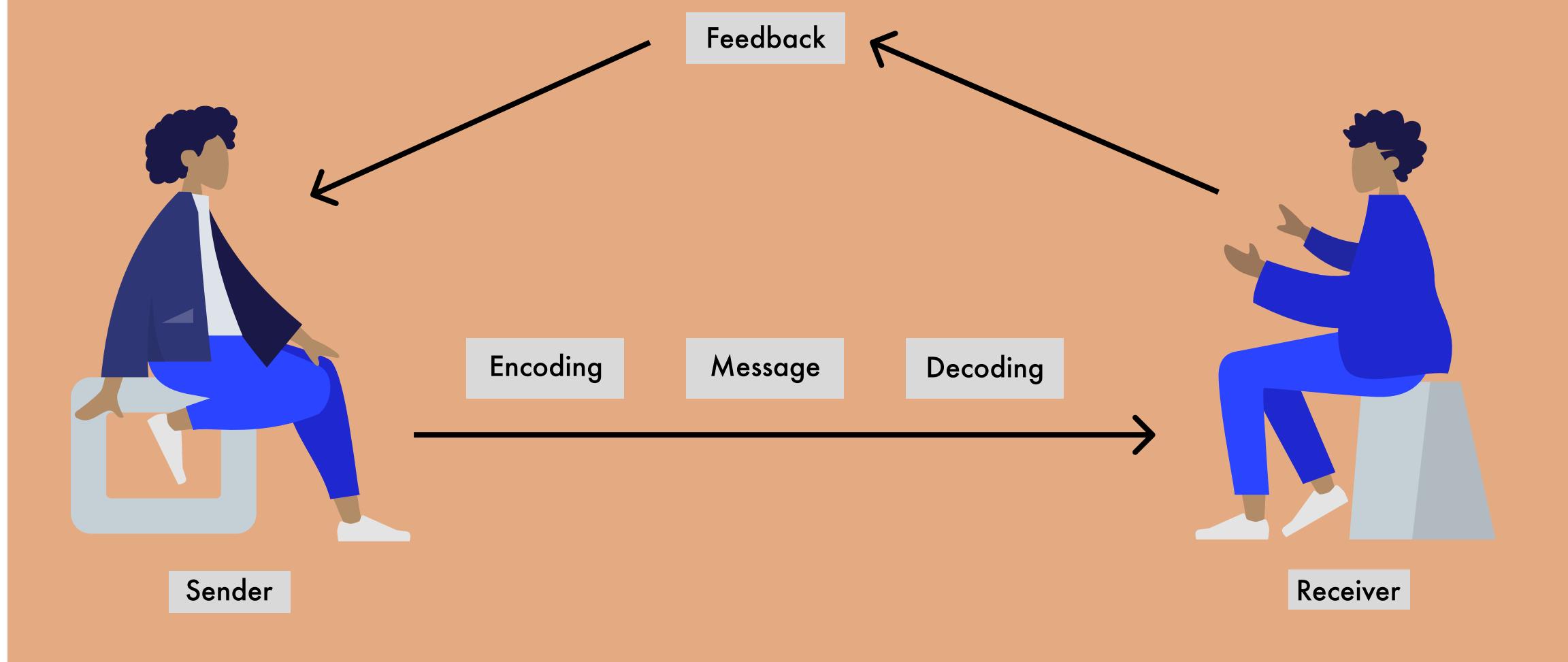
LIGHOT

Ready to Talk

Since the Covid-19, wearing mask has become a mandatory component in people's daily life. However, this health protection might have negative effect on people's communication. This product aims to improve the communication experience and speech intelligibility.



Basic Communication Process



The basic communication process has several components : sender, receiver, feedback, message, encoding phase and decoding phase. Wearing mask would affect the encoding, decoding and feedback phase. In other words, **mask-on communication will decrease the sound of speakers so that the whole communication process will be affected.**

Over **70%** people encountered communication problem while wearing masks.
Over **64%** people stated that face-covering communication has affected their Speech Intelligibility.
People with hearing loss are affected more



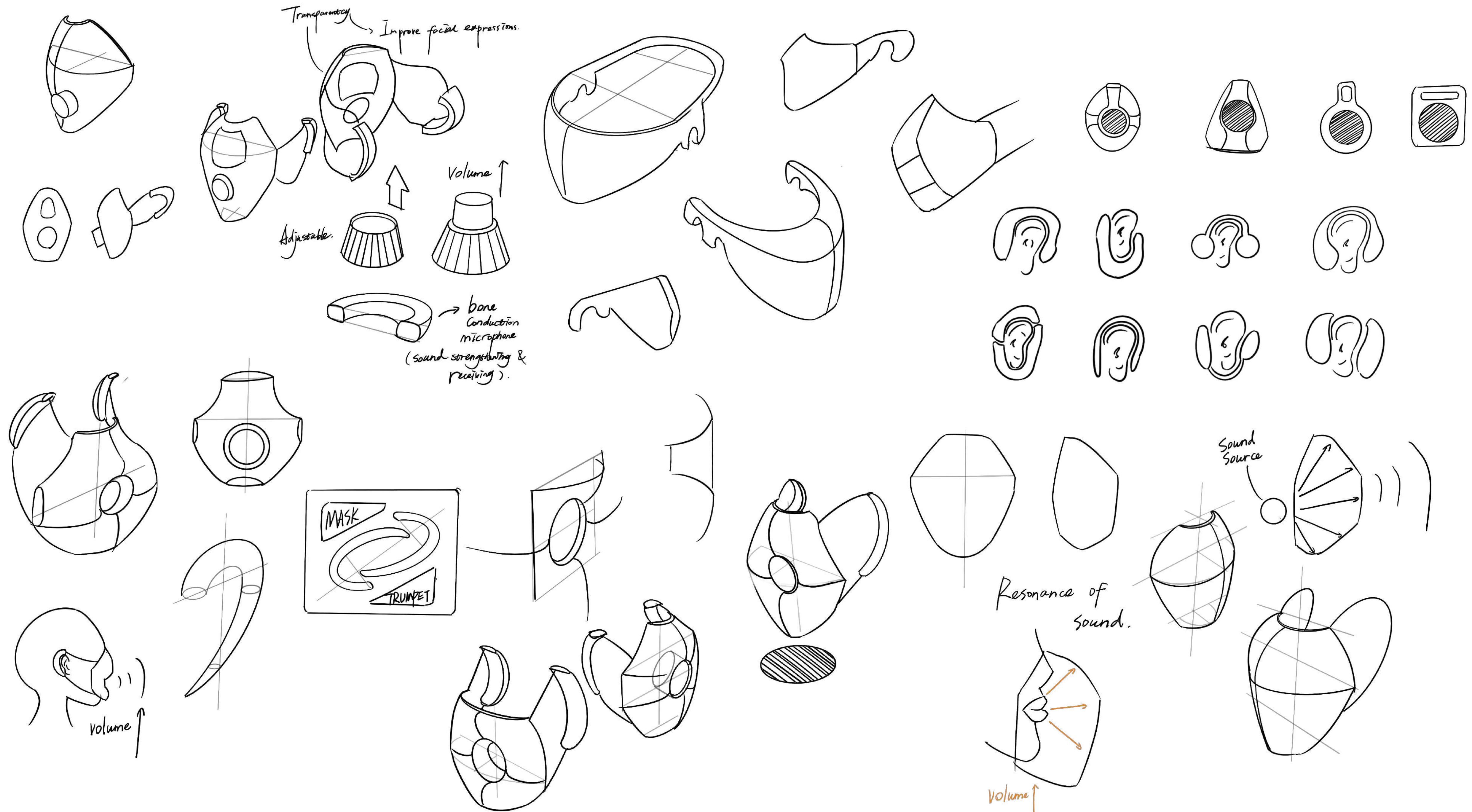
While normal people are troubled by the effects of masks on communication, another minority group may be even more affected. According to the World Health Organization, by 2050 nearly 2.5 billion people are projected to have some degree of hearing loss and at least 700 million will require hearing rehabilitation. **Therefore, minority groups should also be taken into account when setting the product's features.**

The position of this project is the **mask**. It will improve on the existing masks to address the communication issues.

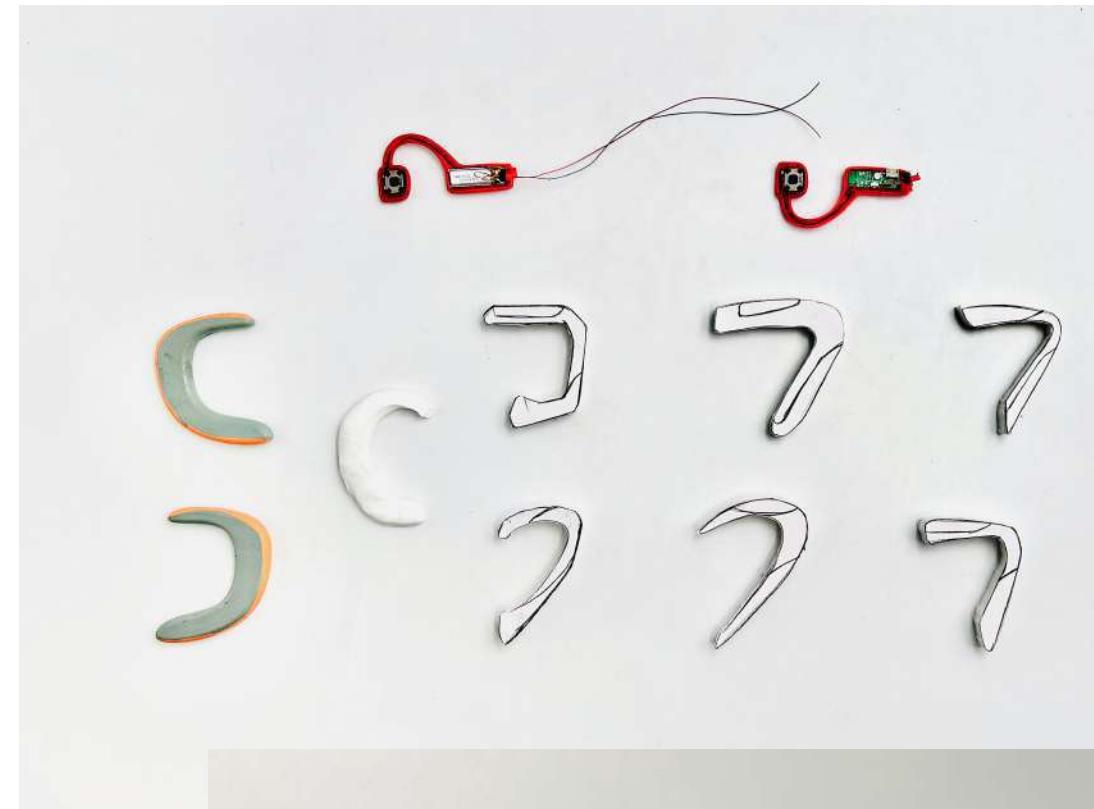
The target users of the product are limited to those who need to wear the mask for a long time and those who need to communicate a lot.

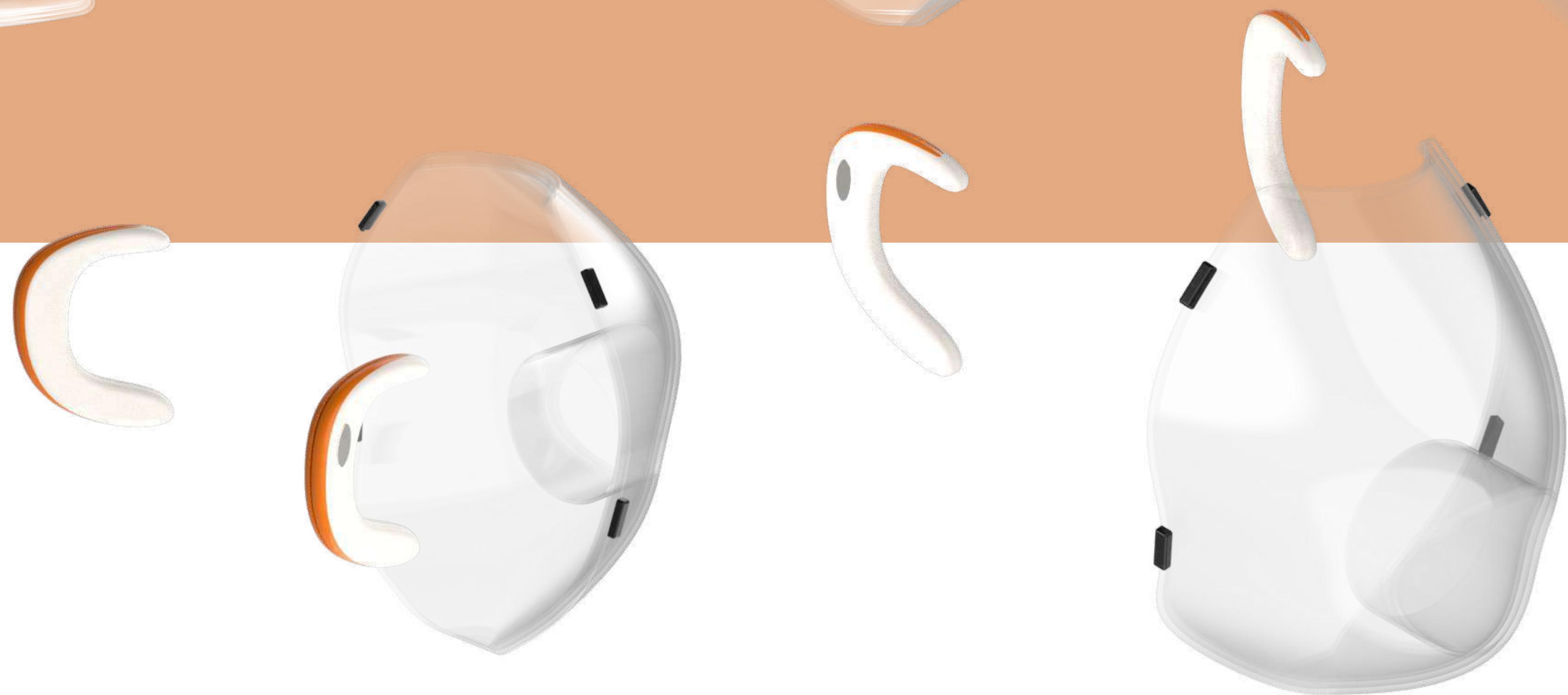
In order to increase the sound entering people's ear, **bone conduction** is chosen to improve the experience. Meanwhile, bone conduction is also useful for people who has mild or moderate hearing loss.





Function & Form Test





Bone Conduction Unit: This component is combined with the lanyard of the mask. It starts working when the user puts on the mask. This bone conduction component detects sound during communication and amplifies it through bone conduction.



Transparent Material: it can increase the facial expression as much as possible. The facial expression plays important role in improving the speech Intelligibility.

Sound Enhance Unit: The special structure and the huge rigid body could enhance the sound of the user. It will create the sound resonance effect so that the encoding phase of communication could be improved.

