

EE SCAPE

VR application mitigating
emotional eating



VR Application 3D

Period

2024.03 - 2024.06

Roles

Planning, Research, Interview, UX/UI design, 3D Modelling, Unreal level design

Tools

Blender, Unreal Engine

BACKGROUND

Emotional Eating

Emotional eating (EE) is food consumption based on emotional factors such as stress or pleasure rather than physical hunger. Unlike normal appetite, this self-rewarding behavior is characterized by a desire for certain foods. Many emotional eaters are concerned about their weight gain and feel guilty. Perpetuating this vicious cycle of stress leads to further emotional eating and can become severe eating disorders.



@ Bigdata OpenPortal of Health Insurance Review & Assessment Service

TARGET USER

From advice of eating disorder experts, we set research subjects to those who emotionally eat at night at home.

**Emotionally eat
at night
at home**

Typical manifestations

"The impulsive eating is highly related to the time."

Not in social context

"Those who have had negative experiences in society could see food as a friend who is easy to meet, never betrays them and always responds to them."

Insights from eating disorder experts interviews.

Refer our subjects to :

“ Emotional Night Eaters ”

RESEARCH PROCESS

1

Preliminary Study

Goal

- Understand the context of emotional eating
- Derive Design Considerations

- Eating Disorder Experts Interviews
- Emotional Eater Survey
- Participatory Design Workshop

2

VR Intervention design

- Design Considerations to Solutions
- EE-Scape Design

3

EE-Scape Prototyping

Implement a mobile VR prototype by using Unreal Engine 5.1, a game engine

4

User Test

Goal

- Confirm the potential of our prototype
- Identify Design Directions

- Pre-survey
- VR Prototype Experience
- Post-survey
- 1:1 Interview

PREMILINARY STUDY

Eating Disorder Experts Interviews

- 1:1 interviews with two experts on eating disorders aimed to understand the **characteristics and problems of emotional eating** and **get advice to define research targets**.
- We asked **how we distinguish** emotional eaters from eating disorder patients, **how eating disorders are different** from other mental health concerns, and **what interventions** have been applied.



Photo of eating disorder expert interview

Emotional Eater Survey

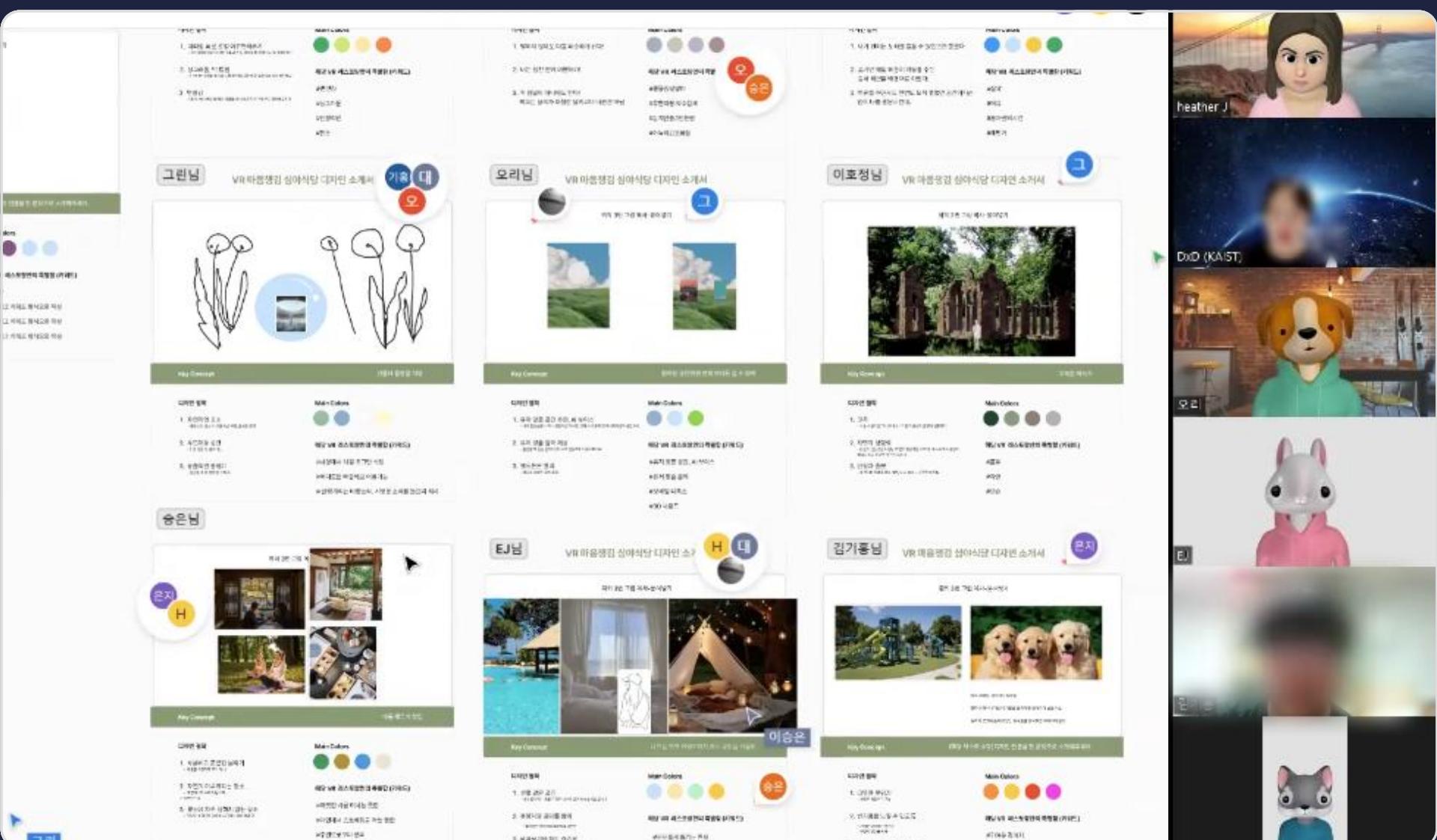
- Emotional eater surveys aimed to identify the **context and pattern of emotional night eating**.
- We asked **how often and why** they craved food at night, **how they responded** to it, what **specific food** they craved, and how emotionally eating at night **affects** their feelings and thinking.
- A total of 31 responses were gathered from 21 females (age M = 25.5 years, SD = 7.5) and 10 males (age M = 24.2 years, SD = 4.3)

