FOCUS GARDEN

YangZhu

Politecnico di Torino
Bachelor's degree in Design e Comunicazione

Focus Garden

Immersive VR Game Design for Attention Training in Children with ADHD

Politecnico di Torino

Bachelor's degree in Design e Comunicazione

Supervisor: Andrea Di Salvo **Candidate:** Yang Zhu

INDEX

ABSTRACT

This thesis explores how virtual reality (VR) can support and enhance sustained attention in children diagnosed with Attention Deficit Hyperactivity Disorder (ADHD). Rather than treating attention training as a repetitive or purely clinical activity, this research investigates how immersive game environments can transform it into an engaging, emotionally meaningful, and interactive experience.
The research begins with a literature review on the current state of ADHD interventions and the use of VR in cognitive and behavioral therapy. Through one-to-one interviews with parents of children diagnosed with ADHD, the study explores their daily challenges, expectations, and emotional perspectives toward attention training. These insights, combined with an analysis of case studies from both therapeutic and entertainment-based VR, AR, mobile, and PC applications, inform the design guidelines and technical framework for the proposed system.
The practical outcome of the thesis is an experimental VR prototype titled *Focus Garden*, a gamified environment inspired by *Alice in Wonderland*, where metaphorical storytelling and rhythmic interaction are used to train focus, timing, and emotional regulation. The project highlights the potential of immersive experience design to foster attention, reduce stress, and enhance engagement in children with ADHD. It also emphasizes user experience (UX) and inclusive design principles, demonstrating how narrative, aesthetics, and technology can collaboratively serve therapeutic and educational goals.

01
INTRODUCTION

Background

Why is it important to focus on attention training for children with ADHD?

Definition, Prevalence, and Cognitive Impact

Attention Deficit Hyperactivity Disorder (ADHD) is one of the most common neurodevelopmental conditions in childhood, affecting approximately 7.6% of children worldwide (Salari et al., 2023). It is primarily characterized by three core symptoms — inattention, hyperactivity, and combined— which often interfere with learning, emotional regulation, and social behavior. ADHD does not reflect a lack of intelligence or effort; rather, it is linked to differences in brain development, particularly in the prefrontal cortex, which governs executive functions such as sustained attention, planning, and inhibition control. Children with ADHD often struggle to maintain concentration in structured environments such as schools. Tasks that require long and uninterrupted attention — for example, reading, completing assignments, or listening to lessons — can quickly lead to distraction or frustration.

In Asia, (Liu et al.,2018) reported that the prevalence of ADHD among Chinese children and adolescents varies across different provinces. Furthermore, a large-scale meta-analysis conducted in mainland China, Hong Kong, and Taiwan found an overall ADHD prevalence of 6.3% among children and adolescents aged 6 to 18 years, with most cases concentrated in the primary-school age range.

In the United States, approximately 11.3% of children aged 5-17 years had ever been diagnosed with ADHD during 2020-2022 (National Center for Health Statistics, 2024).

In this study, the European estimates are incorporated into the broader global average due to the lack of unified, continent-wide prevalence data.

The consequences extend beyond academic performance. Many children with ADHD face social misunderstandings, frequent teacher interventions, and family stress due to the constant need for supervision and behavioral guidance. Parents often implement structured routines, reward systems, or digital tools to support focus, yet these traditional methods may not sustain motivation in the long term.

Recent research (Cunha et al., 2023) suggests that immersive virtual-reality-based interventions can improve processing speed in individuals with ADHD using game-based, multisensory environments, thereby leveraging motivation and engagement to support cognitive functioning. While this particular pilot-study focused on adults, the findings point to potential benefits of dynamic, interactive environments for younger populations with ADHD, which merits further investigation.

Figure.1
Illustration by Michellekuku

Inattention

A child with this type often struggles to stay focused and gets easily distracted. They may forget details or lose track during tasks that require concentration.

Hyperactivity

A child with this type is very active and finds it hard to stay still. They may act or speak impulsively and often interrupt others.

Combined

A child with this type shows both inattentive and hyperactive behaviors. They are easily distracted and may act before thinking.

“

ADHD affects approximately 7.6 % of children and adolescents worldwide, making it one of the most common neurodevelopmental disorders globally.

Global Prevalence of ADHD in Children

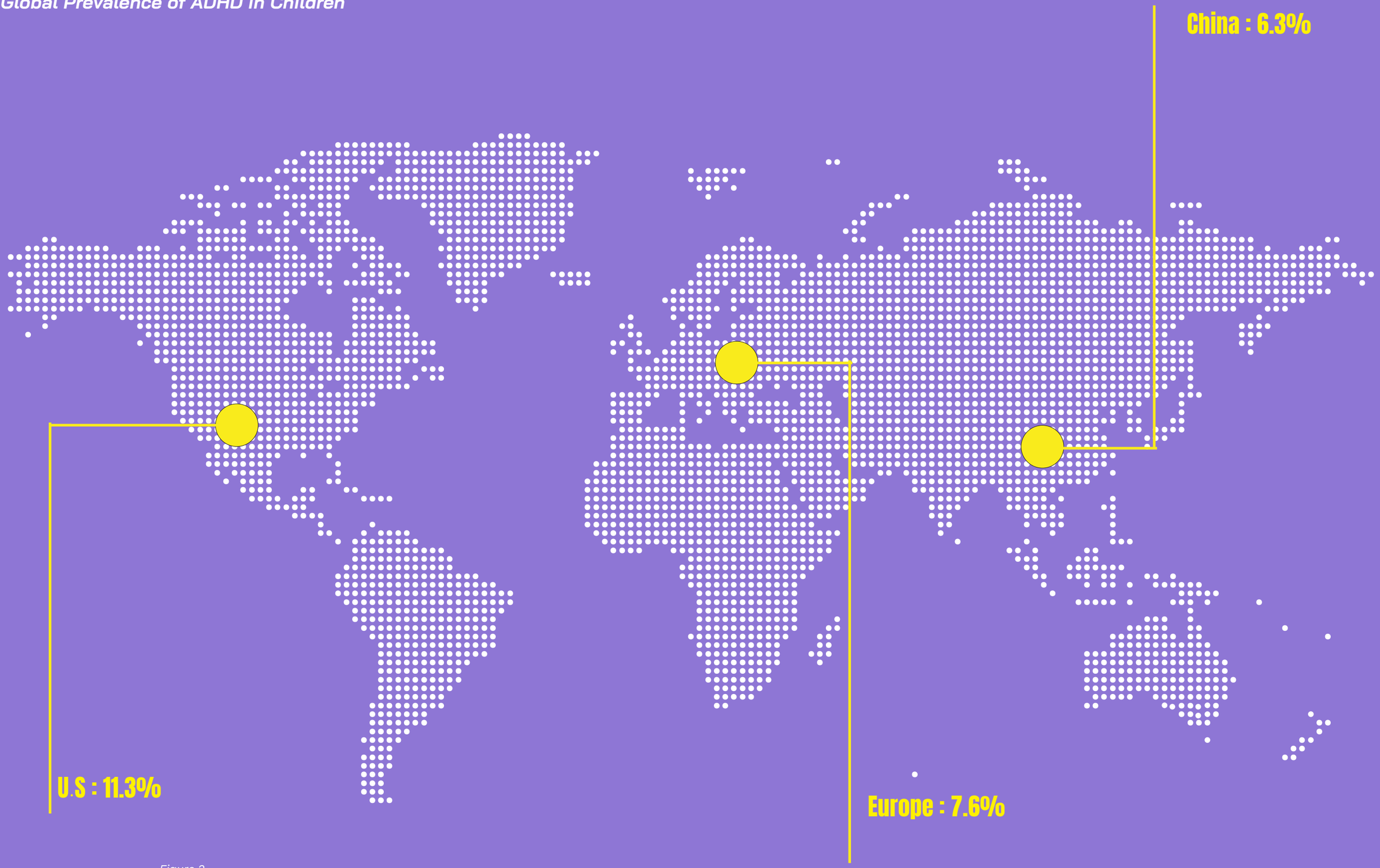


Figure.2
Global Prevalence of ADHD in Children

Literature Review

Why can VR serve as a potential solution for attention training in children with ADHD?

This section provides a review of existing research on Virtual Reality (VR) with the aim of outlining the current landscape of the field. By examining representative studies across education, therapy, and cognitive training, the review identifies major research trends, discusses dominant themes and methodological approaches, and highlights gaps and emerging directions that are particularly relevant to this project.