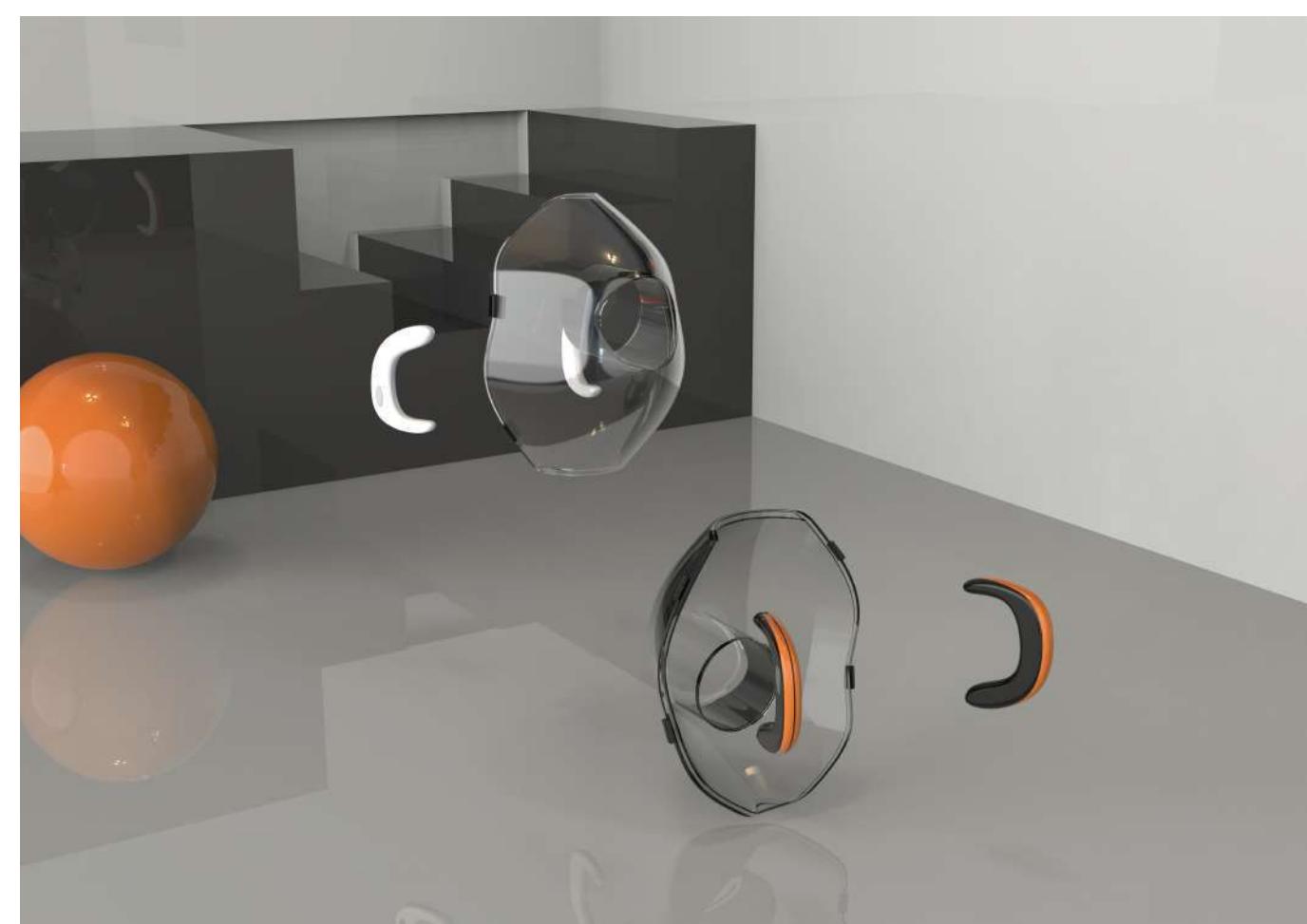


2 User realize the problem and change the 'Ready to Talk'



3 'Ready to Talk' could improve the communication and the using experience

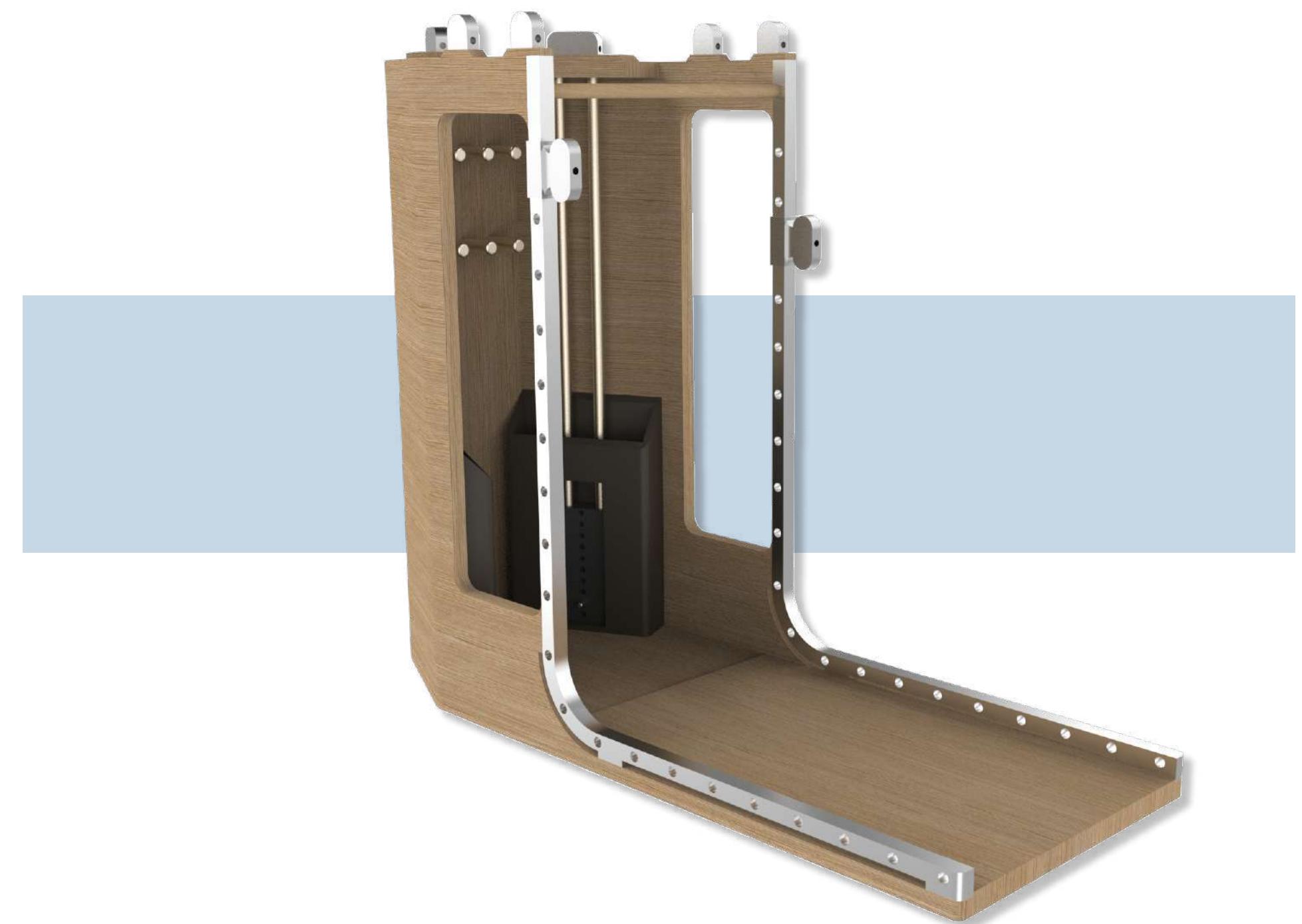
1 Wearing normal mask would have negative effect on daily mask-on communication



Li-wer

This idea is designed to provide multiple indoor exercise under current pandemic situation. Wood is a common material in high-end indoor exercise equipments. A good piece of wood exercise equipment can improve people's health and quality of life.

Found: METSA Plywood Company, China



User Persona



Name: Shawn

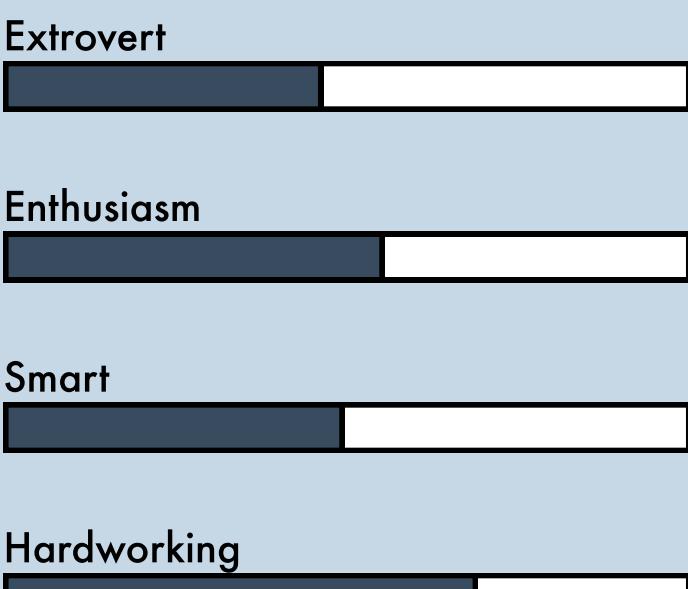
Gender: male

Age: 27

Occupation: Business manager

Status: single

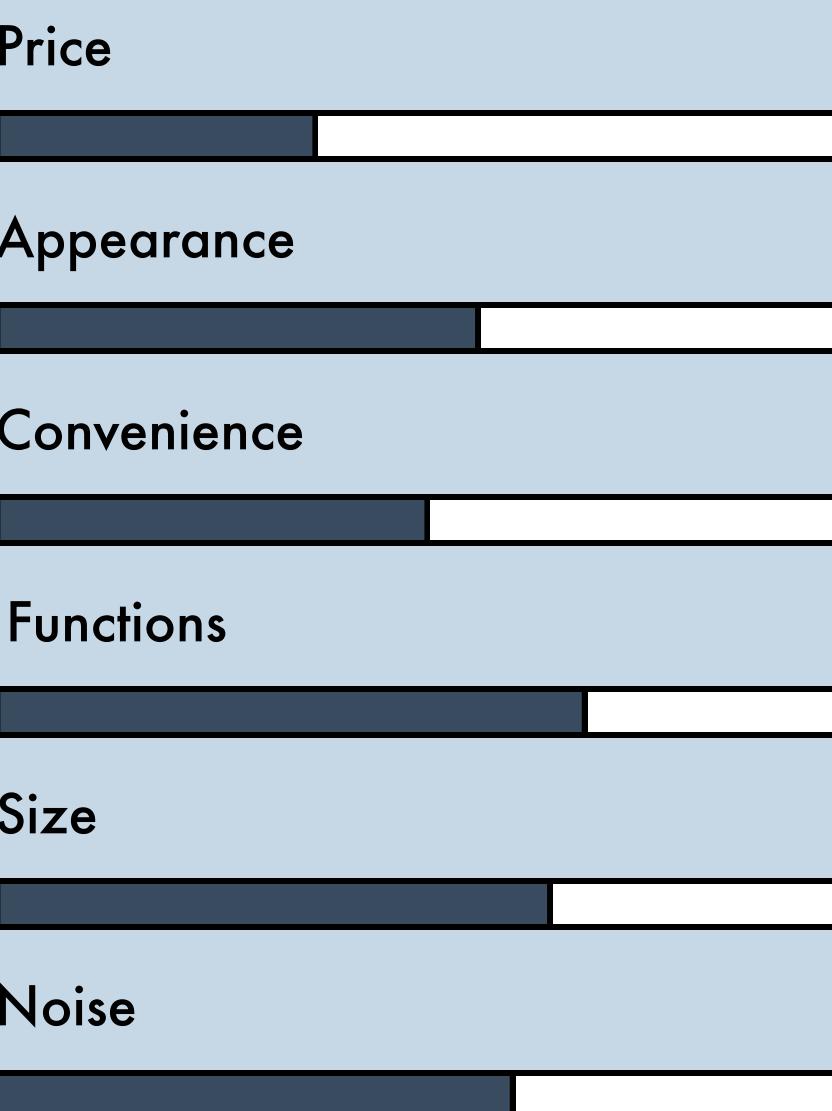
Habit: sports, movie, video games, singing



Goal

- To get enough amount of exercise while working from home.
- To reduce the anxiety and frustration that may come from being at home.

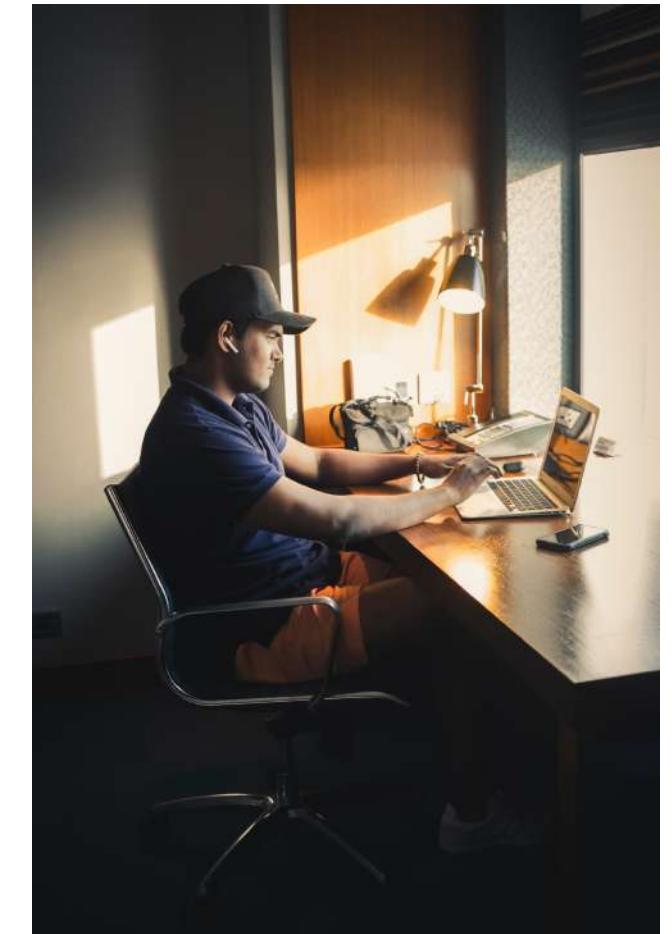
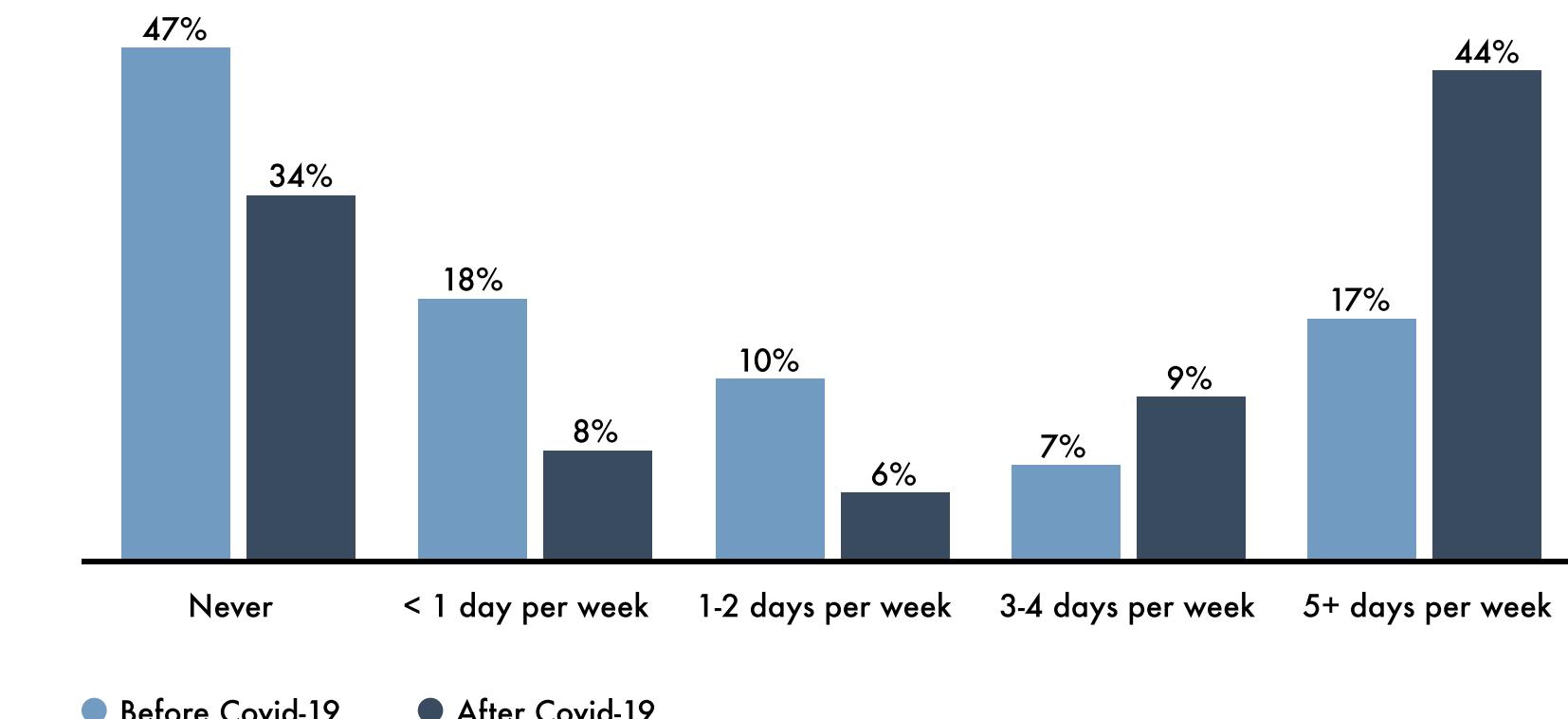
Motivation