Screenshot of affinity diagram and thematic analysis

PREMILINARY STUDY

Participatory Design Workshop

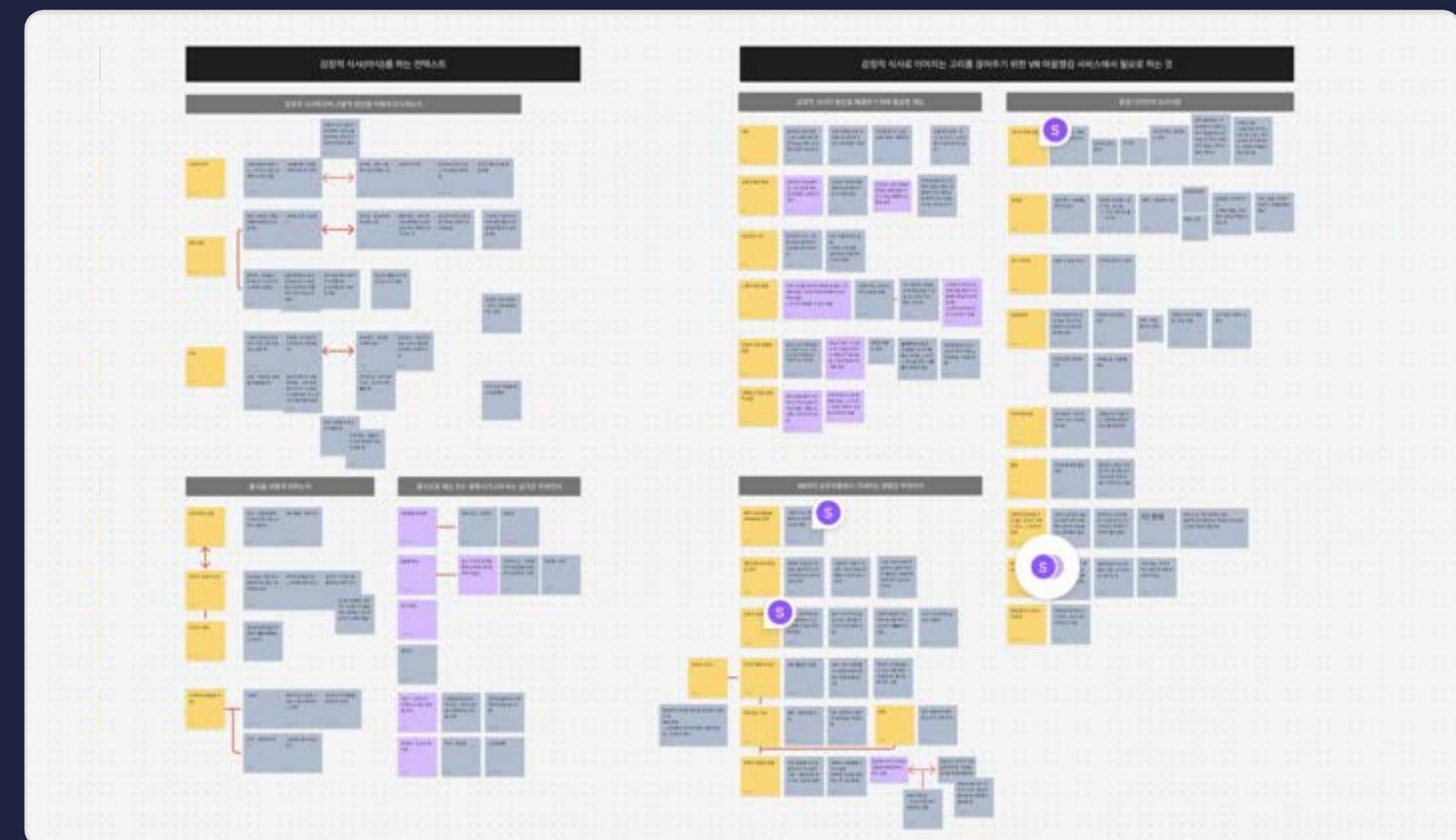
- Participatory design workshop with nine emotional night eaters, six females (age M = 25.3 years, SD = 3.7) and three males (age M = 22.7 years, SD = 4.0) aimed to **define user needs for a VR intervention**.
- Each participant shared their **emotional eating patterns** and designed **a virtual experience that helps overcome food cravings**.



Screenshot of participatory design workshop

Data Analysis

- Three researchers analyzed all the data collected by preliminary studies and then **defined design considerations**.



Screenshot of affinity diagram and thematic analysis

PREMILINARY STUDY



Design Considerations

Dealing with both mental problems and eating behavioral problems is important

All experts highlighted that interventions for emotional eating should address both the emotional problem and the eating behavior.

"In the case of eating behavior problems, underlying psychological and environmental issues should be addressed, along with the eating behavior itself."

Eating disorder expert

All design workshop participants sought a place that made them feel calm and consolation to alleviate the emotions causing late-night eating.

Reducing emotional bonds on food is essential

Emotional eaters attach meanings to food. These emotional bonds to food make them repeat emotional eating.

"Emotional eaters tend to have emotional attachments to food."

Eating disorder expert

"Food is a comforting friend to me."

P9

"I seek out foods as a reward for my hard day."

P1

"Food is my escape where I can take a break from tasks for a while."

P6

Intervention to immediately alleviate cravings is needed

Emotional eaters prefer instant or delivery foods that are ready to eat without cooking. The service should immediately intervene before their appetite leads to actual eating.

All emotional night eaters who answered our survey preferred quickly and easily prepared foods.

"Prevent binge eating by resisting the urge to craving for even five minutes."

Eating disorder expert

"Wearing a VR headset is very effective at blocking out the craving for food in real world."

Eating disorder expert

VR INTERVENTION DESIGN

Design Considerations

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Solution

Use mindfulness meditation and peaceful audio-visual elements

Apply mindfulness meditation, which is used for mitigating eating disorders. Virtual landscapes with peaceful audio-visual elements can reduce user's negative emotions.

Provide unusual experiences about the food

To help emotional eaters perceive it from a new perspective, we placed the food in unfamiliar contexts in a virtual environment.

Provide immersive experiences to lead users to focus on other than craving

It provides a novel and immersive experience that is only possible in a virtual environment, allowing users to get out of focus on appetite.