In recent years, Virtual Reality (VR) has gained growing attention as an innovative medium in education, therapy, and cognitive training. Unlike traditional two-dimensional interfaces, VR provides immersive and interactive environments that allow learners to actively engage with multisensory stimuli such as visual and auditory cues. Through embodied forms of interaction, VR can enhance user engagement and presence, creating experiences that more closely mirror real-world contexts.

Parsons and Phillips (2016) highlight that such immersive environments can be particularly effective in promoting attention and motivation, especially among individuals who struggle to maintain focus in conventional settings. These findings have positioned VR as a promising tool for both psychological assessment and cognitive intervention, paving the way for new approaches to experiential learning and behavioral support.

Virtual Reality (VR) also provides opportunities to transform repetitive cognitive exercises into engaging and meaningful activities by integrating gamified elements and real-time feedback. Research in VR-based learning suggests that immersive systems can support task persistence and working-memory performance through adaptive environments that respond to user behavior. Hamari, Koivisto, and Sarsa (2014) further demonstrate that gamification, when applied thoughtfully, enhances user motivation and engagement across diverse educational and behavioral contexts, supporting its potential integration into VR-based cognitive training systems.

These adaptive and immediate-feedback mechanisms are particularly important for maintaining children's engagement, as they help sustain focus during learning activities. However, despite the potential of immersive technologies, many VR-based attention-training tools still focus on simple reaction tasks or classroom-like simulations, which may limit their ability to support long-term engagement and sustained improvement. Few studies have explored more interactive, gamified VR models specifically designed for ADHD attention training, indicating a gap for further development.

Project Objectives

Aim

Few studies have explored more interactive, gamified VR models specifically designed for ADHD attention training, indicating a gap for further development.

This project aims to design a VR-based attention-training system for children with ADHD. Through immersive environments, gamified mechanisms, and interactive feedback, the system seeks to enhance their ability to sustain attention. The research objectives include conducting desk research and user interviews to analyze current practices, proposing a more engaging and gamified VR training game.

02
METHODOLOGY

Design Process

Showing how the project moves from problem understanding to VR solution creation.

Double Diamond Model

This project follows the Double Diamond design framework, which structures the research and design activities into four stages: Discover, Define, Develop, and Deliver.

The first diamond focuses on understanding the problem, while the second focuses on exploring and creating the solution. This model provides a clear pathway from initial investigation to the development of a VR attention training prototype tailored for children with ADHD.

01
Discover

Insight into the problem

02
Define

the area to focus upon

03
Develop

potential solutions

04
Deliver

solutions that work

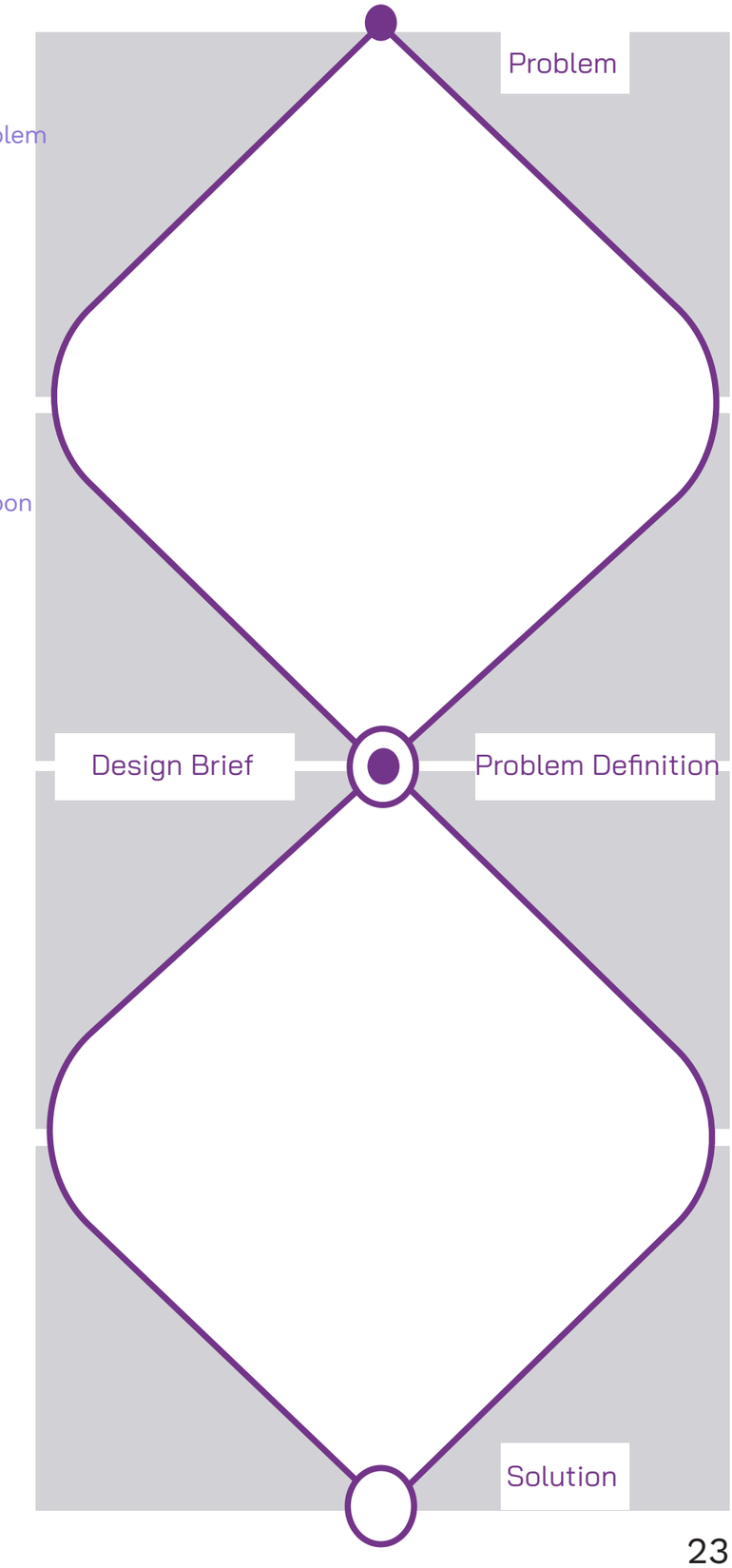


Figure 3
Double Diamond Model

Human-Centered Approach

Human-Centered Design

This project adopts the Double Diamond framework as the overarching design process, the Human-Centered Design (HCD) approach as a detailed methodology guiding each phase of the Double Diamond.

The process unfolds through five key stages — Empathize, Define, Ideate, Prototype, and Test — forming a continuous feedback loop between research and design.
This cyclical process ensures that insights gathered from users directly inform design decisions, allowing for iterative improvement and user validation.

> **Human-Centred Design Thinking, which always begins with understanding (or "empathising" with) people's needs and wants.**

Three core components

Interviews	Personas	Case Studies
to gather first hand insights from parents about real-world attention challenges, daily routines, and expectations toward digital training tools.	to synthesize user types and represent the motivational patterns, frustrations, and behavioral tendencies typical of children with ADHD.	to analyze existing ADHD training tools, VR applications, and gamified learning systems in order to understand current practices and identify design

Contribution to the Design Process

The findings derived from this qualitative process directly inform the interaction strategies, content structure, and engagement mechanics of the proposed VR prototype developed in the Develop stage of the Double Diamond.