Frustration

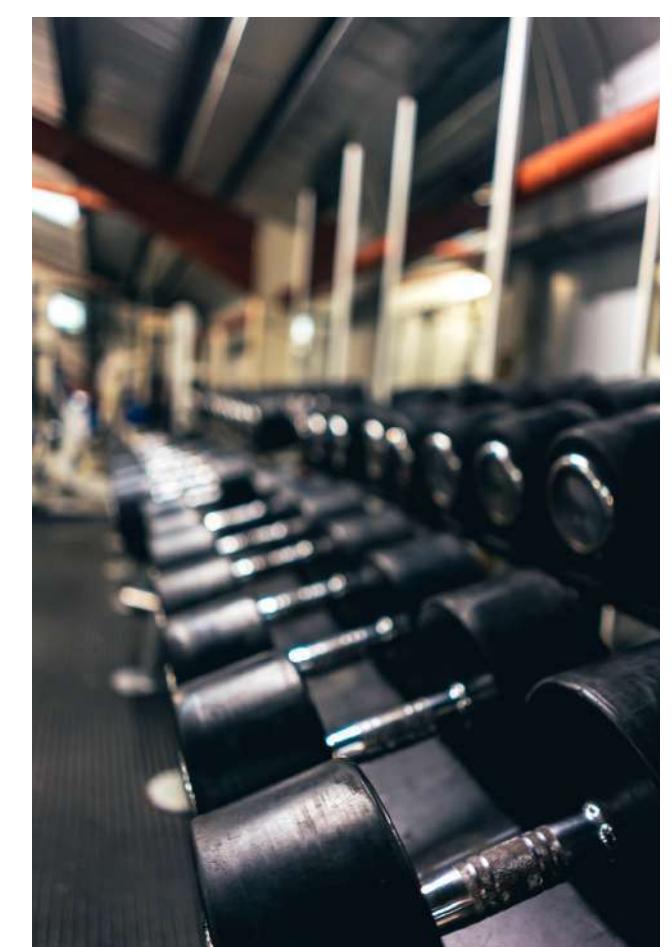
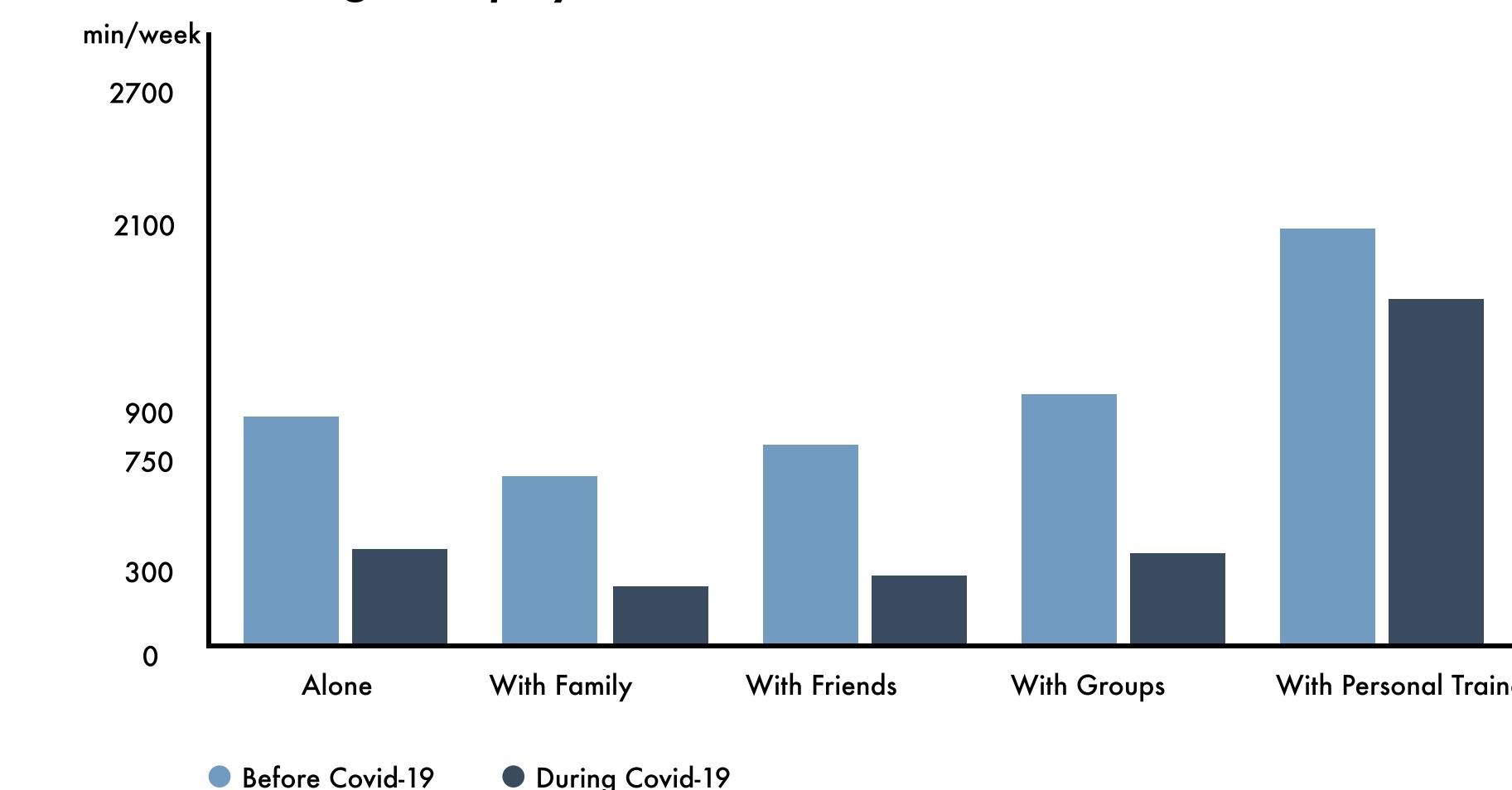
- It is hard to prepare all the equipments for different exercises
- Space size limits physical activities
- Simple training without equipment can not meet the personal fitness requirements

Change in remote work trends due to COVID-19



After COVID-19 80% of people expected to work at least 3 days from home per week.
59% of respondents said they would be more likely to choose an employer who offered remote work compared to those who didn't.
Working from home has become a new working trend since pandemic.

Change of physical activities since COVID-19



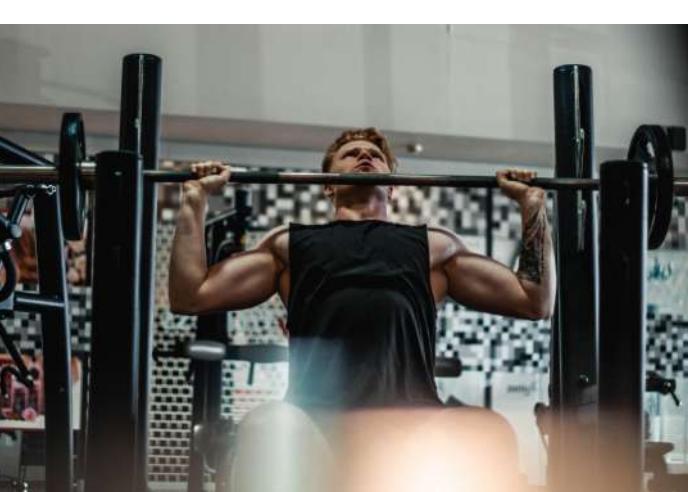
A report about 30 million respondents has found a daily reduction in step counts up to 38% in European countries and 15% in South and North American countries.

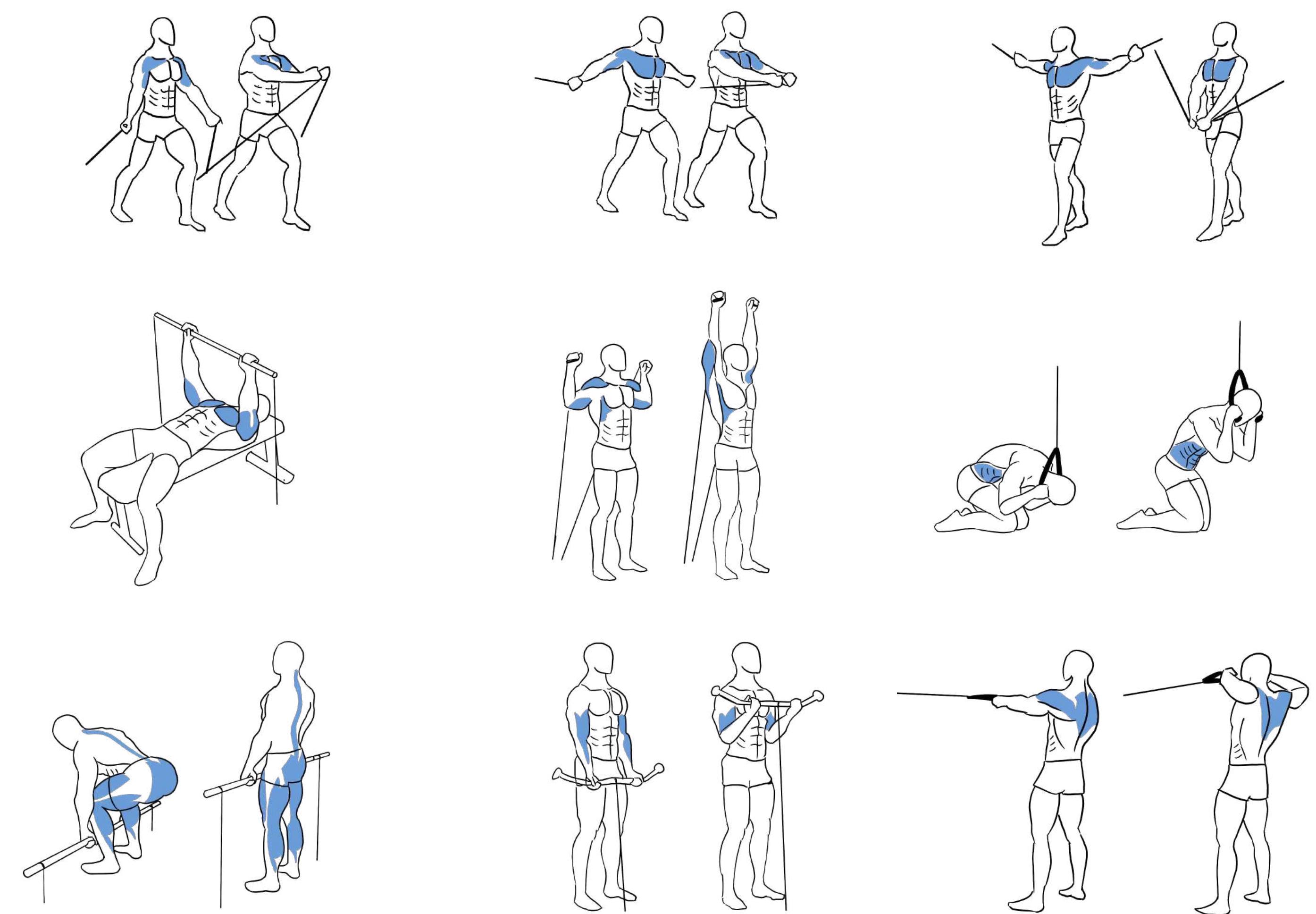
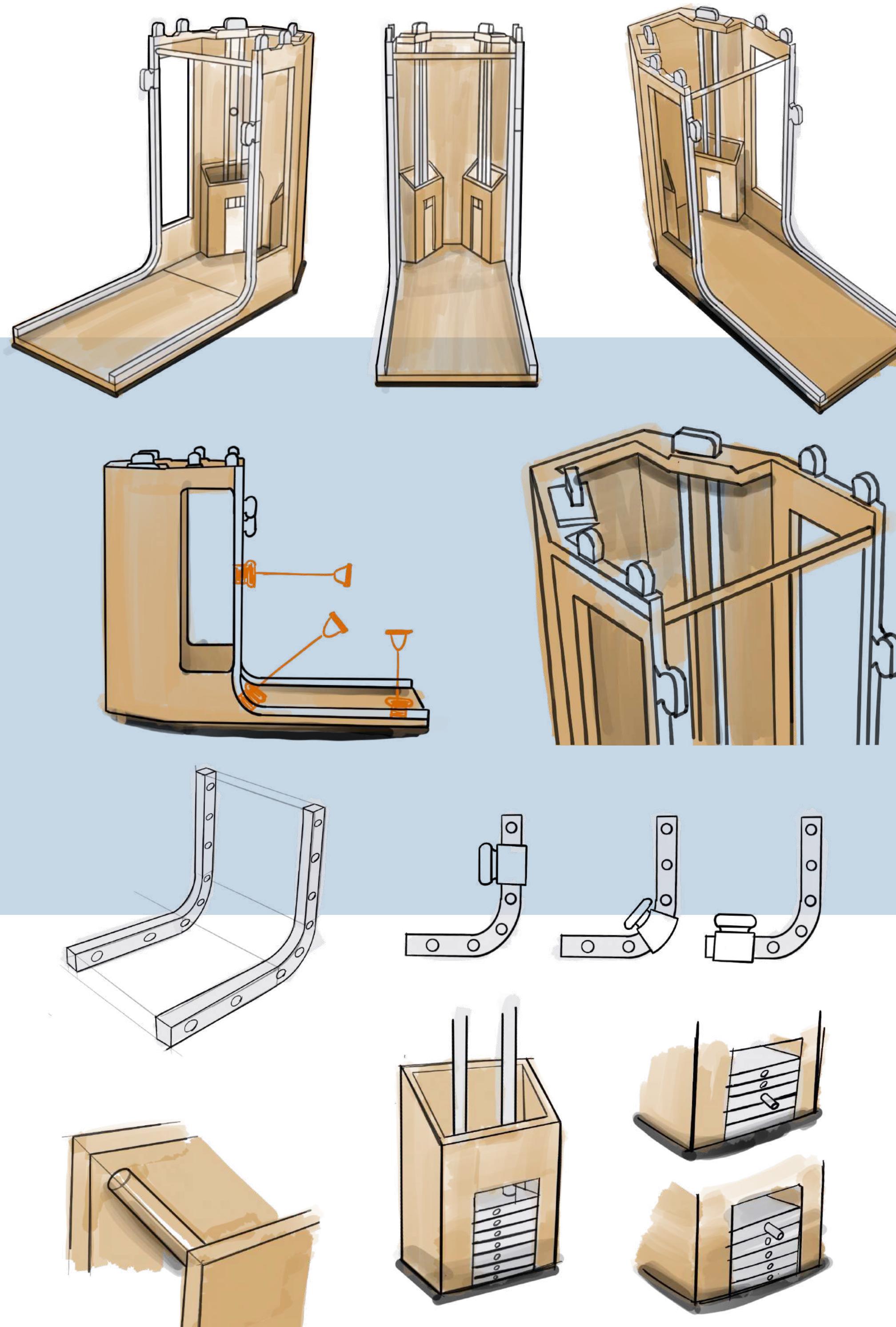
Market Analysis



It can be found that the market fitness equipment can be broadly divided into two categories through the material: metal and wooden materials. The first type of devices often have many functions but they require more space and do not match the appearance of the home environment. The second type of wooden equipment for space requirements are not as high but often a single function, which can not meet the multi-functional fitness needs.