The **awareness** that arises through paying attention, on purpose, in the **present moment**, non-judgmentally

Definition of Dr. Kabat-Zinn, the founder of Mindfulness-Based Stress Reduction (MBSR)

EE-Scape Design

Through iterative discussion with a mindfulness meditation expert, we designed **four mindful steps** of the VR application, EE-Scape,



Step 1 Observe the Food

A user picks up the food in a room and **closely observes** its surface and shape

Step 2 Food in New Context

The food is placed in **unfamiliar contexts**, not on the dining table or kitchen.

Step 3 The Enlarged Food

The food is **greatly enlarged**. This is not the usual way in which we encounter food.

Step 4 See the Food Again

A user **comes back** to the room and sees the food again, then, feel the difference with Step 1

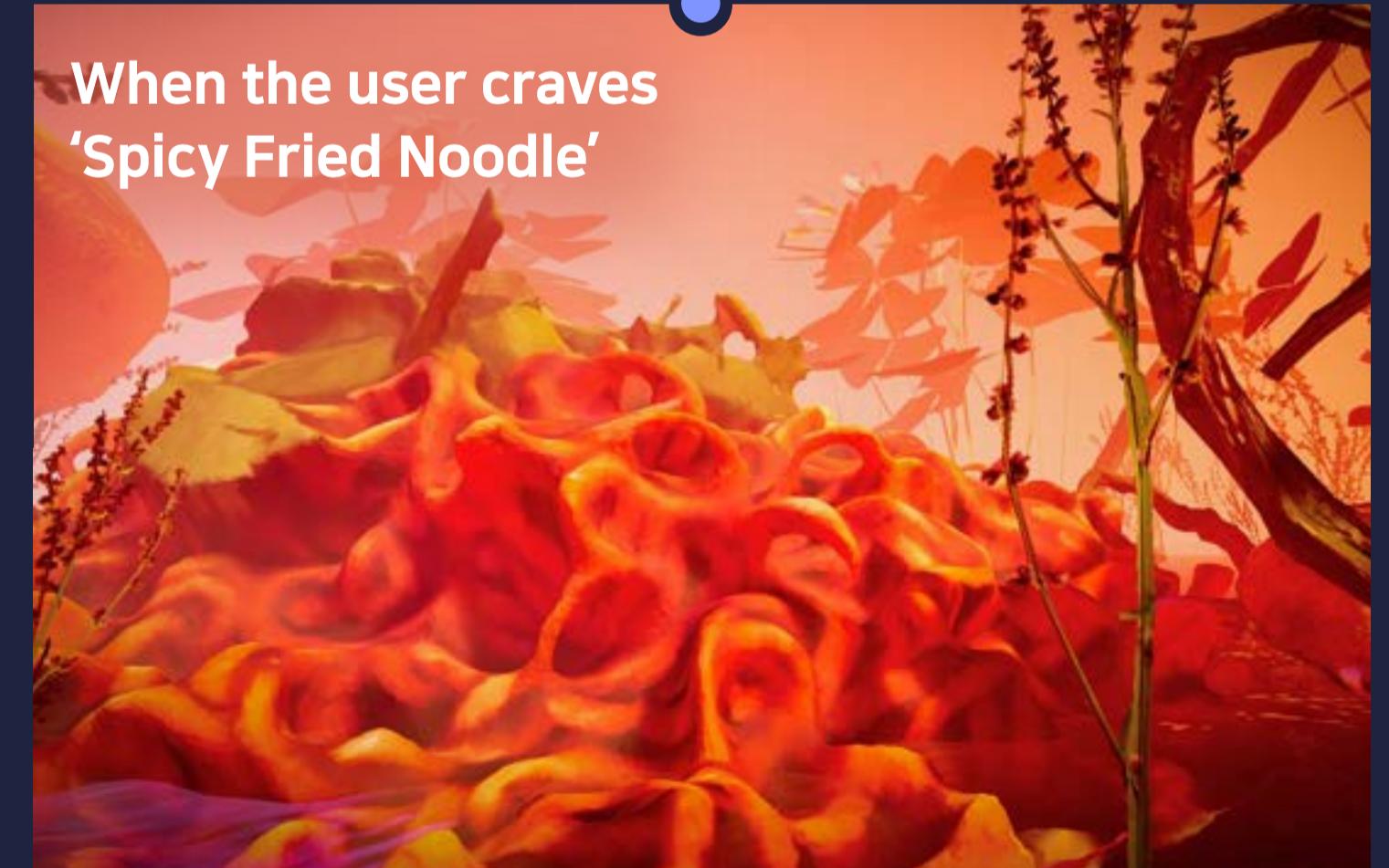
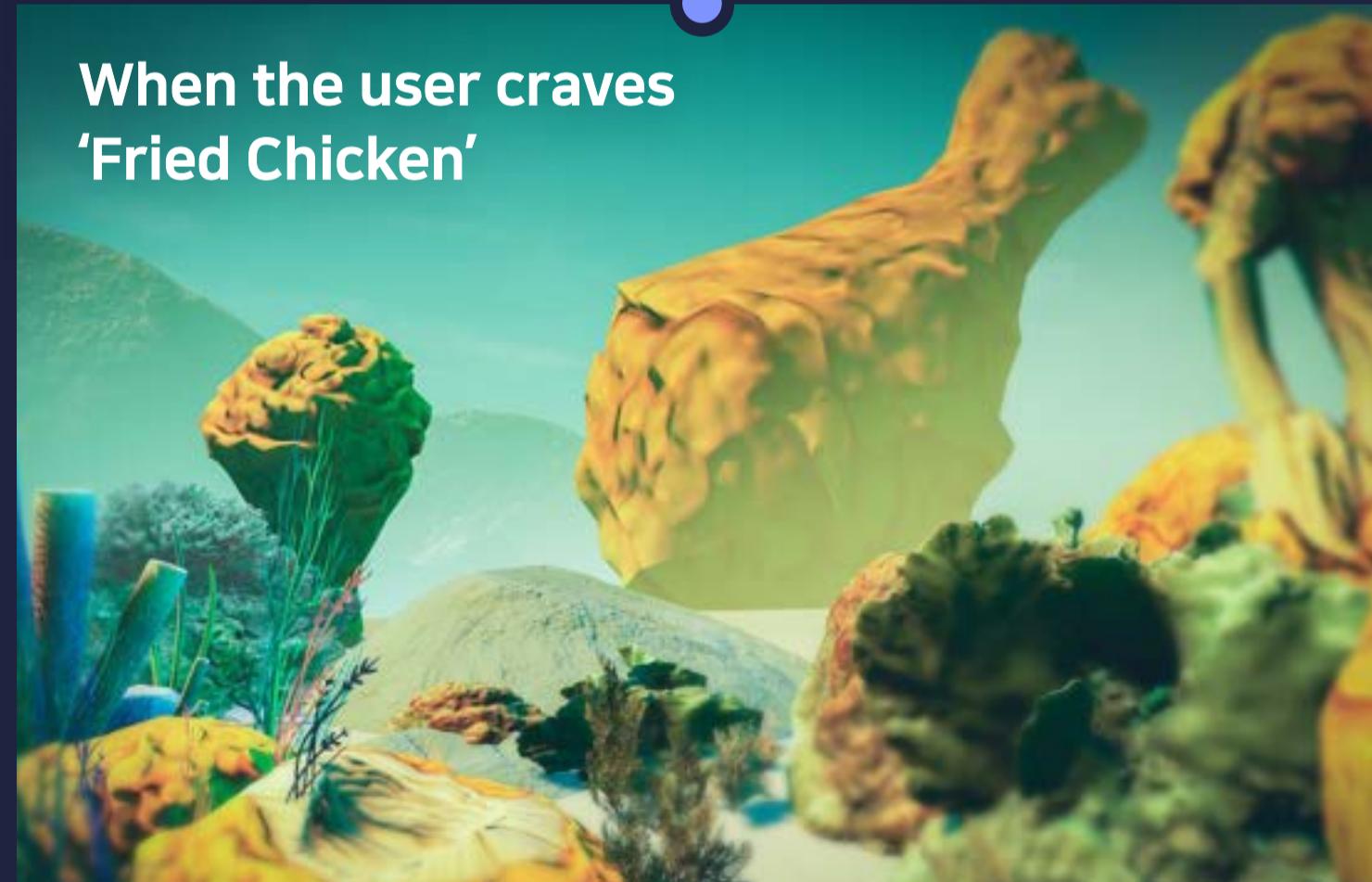
VR INTERVENTION DESIGN

EE-Scape Design

Reflect the specific food that each user is craving at that time

Different people crave different foods in different situations. Based on this, the **VR experience of EE-scape changes according to the food the user craves** at that moment.