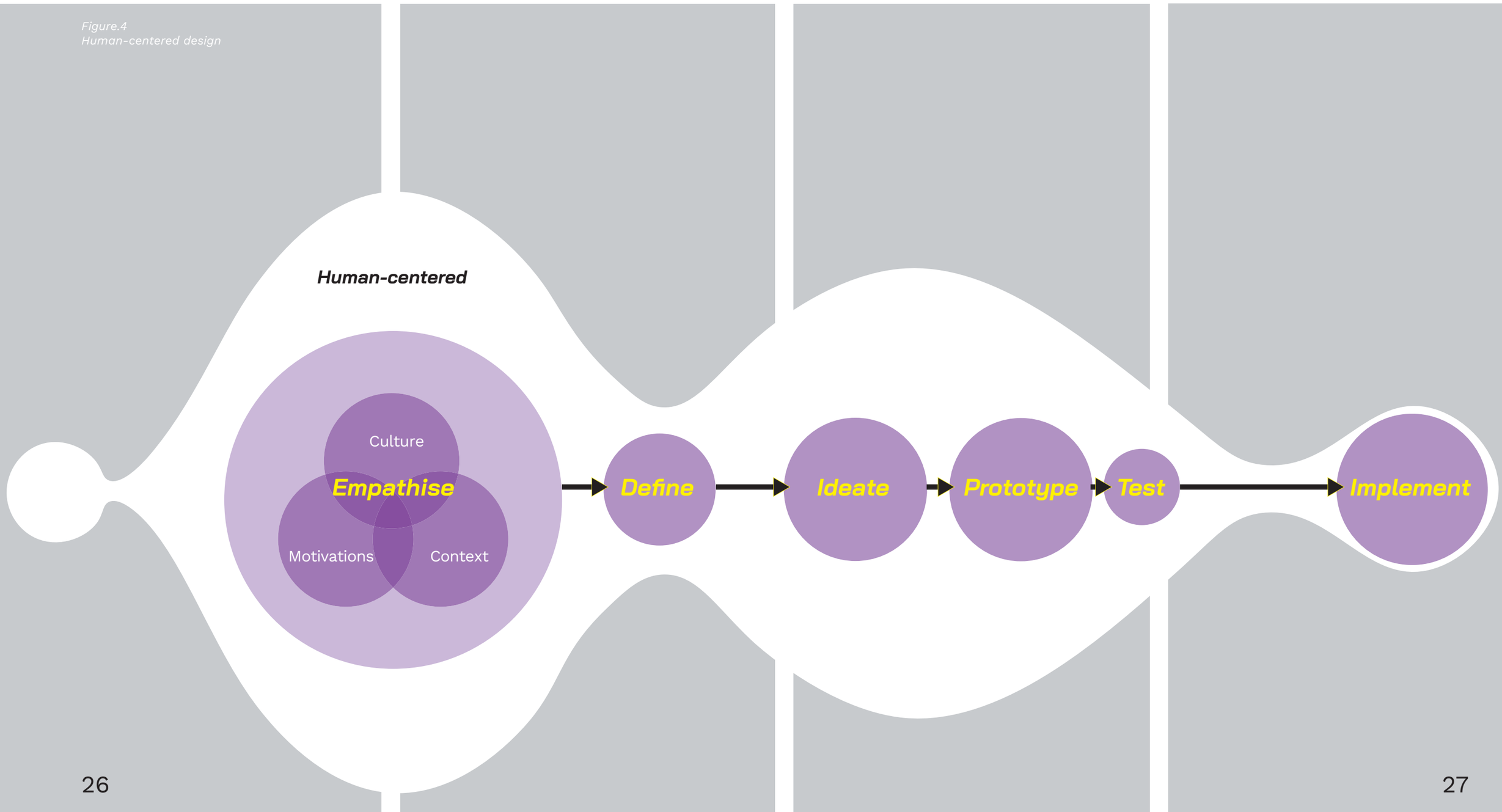
01
Discover

02
Define

03
Develop

04
Deliver

Figure.4
Human-centered design



Interviews

Understanding what users really need in ADHD training.

Semi-structured interviews

To gain an in-depth understanding of the daily attention patterns, emotional experiences, and training needs of children with ADHD, a series of semi-structured qualitative interviews were conducted with parents who actively support their child's behavioral and learning routines.

Semi-structured interviews were selected because they allow the researcher to follow a consistent structure while giving participants the freedom to describe their experiences in detail. The interview protocol was organized around five thematic blocks: warm-up questions, daily behavior and learning, current interventions and tools, pain points and unmet needs, and closing questions. This structure ensured that the conversation progressed naturally from general background information to more specific discussions about attention challenges and expectations for digital or VR-based support.

Warm-up questions

Focused on the child's basic profile, early signs of attention difficulties, and diagnostic information.

Daily behavior and learning

Explored the child's behavior at home and at school, homework patterns, and types of stimuli that most easily capture or distract attention.

Interventions and tools used

Examined strategies parents had already tried, including their perceived effectiveness, limitations, and attitudes toward digital devices or VR as potential interventions.

Pain points and needs

Addressed the most challenging moments in parenting, feelings of overload, and gaps in existing support tools.

Closing questions

Invited parents to reflect on what features they would value in a new attention-training system and whether they would consider participating in future testing sessions.

01 Interview

Interviewee: Ms. Li
Age: 35
Occupation: Freelancer
Location: Shanghai, China
Child: Boy, 7 years old, Grade 1, diagnosed with ADHD

1. Warm-up Questions (5 mins)

Q: Could you briefly introduce your child (age, gender, grade, etc.)?

A: My son is 7 years old, currently in Grade 1. He's very energetic and physically healthy—can't seem to sit still for long!

Q: When did you first notice any attention or behavioral issues? What signs did you observe?

A: Around age 4, I started noticing signs. For example, he never took naps in kindergarten—while all the other kids were resting, he would be singing, jumping, or moving around. The teachers tried everything, but he was always full of energy.

Q: Has your child been formally diagnosed with ADHD? If so, where?

A: Yes, he was officially diagnosed earlier this year at a Hospital in Shanghai. He has mild to moderate ADHD. We're not using medication right now—just behavioral interventions and home support.

2. Daily Behavior and Learning (10 mins)

Q: What are the most challenging behaviors you deal with on a daily basis?

A: So many! The biggest one is his constant movement and nonstop talking. He once told me, "Mom, I feel like I have a hundred monkeys in my head." He's very easily distracted and always fiddling with something.

Q: How does he behave at school? Any feedback from teachers?

A: Teachers are quite frustrated. Especially in subjects like Chinese and Math, he zones out easily. They say he often interrupts, speaks out of turn, and can't focus for more than a few minutes. But when he's interested, he can understand things really quickly.

Q: What is it like when he's doing homework? How do you support him?

A: It's exhausting . He can't sit still for more than 5 minutes without standing up or getting distracted. I have to sit with him the entire time, encouraging and reminding him constantly. I use a timer and small rewards to help him stay focused.

Q: What kinds of things grab his attention most easily?

A: He's really into building things like Lego or flying model planes. He also loves funny cartoons and storytelling. Anything hands-on or highly stimulating grabs him.

3. Interventions and Tools Used (10 mins)

Q: Have you tried any methods to help him improve attention or behavior? How effective were they?

A: We didn't have any medication. We tried some in-person attention training programs—he was okay with them, but they were too expensive. I also tried some parent-child apps or mini programs, but he wasn't very interested.

Q: Which methods seemed helpful? Which didn't work? Why?

A: What works best are our own methods, like using timers, breaking tasks down, or letting him move before sitting down again. Some tools out there are too rigid—no interaction or flexibility—so he just won't use them.

Q: What's your view on using digital devices like phone or VR headset for interventions? Do you set limits?

A: I have mixed feelings. I don't want him to get addicted, but banning them completely doesn't work either. He gets bored with passive content like online classes, but interactive games hold his focus. If there were a learning tool that's engaging and responsive, I'd support that.

4. Pain Points and Needs (10 mins)

Q: What are the most difficult moments you've experienced while parenting your child? Any examples?

A: When I'm on work calls, he constantly interrupts—yelling, seeking attention, pulling on me. It's frustrating. I feel torn between my responsibilities and his needs.

Q: Do you often feel overwhelmed or stretched thin? In what ways?

A: Honestly, almost every day. Especially when I'm unsure how to handle his emotional outbursts or failed social interactions. I'm constantly questioning if I'm doing the right thing.

Q: Are there any tools or features you wish existed to help you and your child?

A: I'd love a tool that tracks his focus patterns and gives me insights—but gently, not judgmentally. Even better if it can offer emotional coaching or guide me in responding calmly in tough moments. Something we could grow together.

5. Closing Questions (5 mins)

Q: If there were a tool (like an App or VR game) designed to help improve your child's attention and behavior, what features would be most important to you?

A: It should really "understand" kids like him. That means allowing some movement, giving positive feedback, and being engaging—not rigid or punishment-based. A parent-child mode would be ideal, with adjustable tasks and visual feedback.

Q: Would you be open to participating in future product testing or feedback sessions?

A: Absolutely! As long as it's not overly complicated, I'd be happy to help out and contribute to something meaningful.

02 Interview

Interviewee: Ms. Zhong
Age: 41
Occupation: Middle school teacher
Location: Changsha, China
Child: Girl, 8 years old, Grade 3, diagnosed with ADHD

1. Warm-up Questions (5 mins)

Q: Could you briefly introduce your child (age, gender, grade, etc.)?

A: My daughter is 8 years old and currently in the third grade of primary school. She has always been a very quiet child who enjoys spending time alone, especially fond of drawing and reading.

Q: When did you first notice any attention or behavioral issues? What signs did you observe?