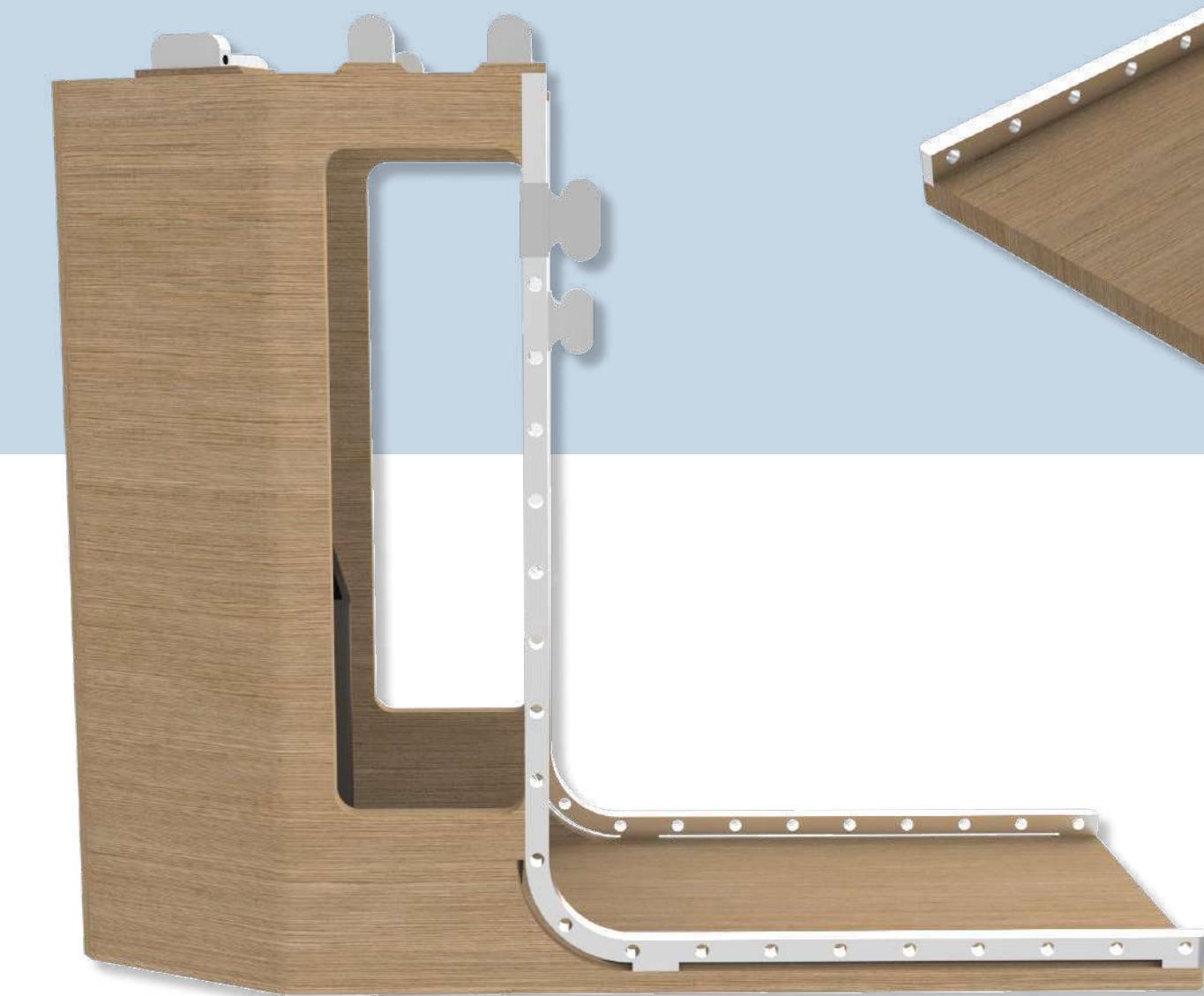
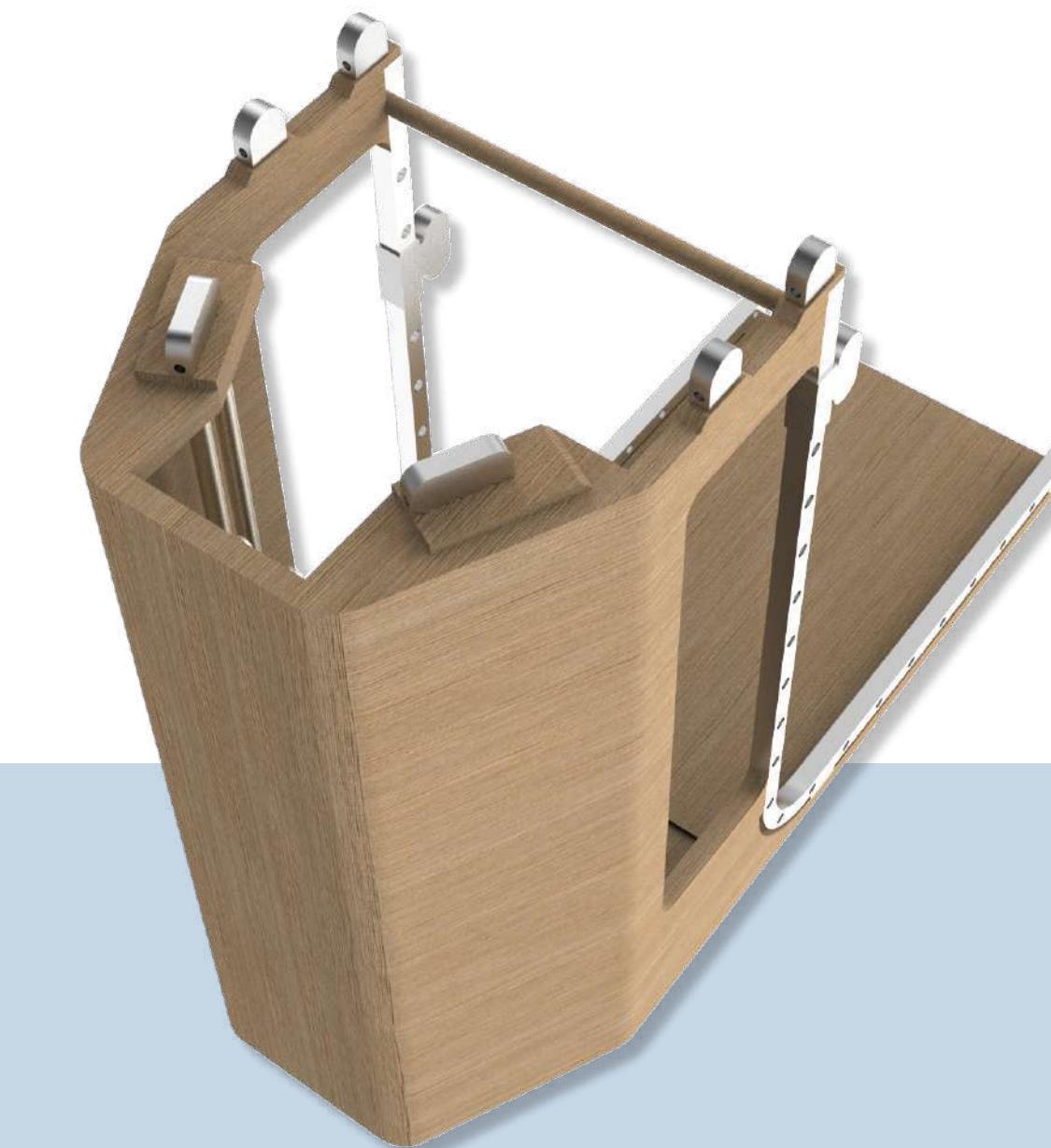
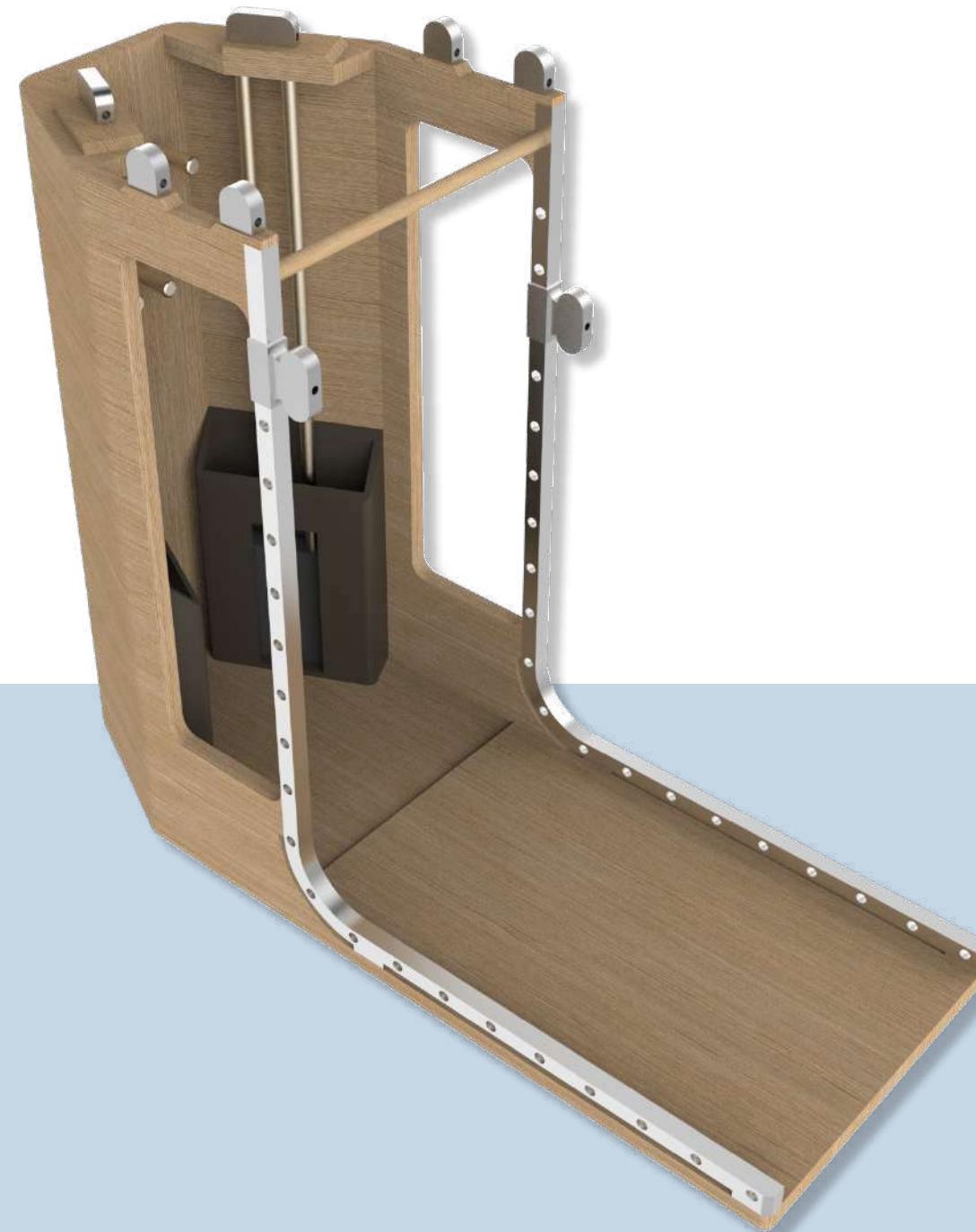
Inspirations

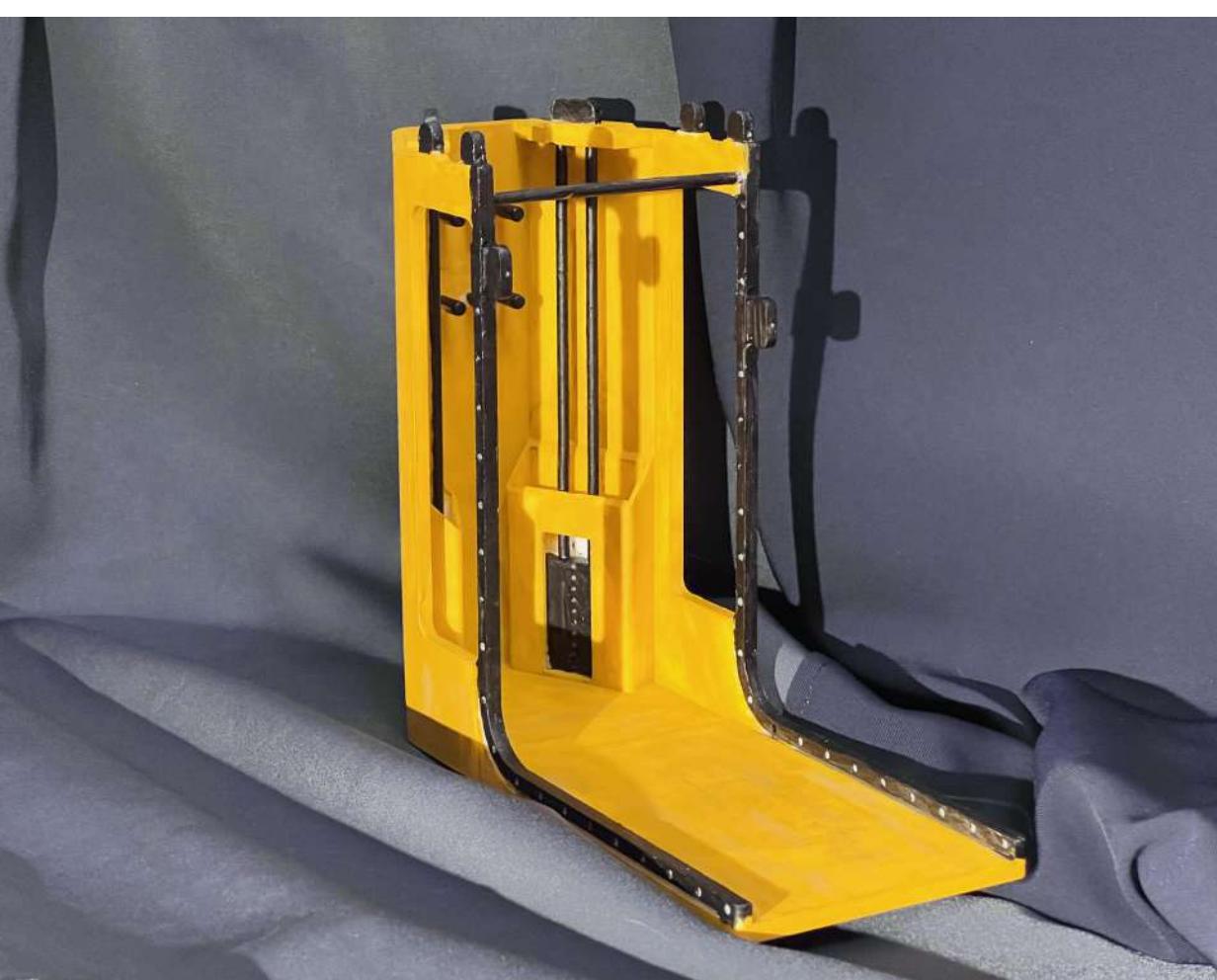




The design process for this project took into account as many sports positions as possible. The prototype for the project was derived from a cable machine in commercial gym. In order to allow the user to complete as much movement as possible with the device, the unit was redesigned with sliding rails. The newly designed slide is L-shaped, which increases the adjustability of the whole device and thus adds more types of movement.