- The 3D food in EE-scape changes according to the user's choice.
- At the step of facing 'The Enlarged Food', the selected food is surrounded by virtual landscape, which is composed with visual elements that resemble the characteristics of each food, such as texture and color.



Screenshots of step 3, 'The Enlarged Food', of EE-Scape



Screenshots of step 1, 'Observe the Food', of EE-Scape

USER TEST

Conducted with 10 of emotional night eaters, 6 females (age M = 23.3 years, SD = 4.5) and 4 males (age M = 24.3 years, SD = 3.0)



Pre-survey

- We asked users to describe **how they feeling now** and **what food they want to eat**.
Question 5 aimed to understand each user's perspective on the food

Q1.
What kind of food are you craving right now?

Q2.
How much would you like to eat?
(10-point Likert scale)

Q3.
Why do you want to eat this food?

Q4.
How do you feel now?

- | | | |
|------------------------------------|----------------------------------|-----------------------------------|
| <input type="checkbox"/> Depressed | <input type="checkbox"/> Lonely | <input type="checkbox"/> Joyful |
| <input type="checkbox"/> Fear | <input type="checkbox"/> Happy | <input type="checkbox"/> Annoyed |
| <input type="checkbox"/> Stressed | <input type="checkbox"/> Calm | <input type="checkbox"/> Bored |
| <input type="checkbox"/> Pleasure | <input type="checkbox"/> Anxious | <input type="checkbox"/> Sad |
| <input type="checkbox"/> Angry | <input type="checkbox"/> Tired | <input type="checkbox"/> Confused |

Q5.
What words come to mind about this food and why?



EE-scape experience

- Users followed **a step-by-step VR mindfulness meditation** taking a minimum of 5 minutes and a maximum of 10 minutes per person.



Post-survey

- Post-survey had very similar questions to those on the pre-survey in order to **determine changes before and after VR prototype experience**.

Q1.
How much would you like to eat?
(10-point Likert scale)

Q2.
How do you feel now?

- | | | |
|------------------------------------|----------------------------------|-----------------------------------|
| <input type="checkbox"/> Depressed | <input type="checkbox"/> Lonely | <input type="checkbox"/> Joyful |
| <input type="checkbox"/> Fear | <input type="checkbox"/> Happy | <input type="checkbox"/> Annoyed |
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Q3.
What words come to mind about this food and why?



Interview

Interview covered two main subjects:

1. **User reflections** on the experience of the VR prototype
2. **Potential and improvements** of our approach to regulate emotional eating