A: I am a middle school teacher and have been writing popular science articles on neuroscience for two years, so I'm quite sensitive to abnormalities in cognitive functions. At first, she appeared especially focused — for example, burying herself in a book for two hours without being disturbed by anything around her. I was quite happy about it at the time, but later noticed something was off, like she wouldn't respond no matter how I called her. This kind of excessive focus is actually also a form of attention problem.

Q: Has your child been formally diagnosed with ADHD? If so, where?

A: Yes, she has been formally diagnosed with inattentive-type ADHD. We take her for attention-related tests once a year. The diagnosis was made at a professional children's psychology center.

2. Daily Behavior and Learning (10 mins)

Q: What are the most challenging behaviors you deal with on a daily basis?

A: The biggest issue is her poor ability to switch attention. Whenever the task changes—like switching from doing homework to listening to instructions, or from Chinese to Math—she reacts slowly and often can't keep up. She also tends to miss information when handling multiple tasks, which causes her to stop halfway.

Q: How does she behave at school? Any feedback from teachers?

A: Her situation is a bit complex. During the new learning phase, she often gets a lot of questions wrong, but during review, she can quickly catch up. Teachers often privately message me, saying "she doesn't seem like a child at this level." At the beginning of this semester, the teacher frequently @-mentioned me in the class parent group, saying she missed important information in class and had trouble with multitasking.

Q: What is it like when she's doing homework? How do you support him?

A: She's actually very quiet and willing to do homework, and she doesn't dawdle. But she often loses track, skips questions, or jumps to unrelated tasks. I usually help by reminding her to go step by step and by breaking down complex tasks so she doesn't get "stuck."

Q: What kinds of things grab her attention most easily?

A: She's deeply drawn to drawing and story-based books—she can finish an entire book in one go. She also likes quiet, structured tasks. This interest is actually a strength of hers and has become an entry point for our later training.

3. Interventions and Tools Used (10 mins)

Q: Have you tried any methods to help her improve attention or behavior? How effective were they?

A: We've tried many methods: visual and auditory channel training, breathing regulation, sensory integration training, and attention-specific training. The most effective was attention training combined with a VR system, which used immersive scenarios to help her practice attention-switching, dividing attention, and improve reaction speed.

Q: Which methods seemed helpful? Which didn't work? Why?

A: Traditional punishments, constant reminders, and forced task schedules didn't work at all. On the other hand, she responded well to tasks with feedback mechanisms and goal-oriented structures—like the mini-games in VR training. Since she isn't the hyperactive type but more of an "execution deficit" type, what she needs is improved brain control ability, not just simple behavioral management.

Q: What's your view on using digital devices like phone or VR headset for interventions? Do you set limits?

A: At first, I was worried about the negative effects of these devices on eyesight and attention. But after learning about professional VR-based attention training systems, I changed my view. The key is that the content must be scientifically designed interventions—not entertainment. We also limit her from using phones outside of training; she only uses the VR headset for targeted training.

4. Pain Points and Needs (10 mins)

Q: What are the most difficult moments you've experienced while parenting your child? Any examples?

A: The hardest times were when the teacher constantly tagged me or when she came home saying, "I didn't finish my homework again." I actually understood her, but still felt helpless—knowing that she wasn't being careless, but genuinely couldn't keep up. That feeling was heartbreaking.

Q: Do you often feel overwhelmed or stretched thin? In what ways?

A: To be honest, yes. Especially when I see her being labeled or misunderstood, or when she's clearly trying hard but not seeing results. I get anxious and wonder if I've done something wrong. Sometimes, after teaching all day, helping her with homework, and reading research materials, I feel completely drained—both mentally and physically.

Q: Are there any tools or features you wish existed to help you and your child?

A: Definitely. Ideally, there would be a system that can automatically assess a child's attention state and provide real-time feedback, so parents can reduce trial and error and feel less anxious. If it could integrate with daily tasks and feel like a game, that would be even better.

5. Closing Questions (5 mins)

Q: If there were a tool (like an App or VR game) designed to help improve your child's attention and behavior, what features would be most important to you?

A: I think the following features are most important:
1. Personalized assessment reports (to track changes across different attention dimensions)
2. Task-switching training that simulates real classroom settings
3. Emotion regulation modules like breathing exercises
4. Achievement feedback and point-based rewards to motivate children to stick with it

Q: Would you be open to participating in future product testing or feedback sessions?

A: Yes, I've been keeping records of my daughter's training and attention changes, and I'd be happy to share this real data. I also hope it can offer some insight to other families.

03 Interview

Interviewee: Ms. Du
Age: 33
Occupation: Architect
Location: ChengDu, China
Child: Boy, 10 years old, Grade 4, not diagnosed with ADHD yet

1. Warm-up Questions (5 mins)

Q: Could you briefly introduce your child (age, gender, grade, etc.)?

A: My son is 10 years old and currently in the fourth grade.

Q: When did you first notice any attention or behavioral issues? What signs did you observe?

A: I noticed it around first grade. Especially during homework time, he had a hard time calming down and focusing.

Q: Has your child been formally diagnosed with ADHD? If so, where?

A: No, he has not been formally diagnosed.

2. Daily Behavior and Learning (10 mins)

Q: What are the most challenging behaviors you deal with on a daily basis?

A: He has trouble completing his homework, which is frustrating for me. He also often makes small mistakes in tests, like writing the wrong characters.

Q: How does he behave at school? Any feedback from teachers?

A: His performance is average. The teacher said he often talks to classmates during class.

Q: What is it like when he's doing homework? How do you support him?

A: He gets distracted easily while doing homework—he might play with the cat or pick at his fingers. I usually sit with him and keep reminding him to focus.

Q: What kinds of things grab his attention most easily?

A: Things like people arguing downstairs or the dog barking easily catch his attention—he'll go check it out.

3. Interventions and Tools Used (10 mins)

Q: Have you tried any methods to help him improve attention or behavior? How effective were they?

A: I tried rewarding him—like giving him 50 yuan for finishing a worksheet in one sitting, and letting him accumulate it. But it wasn't very effective because he's not that interested in money, and he usually gets the toys and devices he wants.

Q: Which methods seemed helpful? Which didn't work? Why?

A: So far, no method has worked particularly well. He can stay calm for a short while, but it doesn't last. Overall, he's still a healthy and lively kid.

Q: What's your view on using digital devices like phone or VR headset for interventions? Do you set limits?

A: I haven't used these tools, but my child does like playing games. I'm a bit concerned about how VR headsets might affect his eyesight. On weekdays, he's allowed to use the iPad for one hour a day. On weekends, there's no limit as long as his homework is done.

4. Pain Points and Needs (10 mins)

Q: What are the most difficult moments you've experienced while parenting your child? Any examples?

A: The most difficult part is when he does homework. I'm really worried that poor grades will make him lose confidence in learning. Also, he likes watching TV or the iPad while eating, which makes me concerned about his vision.

Q: Do you often feel overwhelmed or stretched thin? In what ways?

A: I think it's the same for most parents. Aside from financial stress, the biggest concern is my child's academic performance.

Q: Are there any tools or features you wish existed to help you and your child?

A: If there are tools that can help improve my child's focus, I'd definitely be willing to try them.

5. Closing Questions (5 mins)

Q: If there were a tool (like an App or VR game) designed to help improve your child's attention and behavior, what features would be most important to you?

A: I'd hope such a tool doesn't make the child overly addicted—digital devices do affect eyesight. But if it truly helps with attention, that would be great.

Q: Would you be open to participating in future product testing or feedback sessions?

A: If the timing works out, I'd be open to participating.

04 Interview

Interviewee: Ms. Peng
Age: 37
Occupation: Sales
Location: Zhuhai, China
Child: Boy, 9 years old, Grade 3, diagnosed with ADHD

1. Warm-up Questions (5 mins)

Q: Could you briefly introduce your child (age, gender, grade, etc.)?

A: My son is 9 years old, a boy, and he has just started third grade.

Q: When did you first notice any attention or behavioral issues? What signs did you observe?

A: I first noticed the issues last semester. He would constantly procrastinate on homework, zone out, and couldn't sit still. His teacher often talked to me, saying he interrupted class and didn't follow instructions.

Q: Has your child been formally diagnosed with ADHD? If so, where?

A: Yes, he was formally diagnosed with ADHD after a comprehensive assessment at the Guangzhou Child Development and Behavior Center.

2. Daily Behavior and Learning (10 mins)

Q: What are the most challenging behaviors you deal with on a daily basis?

A: The most difficult behaviors are his lack of focus, impulsiveness, procrastination, and constant fidgeting. Sometimes he talks back when being corrected.