Final Product





Prometheus

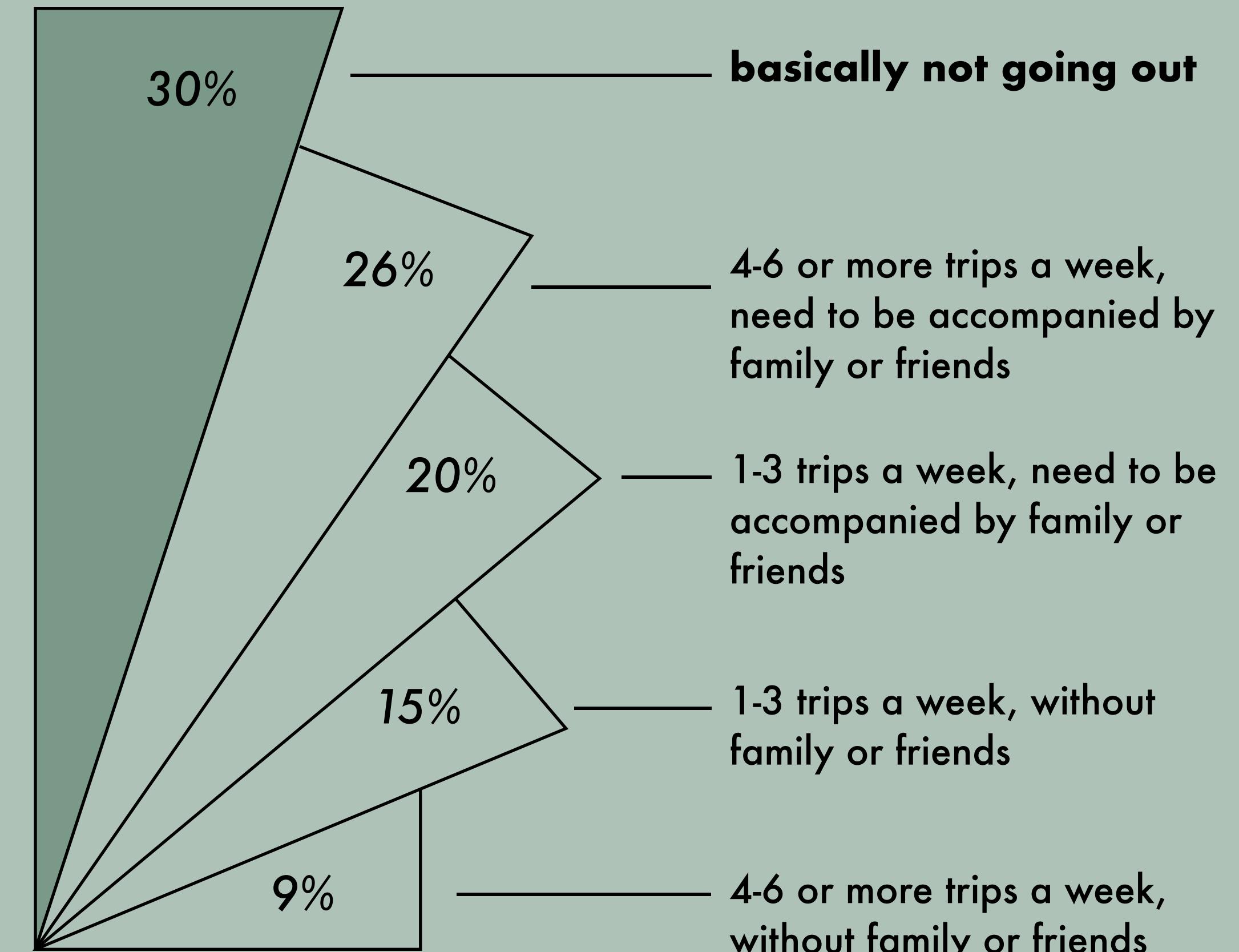
Prometheus is a guide stick designed for the blind. In today's highly developed transportation society, the visually impaired minority still faces many problems in getting around. This project focuses on solving the problem of blind people taking the subway, combining several technologies to improve the travel experience of the visually impaired.





Globally, at least 2.2 billion people have a near or distance vision impairment. According to the China Association of Blind, there are 17.31 million people with visual impairment in China. In China, the overall situation for visually impaired group when they want to go out is much more harder. There are only 200 guide dogs but 17 million visual impaired people. That's 1 guide dog for every 85,000 Chinese people who is visual impaired. Blind cane is still a normally choice when MSVI people want to go out.

"Why we hardly see people with blindness or visual impairment walking on the street?"



There are multiple reasons for this phenomena, such as lack of accessible facilities, lack of volunteer services, self-esteem of visually impaired and so on. This group of the visually impaired population deserves to enjoy the same convenience of travel as the general population does now.

Interview

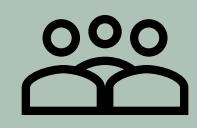


Victor Andrews

"I've always been legally blind, had vision in my right eye. But about 10 years ago, my vision started getting very blurry. And since that time, it's kind of been a gradual decrease."



It's hard for him to use the vending machines to refill his MetroCard and check his card's balance. Victor Andrews wasn't trained on how to use MetroCard vending machines. Instead he goes to the station booth and asks the attendant for help.



Victor Andrews has to travel up two flights of stairs to the platform to ask the attendant for help., where he has to contend with crowds flowing in both directions. Once he reaches the platform, **he struggles with finding where the train car doors open.**

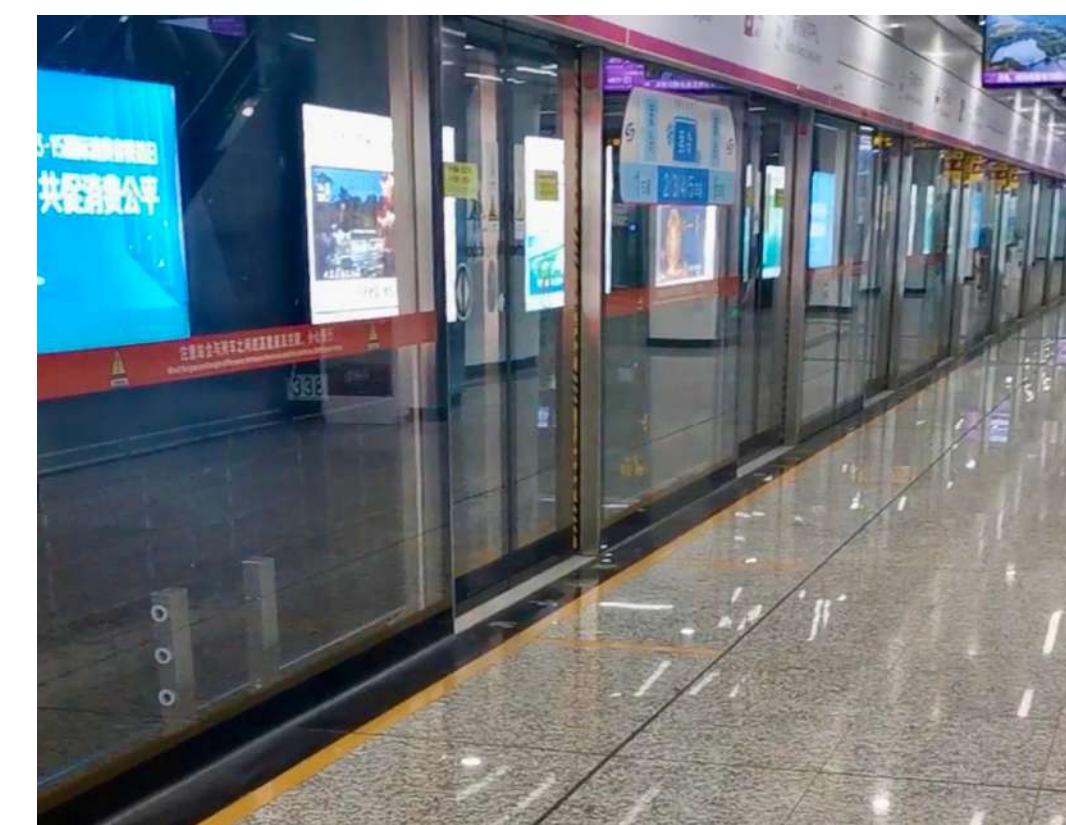
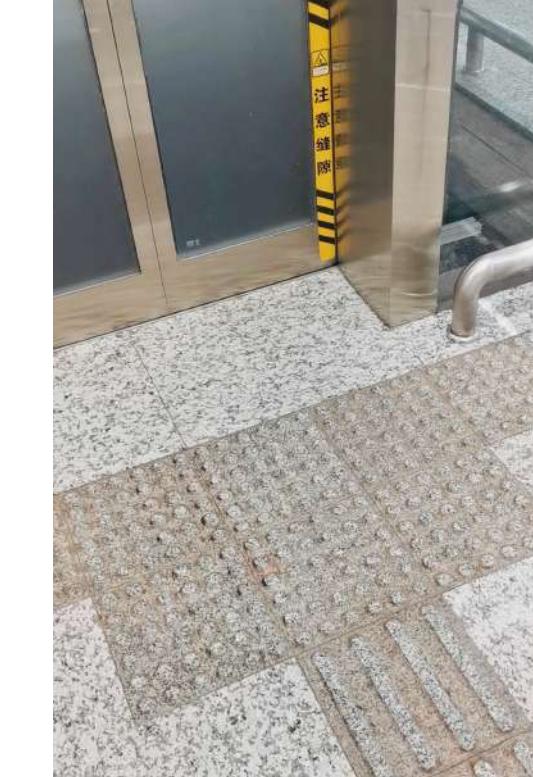


Victor Andrews also doesn't use the subway often because **he has trouble navigating routes he's unfamiliar with.** This is because larger stations have complicated layouts and don't have clear directional information for people with visual impairments.



Victor Andrews also said he barely uses the subway outside of his commutes to work because **service information is often not provided in accessible formats.**

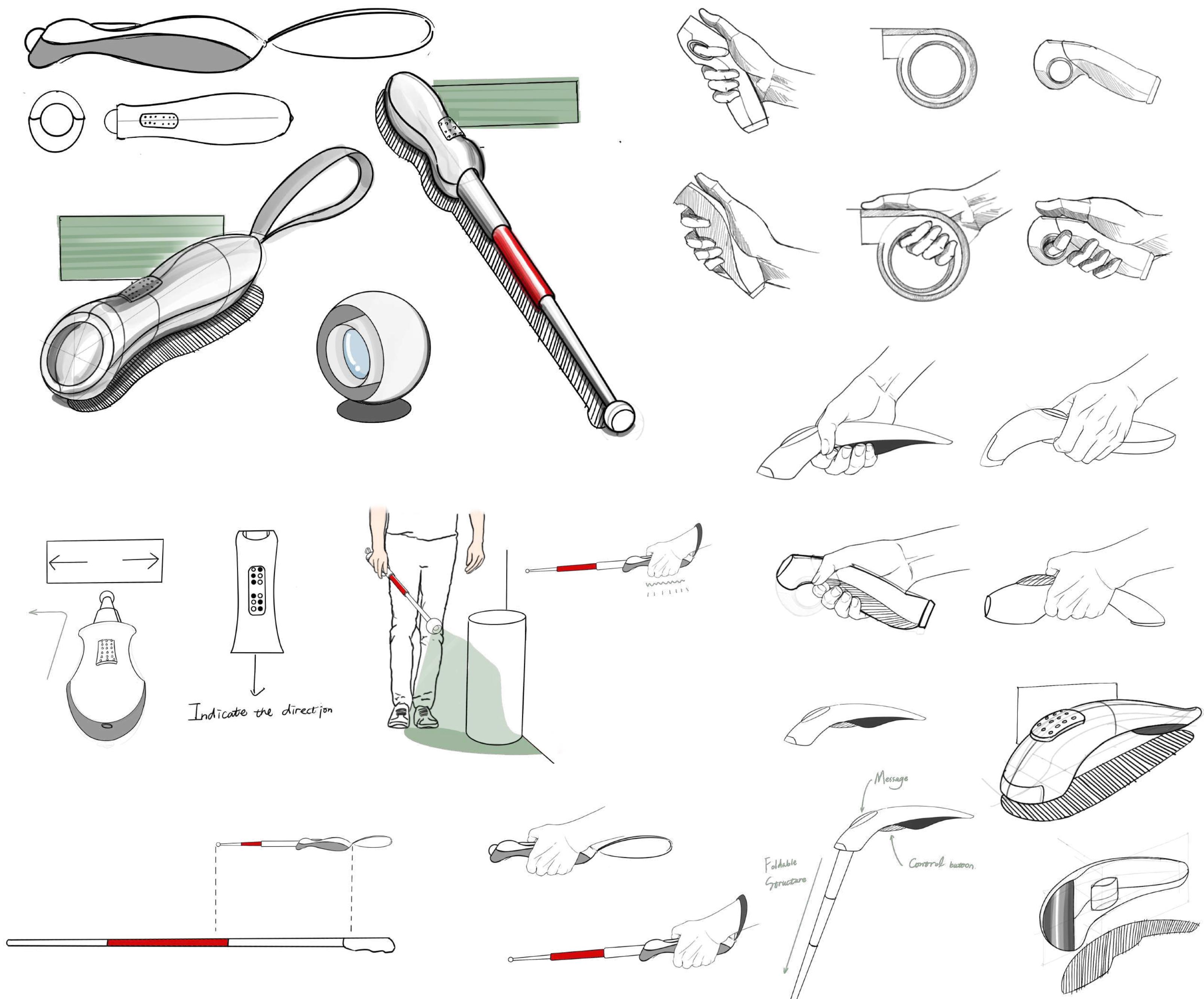
Environment Observation

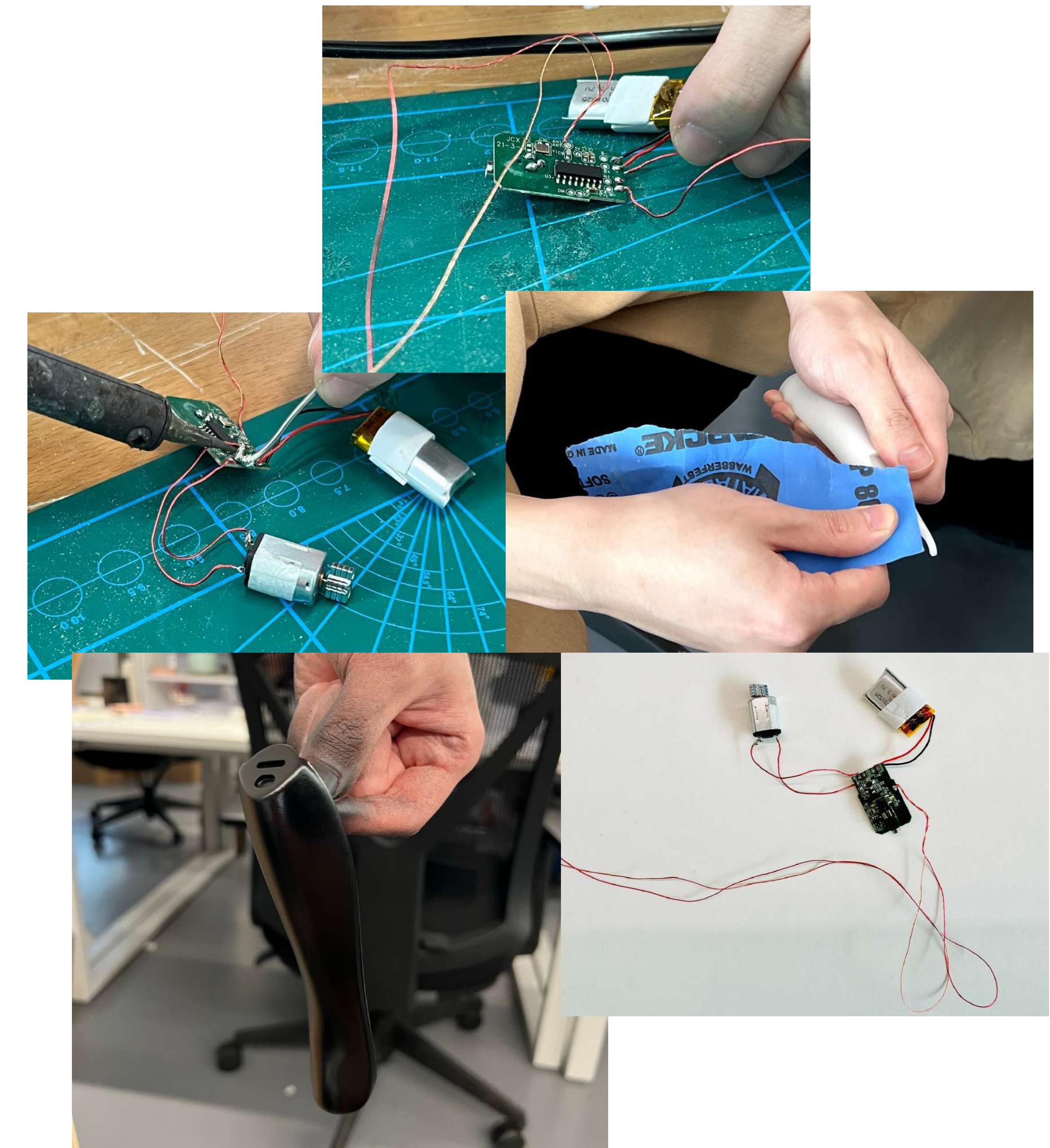
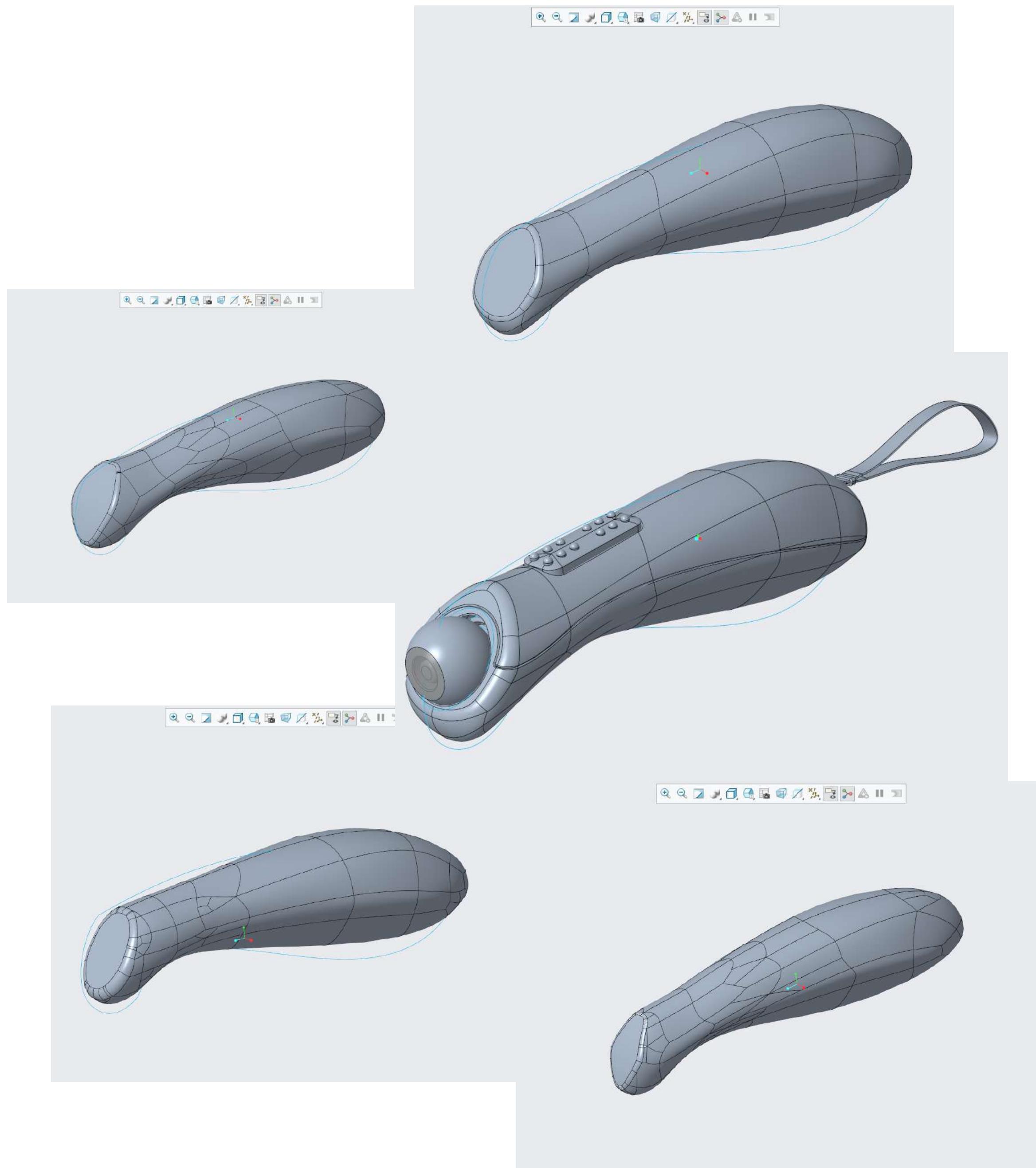