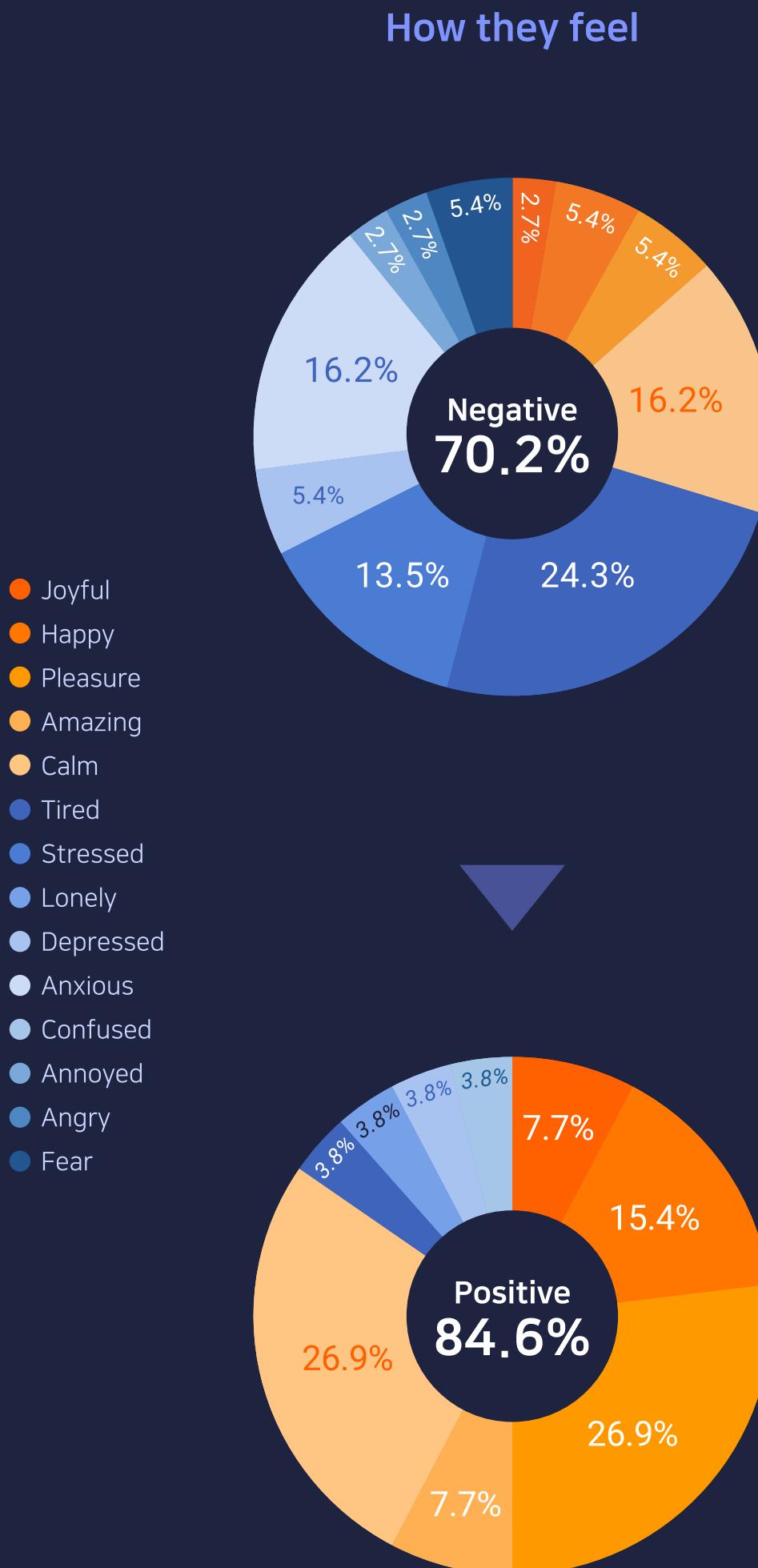
Data Analysis

- Three researchers analyzed all the data collected by user test with thematic analysis.

RESULTS



Reduction of food cravings



- How they feel**
- "It looked like **food**." P5
 - "It looked very sweet. I wanted to eat it." P6
 - "It looked really **delicious**." P3
 - "I imagined the **sweet taste of chocolate**." P9
 - "It just looked a thing. Now I don't want to eat it." P5
 - "It's not the chocolate cake I knew... I crave it less now." P6
 - "I feel some of psychological distance from the cake now." P3
 - "It became part of the scenery ... I no longer wanna eat it." P9

RESULTS

Helpful features

From the interview data, we found three features of our VR mindfulness prototype that were helpful to users in reducing their cravings.

■ Effect of experiencing food from a new perspective

Participants indicated that EE-Scape reduced their cravings by **changing their perception of food**.

In particular, seeing food from a new surrealistic perspective across step 2 and step 3, affected participants' attitudes toward food.

■ Effect of focusing elsewhere rather than on a craving

Some participants emphasized that **beautiful and novel environments** of EE-Scape helped them to distract from a focus on cravings.

"I forgot about my appetite since I was more focused in new experiences of EE-Scape." P2

"The virtual environment was so exciting that I could resist the urge to eat." P4

■ Effect of solving emotional problems

The EE-scape helped participants to relieve their negative emotions that urged emotional eating so that they were less inclined to eat.

"My mind is so relaxed by experiencing EE-Scape that I don't have much appetite now." P10

"I usually eat at night when I'm stressed, but now my stress is calmed, so I don't crave food." P7

Improvements

Provide new contents

The content should be constantly renewed. In particular, elements such as the design of the virtual environment around the food or the background music should be different each time to help users overcome their emotional desire to eat by focusing on new experiences. We can use generative AI for continuous content development.

Improve accessibility

The low accessibility of VR headsets makes it challenging to use the service sustainably. In addition, only users having VR devices, among many emotional eaters, can use the service. It is necessary to make the service available on more portable and accessible devices.

Personalize the user experience

Content should be differentiated for each individual user's situation. For example, P6 and P9 felt calm in the universe, while P7 felt uncomfortable there. therefore, each user's visual preference should considered. Also, users who frequently experience EE-scape can gradually become able to control their emotional eating, so the service should provide a variety of content to address underlying problems.