Q: How does he behave at school? Any feedback from teachers?

A: Teachers say his behavior in class is unstable—he has a very short attention span, frequently interrupts, doesn't follow rules, and sometimes even gets up during lessons.

Q: What is it like when he's doing homework? How do you support him?

A: He can only focus on homework for a few minutes before zoning out or playing with things. I use a visual timer to break tasks into 15-minute chunks, and we have a star-based reward system.

Q: What kinds of things grab his attention most easily?

A: He gets extremely focused on things like TV and video games, but struggles to stay on task with low-stimulation activities like reading or homework.

3. Interventions and Tools Used (10 mins)

Q: Have you tried any methods to help him improve attention or behavior? How effective were they?

A: We've tried traditional Chinese medicine, sensory integration therapy, and various attention-training classes. Many were ineffective—some even made him more resistant.

Q: Which methods seemed helpful? Which didn't work? Why?

A: The most effective approach was the tailored plan from the fourth hospital—integrating Western and Chinese medicine, behavioral therapy, and family support. Ineffective ones were generic, like relying only on medication or tutoring.

Q: What's your view on using digital devices like phone or VR headset for interventions? Do you set limits?

A: My child loves using the iPad and playing games, so I set limits. If a VR game could help improve attention, I'd be open to it—but only if it doesn't become addictive or harm his eyesight.

4. Pain Points and Needs (10 mins)

Q: What are the most difficult moments you've experienced while parenting your child? Any examples?

A: I broke down the moment he was diagnosed. We were often blamed by relatives for his 'bad behavior,' but it turned out to be a neurological issue. The hardest part is seeing him struggle—he wants to do better but just can't control it.

Q: Do you often feel overwhelmed or stretched thin? In what ways?

A: I often feel completely overwhelmed—balancing his academics, emotions, and social issues can feel suffocating at times.

Q: Are there any tools or features you wish existed to help you and your child?

A: I wish there were tools that could train his attention, monitor his progress in real time, and help me better understand how his brain works—ideally with some parent-child interaction features too.

5. Closing Questions (5 mins)

Q: If there were a tool (like an App or VR game) designed to help improve your child's attention and behavior, what features would be most important to you?

A: It needs to be scientific, engaging but not addictive, with clear visual feedback. It should also align with our daily routine—like task breakdowns and positive reinforcement.

Q: Would you be open to participating in future product testing or feedback sessions?

A: I'm open to trying it out and sharing feedback—hopefully to help other parents avoid the same mistakes.

05 Interview

Interviewee: Ms. Cun
Age: 35
Occupation: Manager
Location: FuZhou, China
Child: Girl, 8 years old, Grade 1, diagnosed with ADHD

1. Warm-up Questions (5 mins)

Q: Could you briefly introduce your child (age, gender, grade, etc.)?

A: My daughter is 8 years old and has just started first grade again this year.

Q: When did you first notice any attention or behavioral issues? What signs did you observe?

A: We started noticing problems as early as kindergarten. Her teachers often reported issues with attention and emotional control. Things escalated in first grade when she completely broke down.

Q: Has your child been formally diagnosed with ADHD? If so, where?

A: Yes, she has been formally diagnosed with ADHD after a professional evaluation. The doctor prescribed medication, but we are still deciding whether to start it.

2. Daily Behavior and Learning (10 mins)

Q: What are the most challenging behaviors you deal with on a daily basis?

A: The most challenging behaviors are impulsiveness, aggression, meltdowns during homework, and poor emotional regulation. She often says inappropriate things without realizing it.

Q: How does he behave at school? Any feedback from teachers?

A: At first, she was frequently reported for inattention, excessive movement, and careless mistakes. Over time, she has adapted somewhat, and the feedback has improved.

Q: What is it like when he's doing homework? How do you support him?

A: Homework time is when she's most likely to break down emotionally. She often cries or explodes. We have to take turns taking time off work to help her focus and complete tasks step by step.

Q: What kinds of things grab his attention most easily?

A: She gets very focused when drawing, fishing, playing basketball, or reading about nature—but she strongly resists academic tasks.

3. Interventions and Tools Used (10 mins)

Q: Have you tried any methods to help him improve attention or behavior? How effective were they?

A: We've read many books, such as "Mindful Parenting for ADHD," and adjusted our parenting approach with more encouragement and less criticism. Gradually, we've seen improvements.

Q: Which methods seemed helpful? Which didn't work? Why?

A: The most helpful strategies are emotional validation and strengthening our bond. Punishment or scolding doesn't work—it only increases resistance.

Q: What's your view on using digital devices like phone or VR headset for interventions? Do you set limits?

A: She likes using the iPad, so we strictly limit screen time. I'm concerned about addiction and eyesight damage, but I'd be open to trying science-based attention training games.

4. Pain Points and Needs (10 mins)

Q: What are the most difficult moments you've experienced while parenting your child? Any examples?

A: One of the hardest moments was when classmates mocked her low test scores. They even grabbed her test paper to look and made loud remarks. She broke down crying—I felt devastated.

Q: Do you often feel overwhelmed or stretched thin? In what ways?

A: I often feel completely drained. I even use my lunch break to rush home, tutor her, drive her back to school, and then return to work. It leaves no time for myself.

Q: Are there any tools or features you wish existed to help you and your child?

A:I wish there were tools that could help improve her attention and manage emotions—ideally ones that could also reduce the load on parents by allowing some independent use.

5. Closing Questions (5 mins)

Q: If there were a tool (like an app or VR game) designed to help improve your child's attention and behavior, what features would be most important to you?

A: It should combine game elements with fun and feedback, maybe include relaxation or emotional regulation components. Most importantly, it has to be something the child wants to use.

Q: Would you be open to participating in future product testing or feedback sessions?

A: Yes, I'd love to be involved—especially if it helps create something that supports families like ours and reduces unnecessary detours.

Personas

Turning research data into human-centered design profiles

Based on this qualitative data, three representative personas were developed to synthesize key behavioral traits, pain points, goals, and needs. Rather than portraying individual cases, these personas reflect patterns across multiple families, capturing variations such as high-stimulation seekers, quiet but easily overwhelmed children, and playful children with inconsistent attention. Each persona highlights different emotional contexts and support strategies, illustrating how ADHD-related challenges manifest across environments.

Together, the interviews and personas form the foundation for identifying user needs, defining design opportunities, and guiding the development of a VR attention-training experience that is empathetic, accessible, and grounded in real-world contexts.

Lin Wei

— Anxious but Proactive Mother of a Hyperactive Child

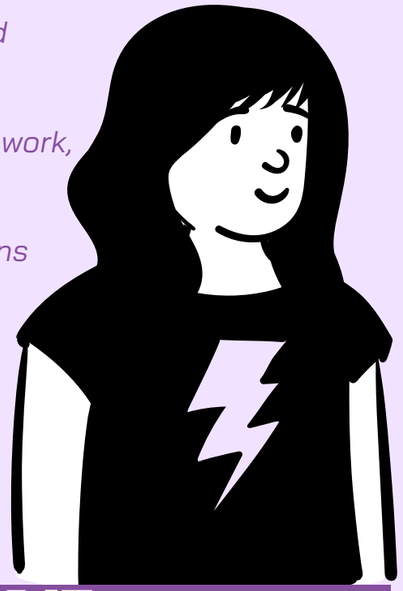
Age: 36
Occupation: Freelancer
Family: Married, 1 son (7 years old, Grade 1, mild ADHD)
Location: Shanghai

Representative Quotes

“He told me: ‘Mom, I feel like I have a hundred monkeys in my head.”

“Completely banning digital devices doesn’t work, but I worry about addiction and eyesight.”

“Can there be a tool that tracks focus patterns and gives me gentle suggestions?”



“I don’t want to be a 24/7 supervisor anymore. I need a tool my child actually enjoys using, and one that truly helps him focus.”

Behaviors & Habits

- Homework requires full parental supervision, supported with timers, task breakdown, and small rewards (Int.01,04).
- Child responds well to high-stimulation/hands-on activities (LEGO, models, cartoons), but resists low-stimulation/academic tasks (Int.01,04,05).
- Tried commercial training programs/apps, but they were too rigid or expensive; the child wouldn’t continue (Int.01,04).
- Digital tools are cautiously allowed: only with limited duration, interactive feedback, and scientifically designed interventions (All).