Barriers for visually impaired people:

- Some underground entrances are **not accessible**
- There are no circular blind corridors, visually impaired people **cannot find the underground doors** and some subways do not even have blind corridors
- There are too many and **complex underground entrances and exits**, and few underground stations have Braille accessibility enhancement signs
- Some stations **do not have volunteers** standing at the platform or at the entrance to help the MVSI people
- **Crowded and obstructed** at peak times

Form Test









This cane generated 3 basic features in terms of

detecting, informing and vibrating.

These features guarantee that the visually impaired could safely take the underground with less problem.

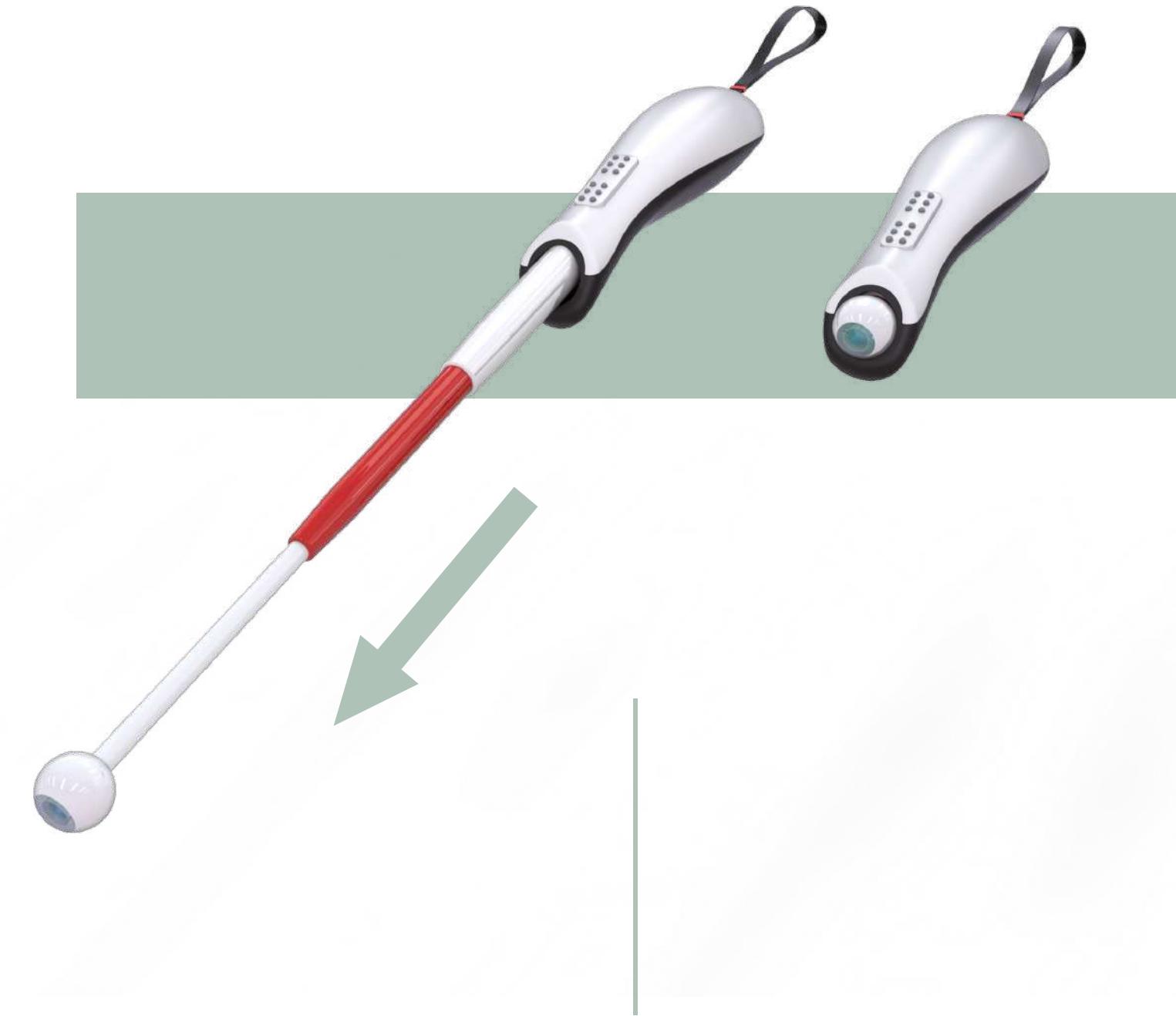
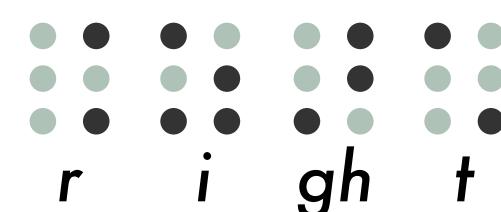
There are infrared cameras on the top of the device that can be used to detect the user's surroundings.

The information processing system inside the device processes information in a timely manner and provides instructions to the user through the product's vibration and Braille modules.

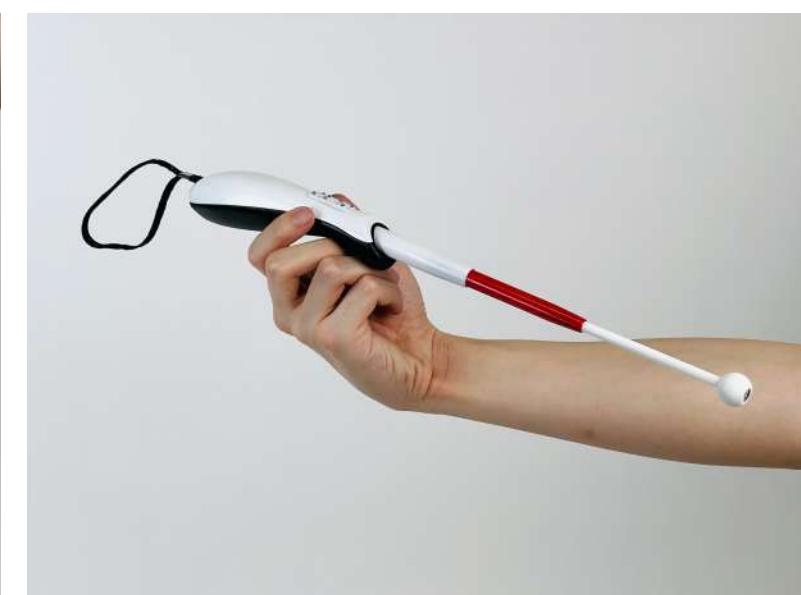
The Braille system is integrated as an information reporting unit.

Users could tell the destination to the cane. The AI system could identify the voice and content. **The cane could report the necessary information by this Braille system.**

"right" of Braille system



The length of the cane has been reduced as well. The normal blind cane can not work well in underground environment because of the **crowded space**. The reason why to keep the stick part is because the stick could **remind others the blind identity**. So this reminder could reduce the risk in some situation(e.g. when visually impaired crossing the sidewalk).



LIGHOT

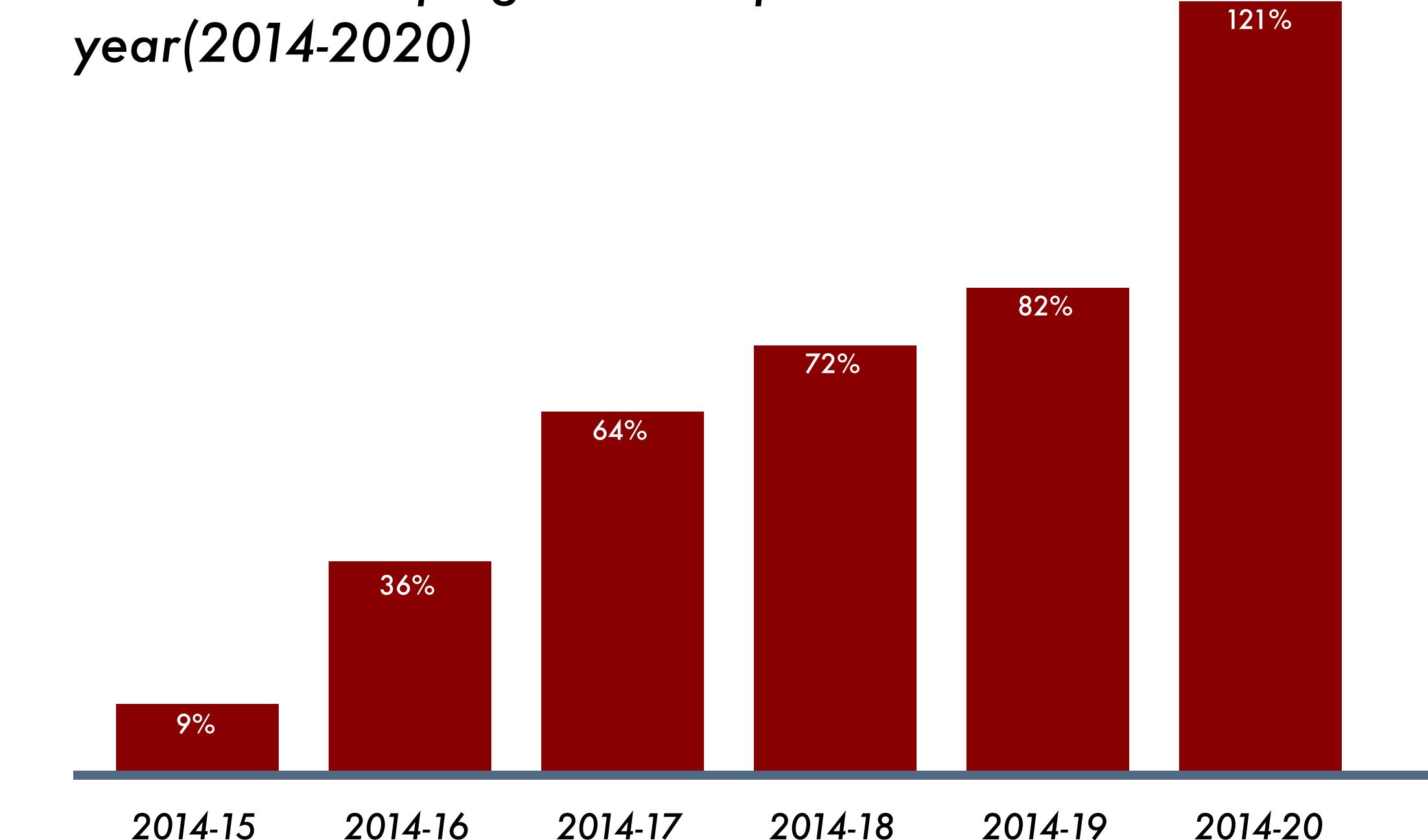
This project focus on the camping, which is becoming an increasingly popular lifestyle.

This project aims to integrate leisure elements to improve the camping experience while solve problem which might be encountered during the trip.





Growth in camping 3+ times per year(2014-2020)



More people are camping, and people are camping more often. The rate of first-time campers in 2020 was five times greater than the rate in 2019. Camping and glamping, or high-end camping, have become trendy among Chinese travelers. Bookings for camping trips increased more than tenfold from last year during the weeklong National Day holiday in October, according to online travel agency.

Interview



Shell
Editor of Camping
With Style

"After I had a bad snowboarding accident, I started looking for comfortable camping gear suitable for someone with a back injury and mobility problems. But not only that, aesthetics are important to me, so I wanted great functionality but I always wanted it to look good. In my search I realised there was a bit of a gap in the market. I started writing about comfy and stylish camping gear and was amazed at how quickly it took off and the phenomenal response!"

"Modern life is extremely complicated and can at times be overwhelming to navigate, a walk in the park or woods however is as simple and as natural as can be and is a great antidote to our tech-connected lives."

"Many people have tried camping and have been put off, usually because they had a tiny tent they couldn't move in and ended up on a flimsy roll mat or air bed that deflated in the night leaving them cold, tired and uncomfortable."

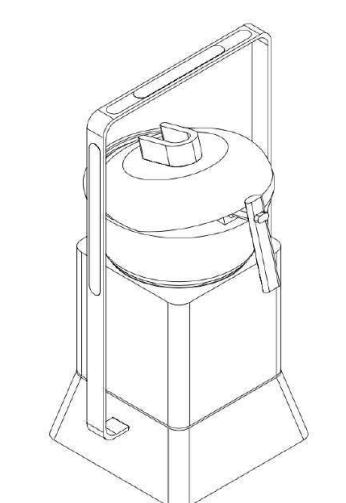
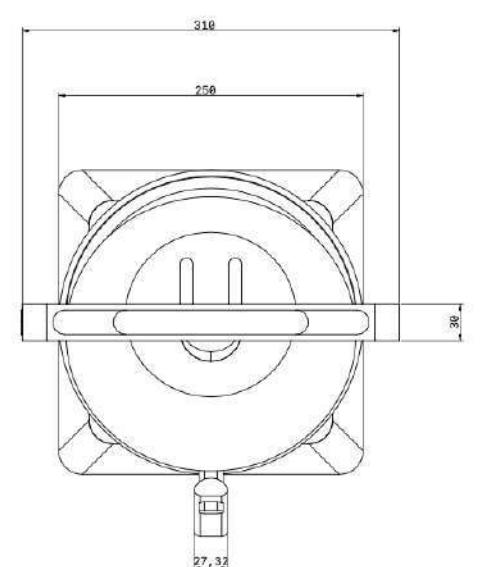
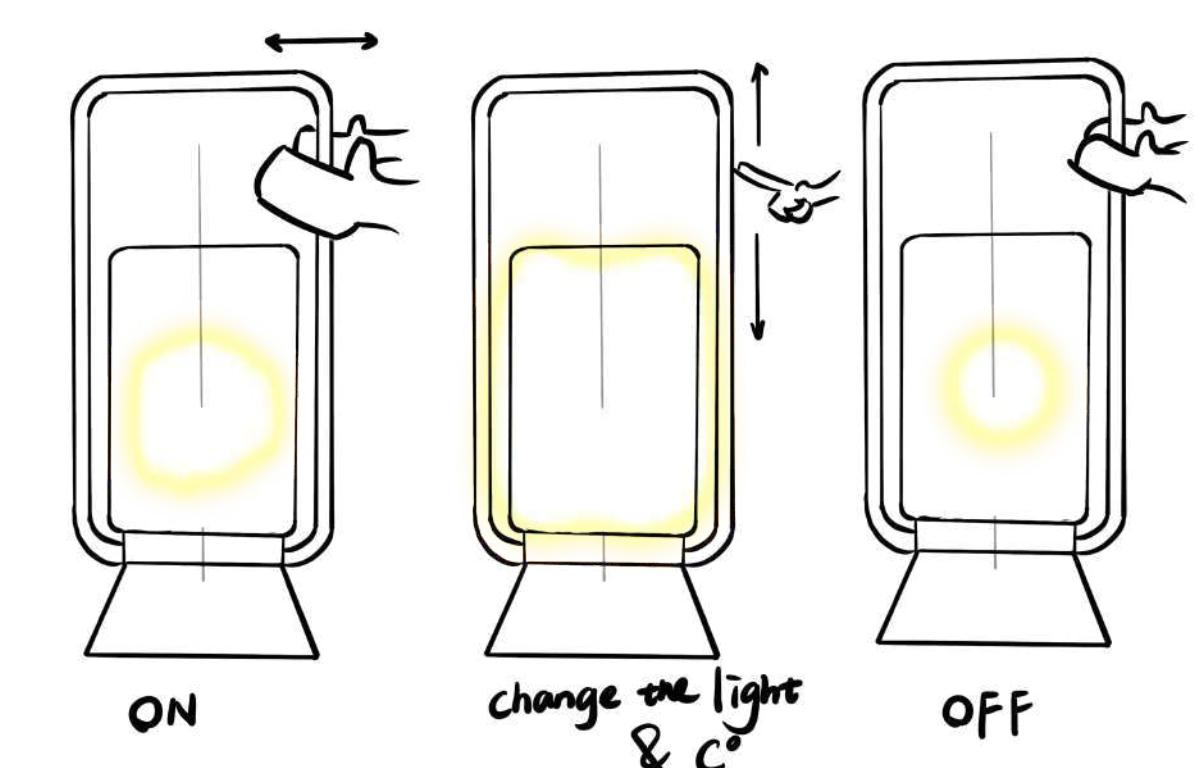
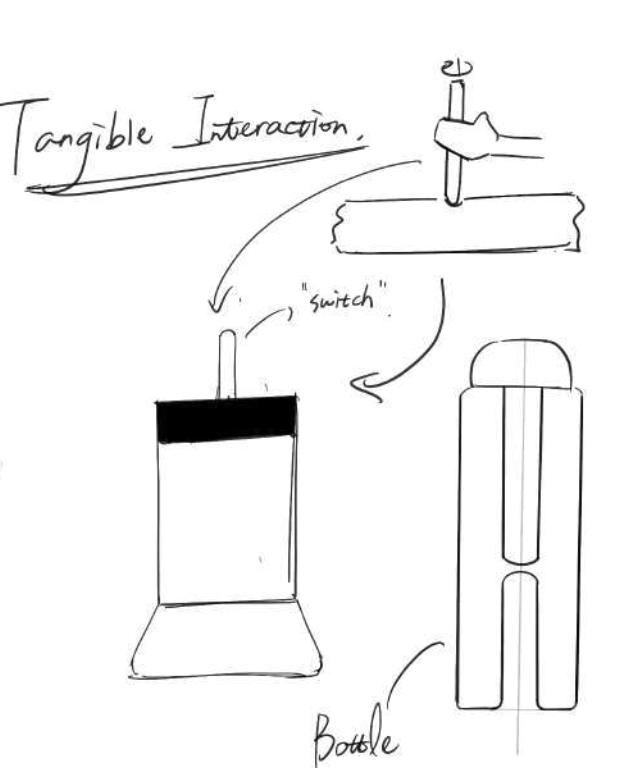
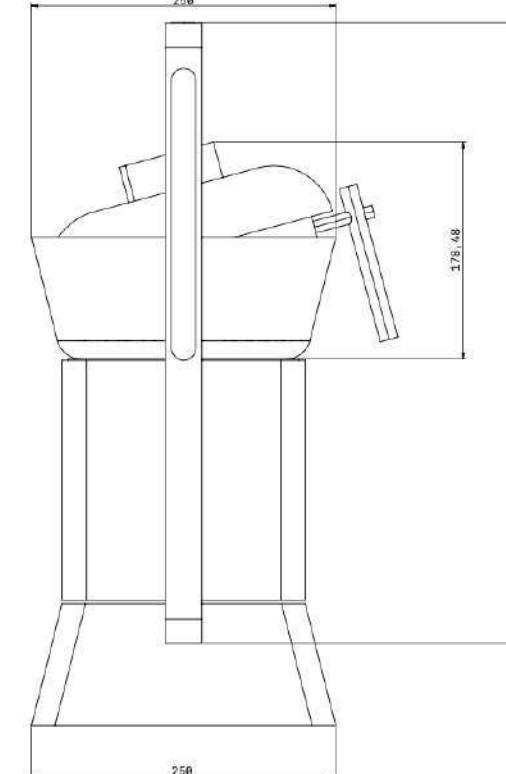
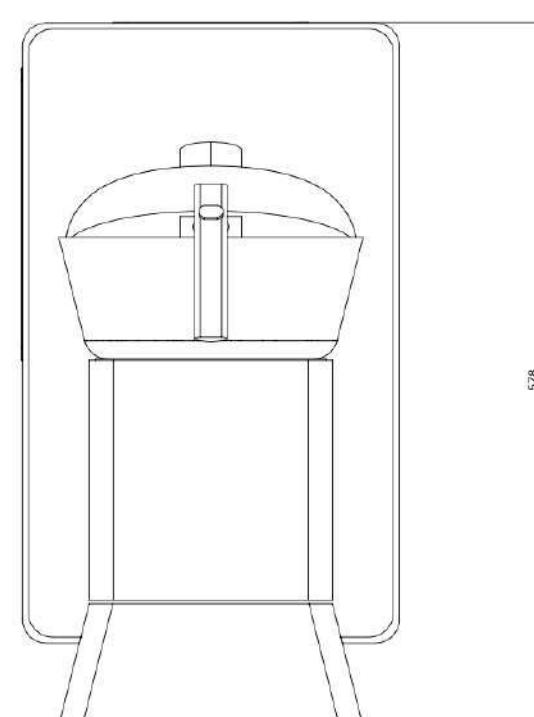
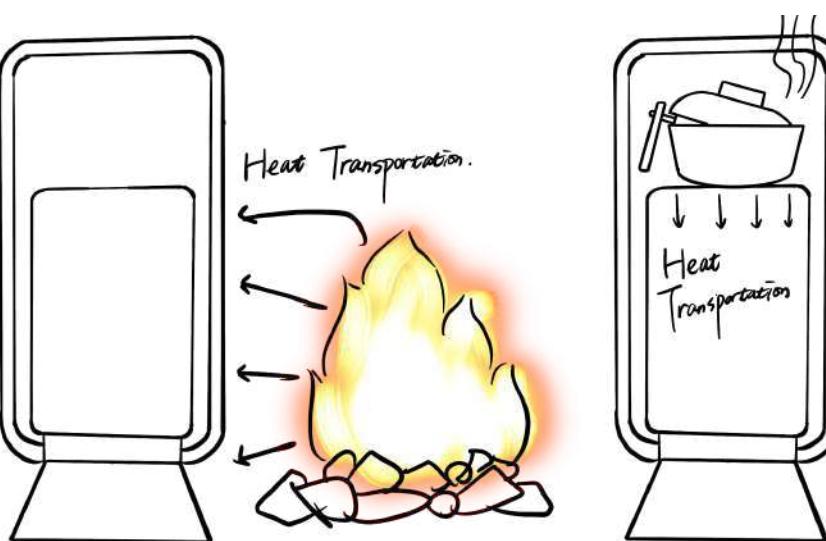
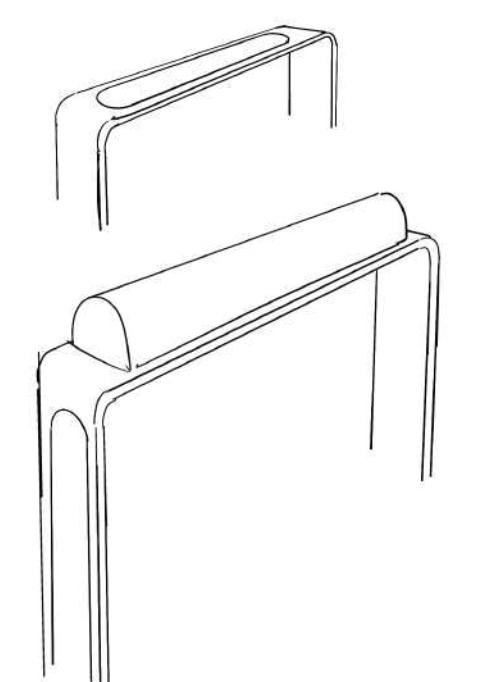
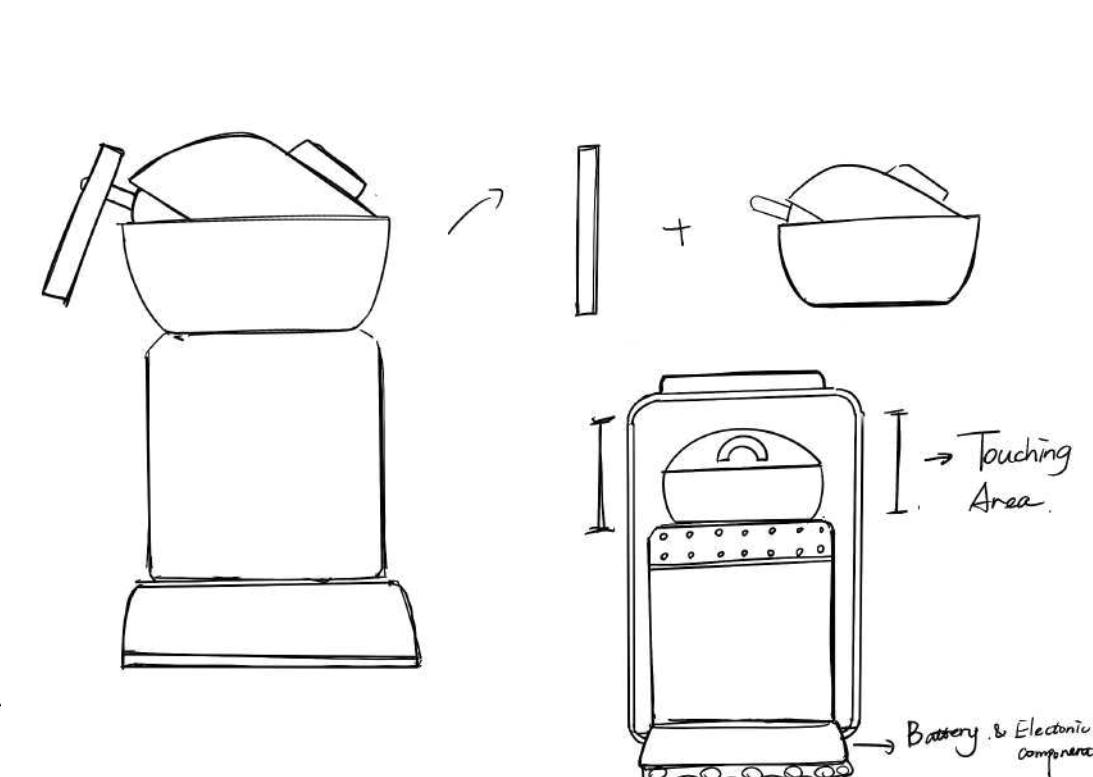
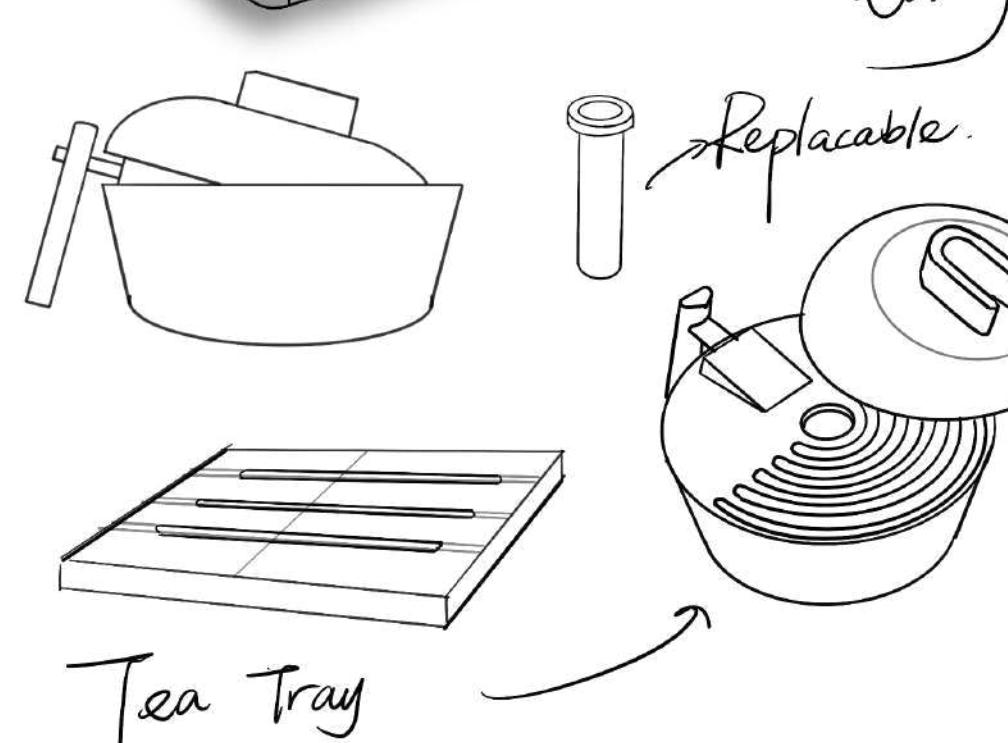
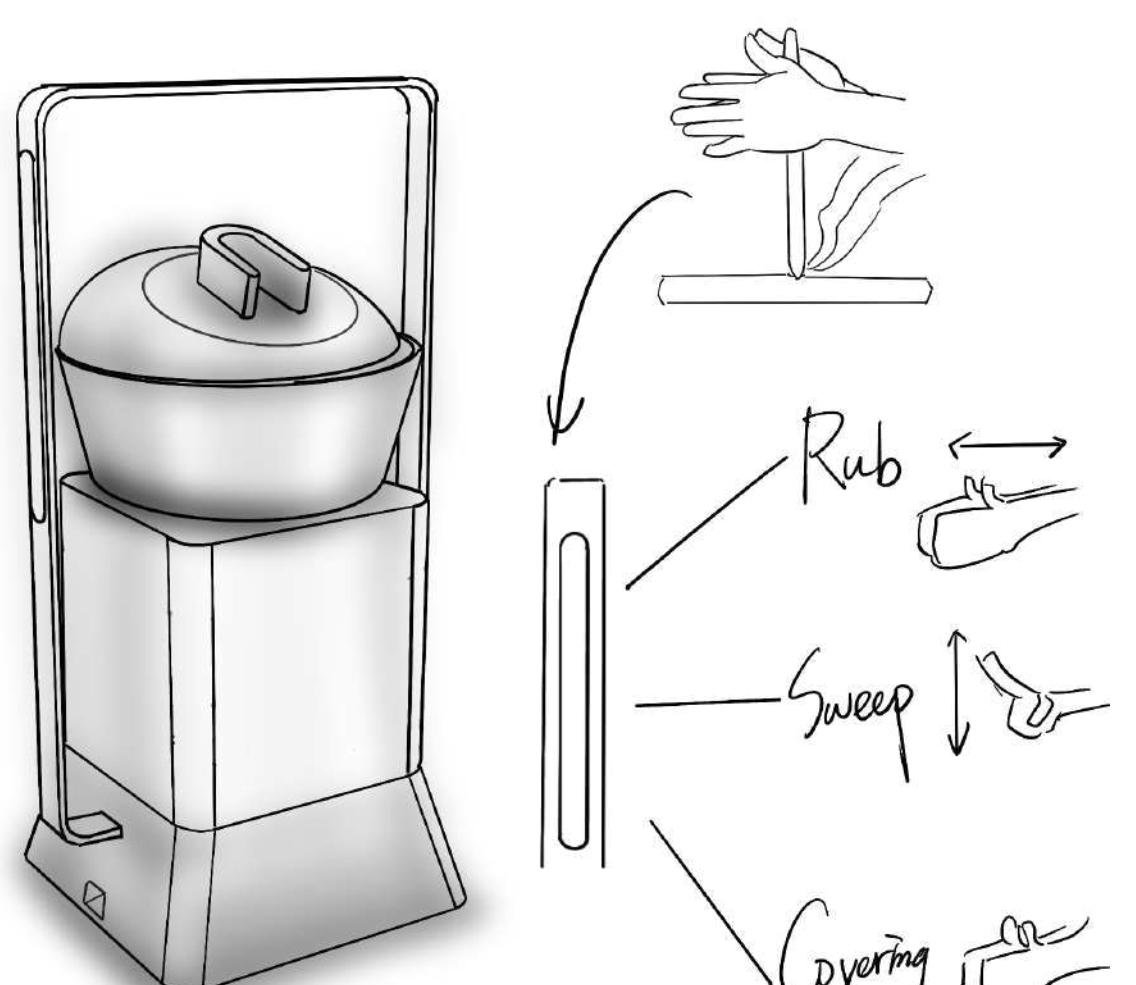
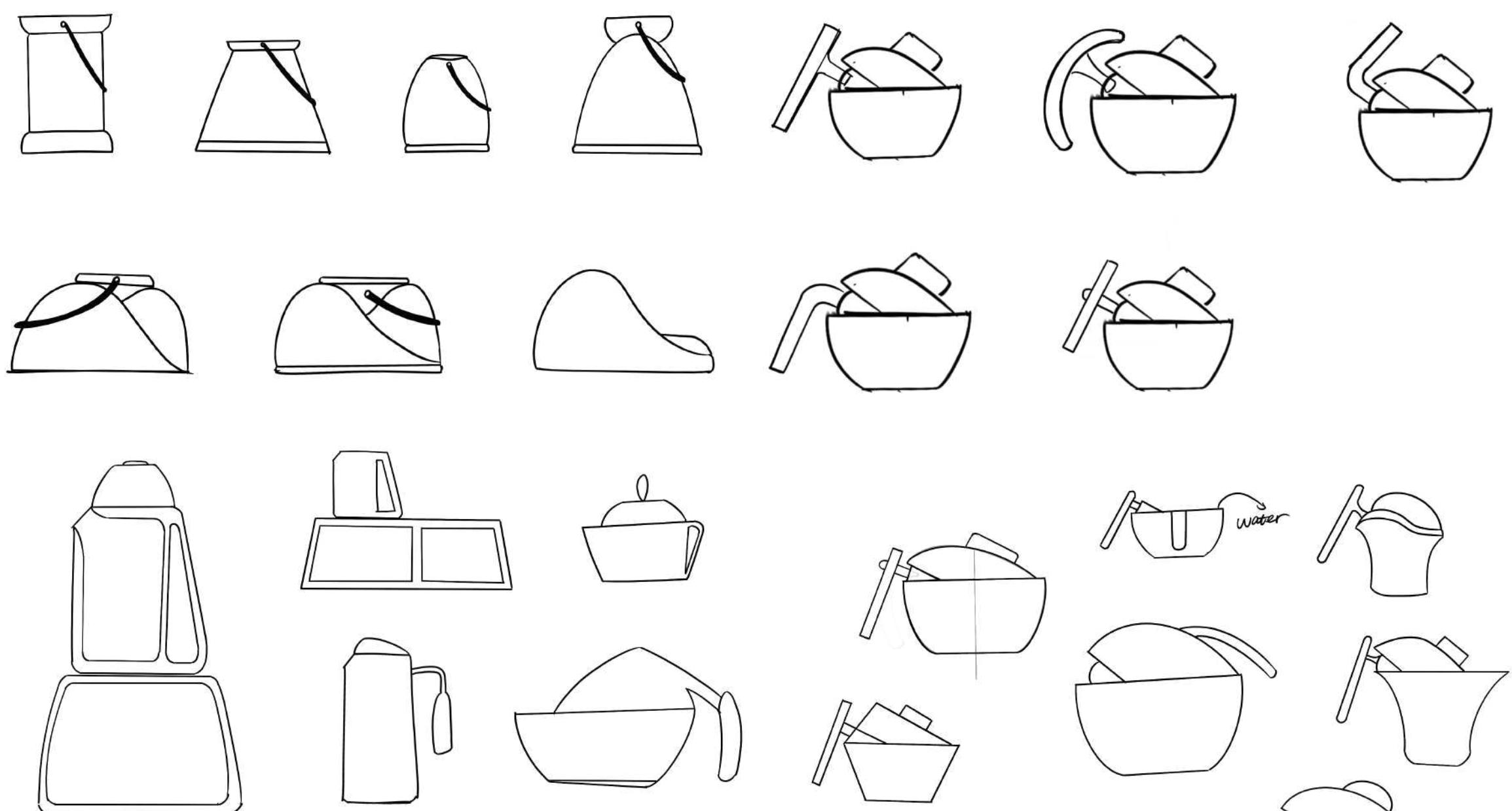
The experience of camping equipment directly affects people's feelings about camping, so having aesthetically pleasing and useful equipment is a must for camping.