Pain Points

- Homework support is exhausting: child can’t sit still, interrupts, and gets distracted easily (Int.01,04).
- Child frequently singled out by teachers; parent feels social pressure from being mentioned in group chats (Int.02,04).
- Emotional and social struggles: child loses control, gets teased; parent feels guilt and helplessness (Int.05).
- Tool dilemma: balancing effectiveness, addiction risk, and eyesight concerns (All).

Goals

- Child can complete short bursts of high-quality focus training, gradually transferring to learning tasks.
- Parent no longer has to constantly monitor, but can still track progress and receive supportive guidance.
- Improve parent-child relationship, reduce conflicts and emotional meltdowns.

Needs

- Short modular training, easily integrated into daily routine (Int.01,04,05).
- Interactive methods that allow small movements/fidgeting (reduces resistance) (Int.01).
- Instant positive feedback and visualized achievements (points/badges/streaks) (Int.01,04,05).
- Parent dashboard: focus duration trends, task completion rate, emotional/meltdown log, gentle suggestions (Int.01,04).
- Emotional regulation module: breathing guidance, relaxation exercises, overload “cool-down” mode (Int.02,05).
- Parental controls: session limits, content selection, eye-care reminders, anti-addiction safeguards (All).
- Scientific foundation: training logic based on attention dimensions (sustained/selective/divided/switching) (Int.02).

Zhou Min

— Rational, Research-Oriented Mother of an Inattentive Child

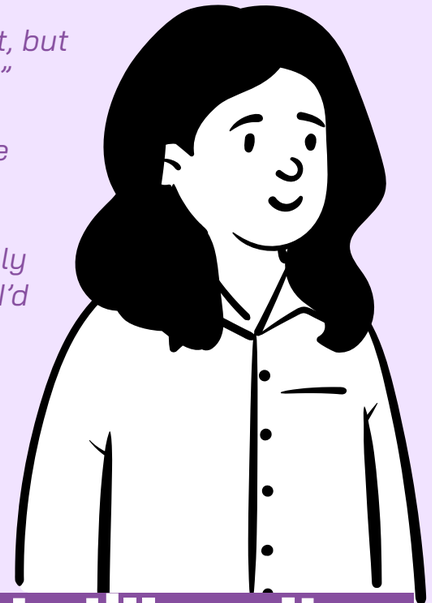
Age: 41
Occupation: Middle school teacher, part-time science writer
Family: Married, 1 daughter (8 years old, Grade 3, diagnosed ADHD-Inattentive type)
Location: Changsha

Representative Quotes

“She can read a book for two hours straight, but completely misses classroom instructions.”

“I know punishment doesn’t work—what she needs is training her brain’s control.”

“If there were a tool that could automatically assess her focus and give me real reports, I’d trust it.”



“She tries so hard, but still can’t keep up. I need a scientifically validated tool that helps me understand her attention patterns and provides objective feedback.”

Behaviors & Habits

- Daughter is quiet and willing to do homework, but often loses track, skips questions, or freezes (Int.02).
- Shows deep focus in drawing and story-based books, but struggles with task switching (Int.02).
- Tried multiple interventions: sensory training, attention programs, breathing regulation; the most effective was VR attention-switching training (Int.02).
- Parent actively records training results and reads neuroscience research (Int.02).

Pain Points

- Teachers frequently message her, saying her daughter misses key information and lags behind (Int.02).
- Heartbroken when seeing her child put in effort but achieve no results (Int.02).
- Distrust of generic or entertainment-only tools; insists on scientific credibility (Int.02).

Goals

- Help her daughter switch tasks faster and reduce information gaps.
- Gain objective progress reports to reduce trial-and-error parenting.
- Use safe, evidence-based digital tools that support long-term habit building.

Needs

- Task-switching training: classroom-like simulations for shifting from one activity to another (Int.02).
- Personalized assessment reports: track sustained/divided/switching attention and show trends (Int.02).
- Emotion regulation modules: breathing, relaxation exercises (Int.02).
- Scientific validation: evidence-based design, not pseudoscience.
- Goal-driven feedback: motivating rewards instead of punitive systems (Int.02).

Li Ting

— Hesitant Mother of a Suspected ADHD Child

Age: 33
Occupation: Architect
Family: Married, 1 son (10 years old, Grade 4, not formally diagnosed with ADHD)
Location: Chengdu

Representative Quotes

“During homework he always gets distracted—petting the cat or fidgeting with his fingers.”

“The teacher says he talks too much in class and his grades are just average.”

“I’m worried VR might harm his eyesight or make him addicted.”

“He’s unfocused with homework, but hasn’t been diagnosed. I’m unsure if I’m overthinking, and I’m worried about risks from medication or VR devices.”

Behaviors & Habits

- Easily distracted by environmental noise (dog barking, people arguing).
- Rewards (money, toys) are ineffective; he already gets what he wants.
- Plays games eagerly, but parent restricts screen time strictly.
- Family is uncertain whether issues are ADHD or just typical “playfulness.”

Pain Points

- Concern about slipping academic performance and loss of self-confidence.
- Anxiety about whether to seek medical diagnosis; feels conflicted.
- Distrust of medication and electronic interventions (fear of addiction/eye strain).

Goals

- Find a low-risk, low-barrier way to observe and support her child.
- Clarify whether the child needs professional help.
- Introduce training without increasing family conflict.

Needs

- Lightweight training modules: short, simple, engaging.
- Preliminary screening: attention assessment to help parents decide on next steps (inspired by Nesplora Aula).
- Safety-first design: session limits, eye-care features, anti-addiction safeguards.
- Parental education: ADHD knowledge presented gently, to reduce guilt and anxiety.

Case Studies

Exploring existing cases to inspire design innovation.

To complement the user interviews and deepen the understanding of existing design strategies in attention-related digital experiences, a series of comparative case studies was conducted. These cases include clinical-grade training tools, VR rhythm games, cognitive fitness applications, and mainstream entertainment platforms with parental control systems. By analyzing their interaction models, feedback mechanisms, difficulty structures, and engagement strategies, the study identifies design patterns that are effective—and limitations that remain unresolved—for sustaining attention, regulating emotions, and motivating long-term participation.

The selected cases span both medical-validated systems (e.g., EndeavorRx) and high-engagement commercial experiences (e.g., Beat Saber, Maestro), allowing the research to compare how different industries approach cognitive engagement, sensory stimulation, and user motivation. Across these cases, several elements consistently contribute to successful focus-related gameplay: short modular tasks, multisensory feedback, gesture-based interactions, rhythmic synchronization, and positive reinforcement loops. At the same time, gaps such as limited personalization, insufficient emotional regulation support, or overly demanding interfaces highlight areas where further innovation is needed—especially for younger or neurodiverse users.

01

EndeavorRx

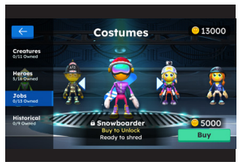
2020 USA

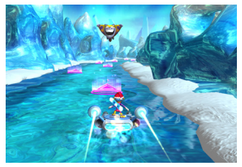
Category
ADHD Training

Source
Akili Interactive

Target Users
Children 8–12 (ADHD)

Aim
Improve pediatric ADHD attention through clinical-grade gameplay





Ratings

4.0 out of 5

1.1K Ratings
on Apple Store

Platform
App

Description

It is a therapeutic video game developed for children with ADHD. The game combines motor tasks with adaptive challenges, requiring players to respond to visual and auditory signals while reducing distractions. The short and repeated levels are designed to strengthen attention skills, while positive feedback supports motivation. The environment is colorful yet structured, offering a balance between engagement and scientific purpose. In this way, the game serves both as entertainment and as a treatment tool, making training more enjoyable.

Interaction style

- Mobile-based gameplay with simple navigation and response tasks.
- Uses sensory-motor navigation (move, avoid, collect) combined with distraction filtering.

Task design

- Short, modular levels designed for 5–10 minutes of play, reducing fatigue.
- Tasks are adaptive: difficulty increases or decreases depending on child's performance.

Feedback

- Immediate visual and audio reinforcement for correct actions.
- Rewards through achievements, points, and encouraging messages.

Engagement Strategy

- Game is framed as fun and colorful adventure, reducing the stigma of "therapy."
- Repetition is intentionally built in to reinforce focus without boredom.
- Clinical validation provides trust and credibility for parents and teachers.

Potential Reference

- Use short, repeatable training sessions (5–10 min) with progressive difficulty.
- Integrate adaptive so tasks scale with attention performance.
- Ensure positive reinforcement outweighs failure, boosting self-confidence.
- Present the game as play, not therapy, to encourage willingness

02

Maestro

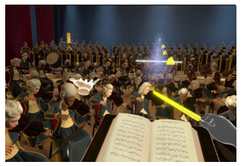
2022 France

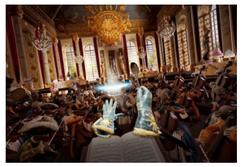
Category
VR Music / Rhythm Game

Source
Double Jack

Target Users
General VR players, music enthusiasts

Aim
Transform classical music into an engaging VR experience through interactive conducting





Ratings

4.9 out of 5

1,762 Ratings
on Apple Store

Platform
VR

Description

Maestro is a VR rhythm and conducting game where players embody a virtual orchestra conductor. Using motion controllers, they must lead musicians, follow rhythm cues, and shape tempo and intensity to perform classical pieces. The game combines music education and entertainment, turning complex orchestral works into an accessible, gamified experience. It emphasizes hand–eye coordination, attention to timing, and rhythmic precision, while offering an immersive way to explore classical music.

Interaction style

- Gesture-based control (conducting with hands) is intuitive and natural, lowering the learning curve.
- Encourages body movement + rhythm synchronisation, which aligns well with ADHD needs for active engagement.

Task design

- Tasks are short and modular (musical sequences) that can be repeated and varied.
- Clear cause–effect mapping (gestures → music outcome) reinforces attention and motivation.

Feedback

- Immediate audio feedback (orchestra response) + visual cues (musicians reacting).
- Reinforces success in a positive way instead of highlighting mistakes.

Engagement Strategy

- Rhythm and music provide built-in reward loops (ADHD-friendly).
- The sense of agency and mastery (being the “conductor”) boosts confidence and motivation.

Potential Reference

- Use short rhythm-based modules to sustain focus without fatigue.
- Integrate gesture + audio-visual feedback to maintain immersion.
- Offer positive reinforcement loops (like applause, success sounds, colorful visuals).
- Frame tasks as creative leadership roles (conductor, builder, guide) to enhance symbolic empowerment.

03

HealthXR

2024 USA

Category
VR Cognitive & Physical Training

Source
SevenPointOne

Target Users
General fitness and wellness

Aim
Provide structured VR modules that combine fitness, attention training, and emotional regulation for both rehabilitation and everyday health

Ratings

4.7 out of 5

7 Ratings
on Meta Quest

Platform
VR

Description

It is an immersive VR app on Meta Quest designed to train physical, cognitive, and emotional skills. Modules include Breathing Travel, Rhythm Punch, and Batting Practice, blending sensory-motor tasks with adaptive challenges. Users stretch, punch, swing, and navigate while staying focused. The system promotes weekly goals, progress tracking, and random play mode to keep engagement high and avoid routine fatigue. Positive reinforcement through points, levels, and visual feedback ensures the training stays structured yet enjoyable.

Interaction style

- Immersive VR tasks blending motor actions (stretching, punching, swinging) with cognitive focus.
- Combines physical movement + attention tasks, making training more embodied and less abstract.

Task design

- Modular training modules (Breathing Travel, Rhythm Punch, Batting Practice).
- Adaptive challenges: difficulty scales depending on user performance.

Feedback

- Immediate positive reinforcement through points, levels, and visual/audio cues.
- Progress tracking tools to keep users motivated and aware of growth.
- Weekly goal-setting ensures a balance of structure and flexibility.

Engagement Strategy

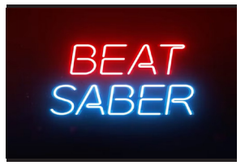
- Integrates fitness, cognitive, and emotional regulation in one system (holistic approach).
- Weekly goals + randomization sustain long-term engagement and prevent routine fatigue.
- High replay value through varied modules (breathing, rhythm, sports-based tasks).

Potential Reference

- Combine movement-based interactions (balancing, punching, stretching) with focus tasks .
- Provide weekly progress goals for children/ parents to monitor improvement.
- Develop modular VR sessions (breathing, rhythm, cognitive play) so users can rotate activities based on attention levels.

04

Beat Saber



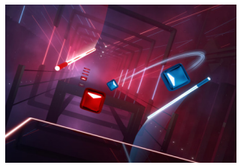
2018 Czech Republic

Category
VR Rhythm Game

Source
Beat Games

Target Users
General gamers, fitness players

Aim
Entertainment and rhythm-based physical activity



Ratings

Ratings

4.5 out of 5

53k Ratings
on Meat Quest

Platform
VR

Description

Beat Saber is a rhythm-based VR game where players slice colored blocks in sync with music. The gameplay requires fast reactions, spatial awareness, and attention to rhythm. Its design promotes focus, coordination, and full-body engagement, which has been noted for potential cognitive and physical benefits beyond entertainment.

Interaction style

- Rhythm-based VR gameplay where players slice colored blocks in sync with music.
- Requires fast reactions, spatial awareness, and rhythm coordination.

Task design

- Short, repeatable rhythm tasks with increasing difficulty.
- Clear goal-oriented design (hit blocks correctly, avoid obstacles).

Feedback

- Immediate feedback when a block is hit or missed.
- Positive reinforcement through visual effects, score updates, combo streaks.

Engagement Strategy

- Highly immersive music integration keeps users motivated.
- Gradual difficulty progression sustains challenge without overwhelming.
- Competitive modes and scoreboards boost replay ability.

Potential Reference

- Use short rhythm-based tasks to train sustained focus in manageable sessions.
- Provide instant, multisensory feedback (visual flashes + sound cues + points).
- Gradually increase difficulty to maintain engagement without frustration.
- Encourage physical movement + cognitive focus to strengthen mind–body coordination.

05

Fortnite

2017 USA

Category
Online Multiplayer Game
with Parental Controls

Source
Epic Games

Target Users
Teens, children, parents

Aim
Provide a safe and manageable online gaming experience for young players through integrated parental controls

Description

Fortnite is a multiplayer game mixing battle royale, creative building, and social play. Given its large underage audience, Epic Games added a parental control panel. Parents can limit chat, friend requests, purchases, and play time, ensuring safer gameplay. For ADHD contexts, it shows how engagement can be balanced with parental oversight, offering a model for child-focused VR design.

Ratings

–

Platform
PC

Interaction style

- Combines building tasks + battle gameplay + social interaction.
- Highlights the value of collaborative/ competitive dynamics to sustain attention.

Task design

- Strong goal-oriented structure (survival, achievement) while allowing creativity.
- Players must plan, prioritize, and adapt quickly — skills relevant to attention training.

Feedback

- Real-time success/failure cues (elimination, survival ranking).
- Immediate reinforcement through rewards, progress levels, and unlockable content.
- Use of visual and audio feedback (alerts, countdowns, celebratory effects).

Engagement Strategy

- Social play: communication, teamwork, and community aspects heighten motivation.
- Personalization via parental controls: parents can limit time, interactions, purchases.

Potential Reference

- Introduce parent/teacher dashboards to balance engagement with safety and supervision.
- Apply fast, clear feedback loops (points, rankings, progress indicators).
- Adapt social interaction features but in a safe, moderated format for children.

03
Define

Insights

Translating findings into clear design opportunities.

From Research to Insights

During the Discover phase of this study, a systematic exploration was conducted through five semi-structured parent interviews, analyses of representative VR and game-based applications, and a comprehensive literature review. The research examined the attentional behavior patterns of children with Attention Deficit Hyperactivity Disorder (ADHD), the psychological states and coping strategies of parents in everyday training contexts, and the strengths and limitations of current digital intervention tools.

The synthesis of these findings reveals that Virtual Reality (VR) holds unique potential in the field of attention training — not only by enhancing engagement through immersive interaction, but also by supporting emotional regulation and sustained focus through rhythm, movement, and multisensory feedback. At the same time, it highlights parents' ambivalence between effective intervention and concerns over screen dependency or visual strain, as well as the limitations of existing tools in terms of scientific grounding, adaptive personalization, and ethical safety.

Building upon these observations, this section summarizes five key insights from both user (parent and child) and contextual perspectives, forming the foundation for the design guidelines developed in the subsequent Define phase.

Engagement must balance stimulation and structure

Children show strong focus in highly stimulating or creative contexts (LEGO, music, drawing), but resist monotonous or abstract tasks. Parents allow digital tools only if they combine fun and scientific credibility.

EndeavorRx and Beat Saber demonstrate how short, modular, rhythm-based tasks sustain attention without fatigue.

Design implication: Create structured yet playful sessions—5–10 minute loops that blend entertainment and therapeutic intent to maintain engagement and trust.

Movement and rhythm improve focus when cognitive load is controlled.

Observation: Physical engagement (gestures, stretching, tapping) helps children release hyperactivity and regulate attention, but excessive visual/auditory input can overwhelm them.