Electricity is often in short supply when camping outdoors. In contrast to heat, people can build fires while camping. Therefore, collecting and converting potentially wasted heat into electricity can enhance people's camping experience.

When camping, people have a lot of water needs (such as drinking water, making tea, making coffee, etc.), but when camping people do not have immediate access to water of drinkable quality. Therefore, it is necessary to treat the water when camping.

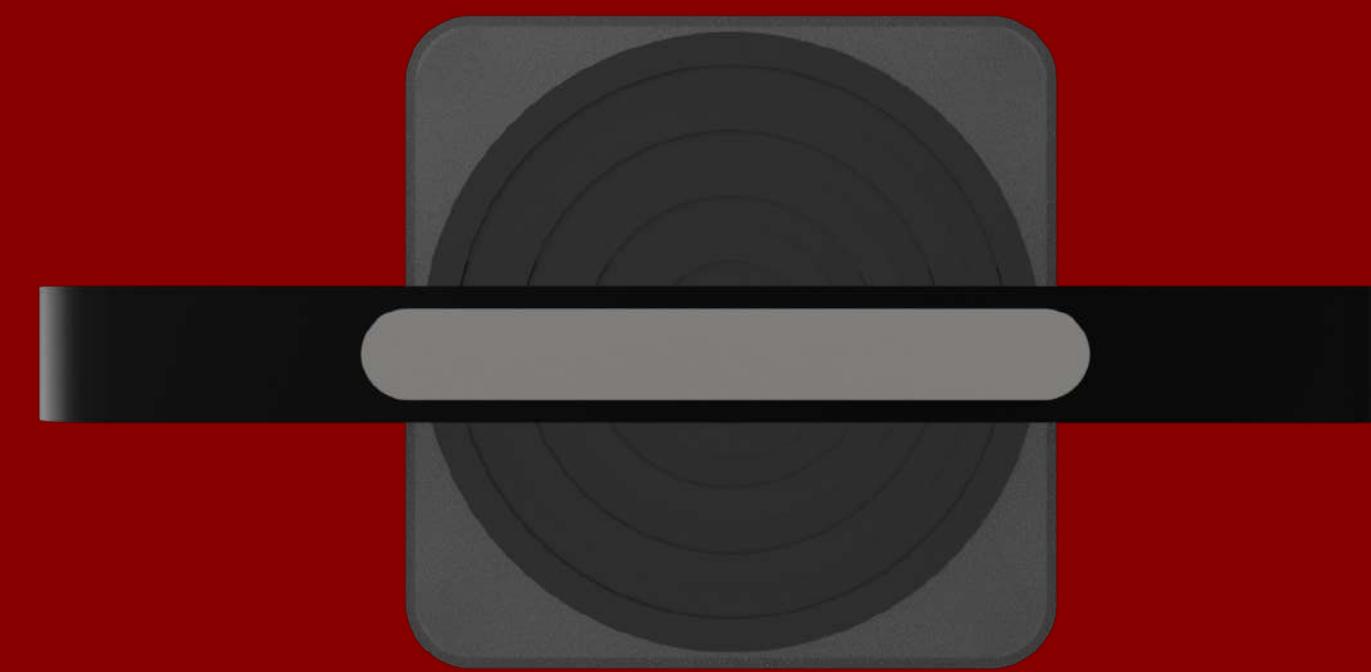
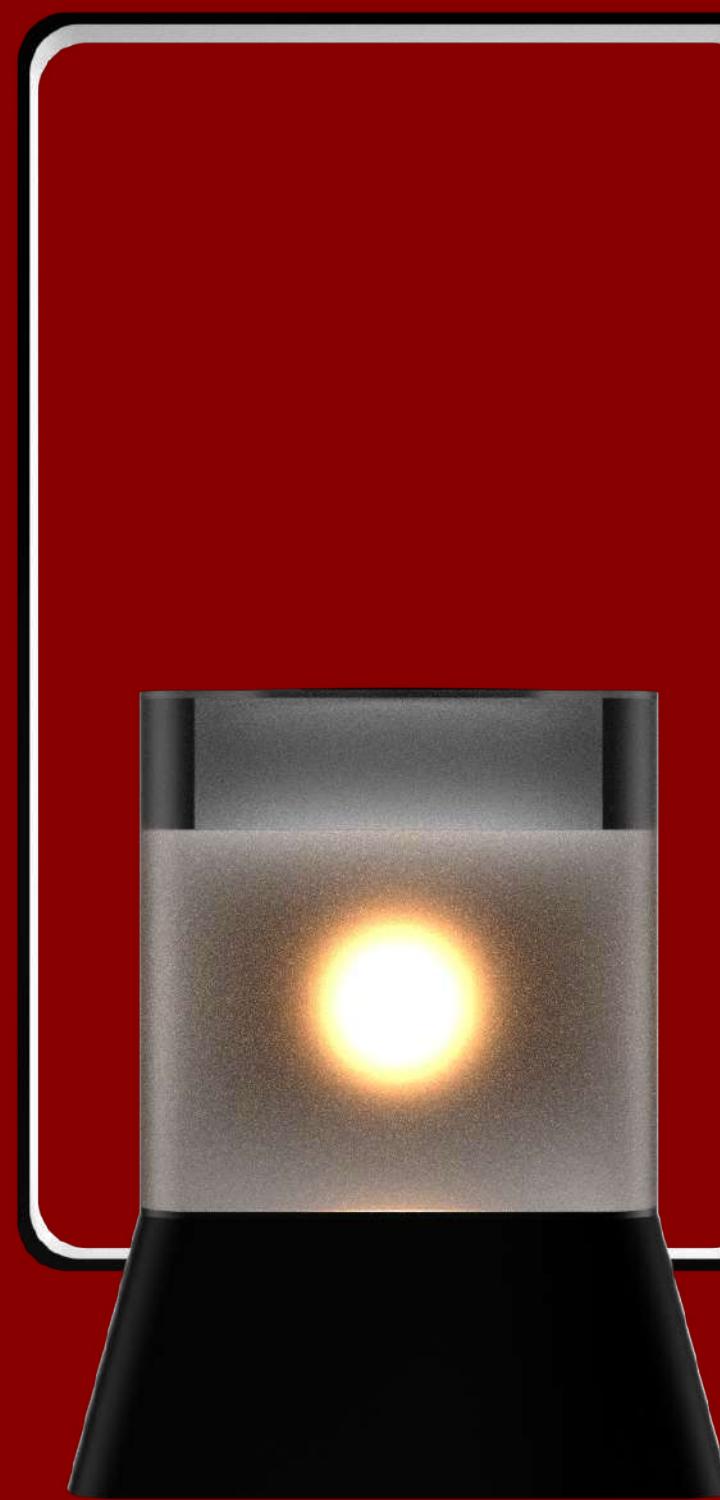








The overall shape of the kettle is inspired by a traditional Chinese tea set: the lidded bowl tea. The body of the kettle and the lid create a visual imbalance. At the same time the spout of the kettle and the style of the bottom are also borrowed from tea plates. The circular hole in the center of the kettle can be used to prevent the water purification module or the tea module.



There is a thermoelectric devices inside of the base which can transfer heat into electricity and store it. This base can be placed by the fire when the user uses the kettle to boil water, while the user can place the kettle on top of it after boiling water. This device absorbs the heat emitted during both processes and converts the heat that would otherwise be wasted into electricity. The power collected by the device can be used for the use of its own lights or for charging other small electronic devices.



Packaging Box: considering the convenience required by users when camping, the corresponding size of the carrying case can be used to store the kettle.

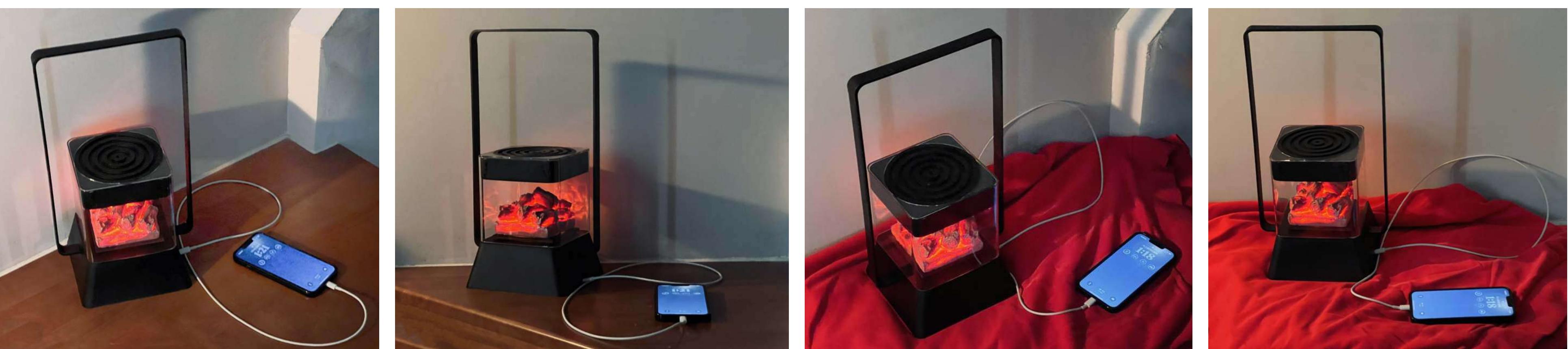


Magnets: the handle of the kettle is removable and can be combined with the handle of the light through the internal magnet, so that the user can easily lift the light.



PS: the luminous effect of the model is only a demonstration model, the rendering effect is different from the modeling

The light-on interaction is inspired by drilling for fire, an ancient way of making fire. Users can rub the lever next to the device back and forth to turn the light on; users can slide their fingers up and down the lever to control the intensity of the light; and users can cover the lever with their hands to turn the light off.



PS: the luminous effect of the model is only a demonstration model,
the rendering effect is different from the modeling