Case connection: Maestro and HealthXR effectively integrate gesture + rhythm synchronisation to sustain attention through embodied action.

Design implication: Encourage body-based and rhythmic interaction with adjustable intensity—active focus rather than sensory overload.

Observation: Emotional meltdowns often coincide with attention loss; parents express helplessness and guilt. Emotional safety and calming transitions are key.

Case connection: HealthXR incorporates breathing and relaxation modules; Maestro reinforces positive feedback loops.

Design implication: Introduce an “emotional regulation layer”—breathing guides, cooldown phases, and gentle feedback instead of punitive systems.

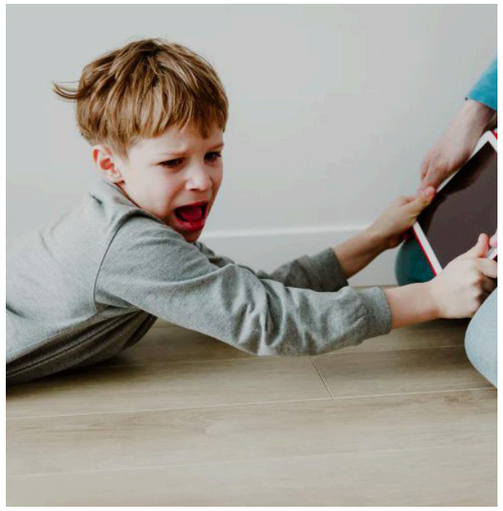
Attention training must integrate emotional co-regulation.

Observation: Continuous homework monitoring exhausts parents; they desire a way to observe progress without constant intervention.

Case connection: Fortnite’s parental dashboard and EndeavorRx’s clinical data interface show models for co-monitoring.

Design implication: Develop a parent dashboard that visualizes progress trends, focus duration, and emotional stability—turning supervision into collaboration.

Parents seek partnership, not supervision.



Symbolic and narrative structures sustain long-term motivation.

Observation: Children engage longer when training tasks carry story or role identity (artist, hero, explorer). Abstract repetition leads to boredom.

Case connection: Maestro uses the “orchestra conductor” role to create symbolic mastery; Beat Saber turns rhythm into empowerment.

Design implication: Embed a narrative of progression and mastery, using metaphors (e.g., garden growth, music conduction, or wonderland exploration) to make progress emotionally meaningful.

Guidelines

The guidelines set the boundaries and direction for our design.

Based on the insights from user interviews, personas, and case studies, five design guidelines were developed to transform research findings into actionable principles for the VR-based attention training system.
These guidelines aim to create an experience that is engaging, emotionally supportive, and ethically safe — balancing fun, therapeutic intent, and inclusivity for children with ADHD.

01

Core Vision & Functional Goals

Balance fun and therapy. The system should integrate engaging gameplay with clear therapeutic purpose. Activities must be short, modular, and repeatable to prevent fatigue and sustain motivation, while offering positive, immediate reinforcement instead of punishment.

Interaction & Gameplay

02

Design simple, intuitive gestures (reaching, balancing, rhythm tapping) that encourage body movement without overwhelming users.
Support multisensory immersion with light and sound cues to guide attention, while avoiding over-complex interfaces that could raise cognitive load.

03

Emotional & Cognitive Support

Create a safe but stimulating environment, where structured visuals and rhythmic flow help maintain focus.
Integrate breathing or rhythm-based regulation to reduce stress, and allow users to adjust sensory intensity based on comfort and emotional state.

Accessibility & Personalization

04

Implement adaptive difficulty so task complexity scales with user performance.
Provide parent and teacher dashboards for monitoring progress and feedback.
Sessions should remain flexible in duration and allow personalization of feedback style or pace.

05

Symbolic & Narrative Dimension

Use storytelling and symbolism to turn training into a journey of growth.
Reinforce self-efficacy through progressive achievements, embed social interaction opportunities within safe boundaries, and value creativity and collaboration as integral to focus and self-regulation.

04
CONCEPT

Game Concept

Introducing the core idea of a VR journey that turns attention training into an immersive, story-driven experience.

Focus Garden

Focus Garden is a virtual reality experience designed to enhance sustained attention and emotional regulation in children with ADHD. Inspired by Lewis Carroll's Alice in Wonderland, the project reimagines the classic tale as a metaphorical journey through focus, distraction, and balance. Within this symbolic world, every spatial and interactive element represents a psychological transition—from overstimulation and chaos toward calm and controlled awareness.
The concept transforms attention training into an immersive narrative of self-discovery. Each environment—Rabbit Hole, Tea Party, and Calm Forest—embodies a distinct cognitive and emotional stage. Through rhythm, puzzles, and breathing-based interactions, players learn to synchronize perception, action, and emotion while exploring an imaginative, multisensory landscape.

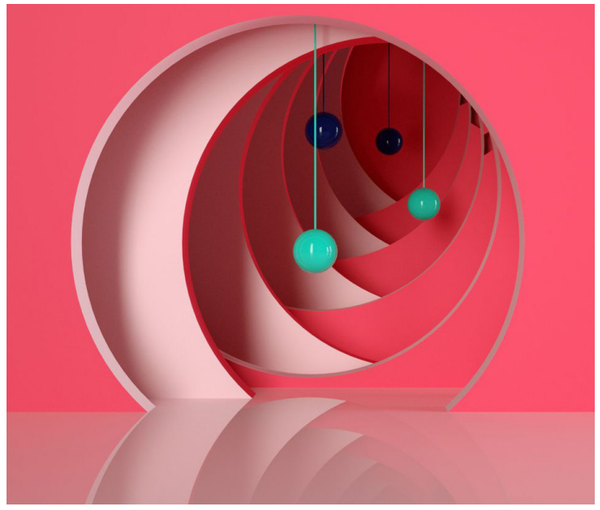
Game structure

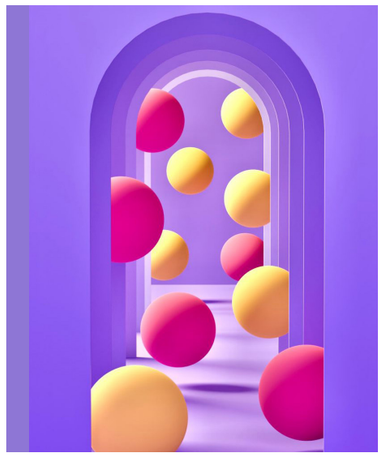
Story	"Falling into the Rabbit Hole"	"The Mad Hatter's Tea Party"	"Conversation with the Caterpillar"
Space	Tunnel	Open tea room	Calm forest
Play	Rhythm Game	Puzzle Game	Breathing Training
Goal	Practice reaction timing and temporal awareness	Improve concentration and reduce distractibility	Promote emotional balance and stress reduction

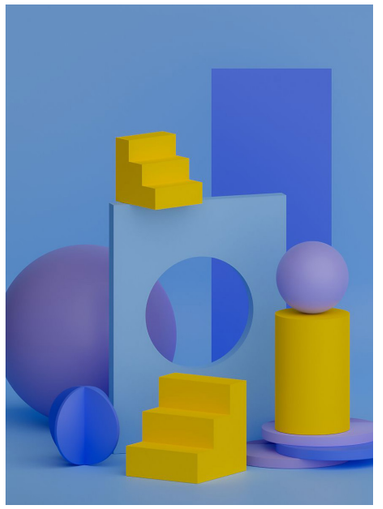
Moodboard

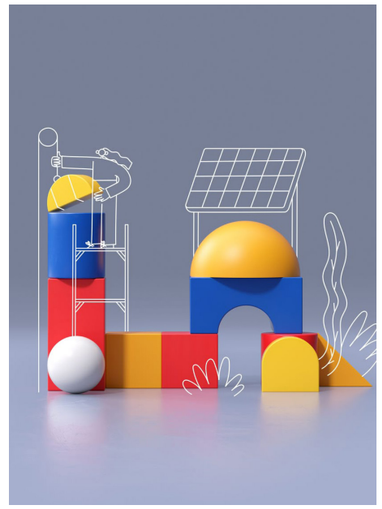
Gathering visual cues that shape the mood and style of the project.

The moodboard gathers a collection of visual references—including colors, compositions, textures, lighting styles, and symbolic imagery—that shape the atmosphere of Focus Garden. These images serve as an early exploration of the emotional tone and aesthetic identity of the VR experience, helping to establish a coherent visual language across the three environments: Rabbit Hole, Tea Party, and Calm Forest.







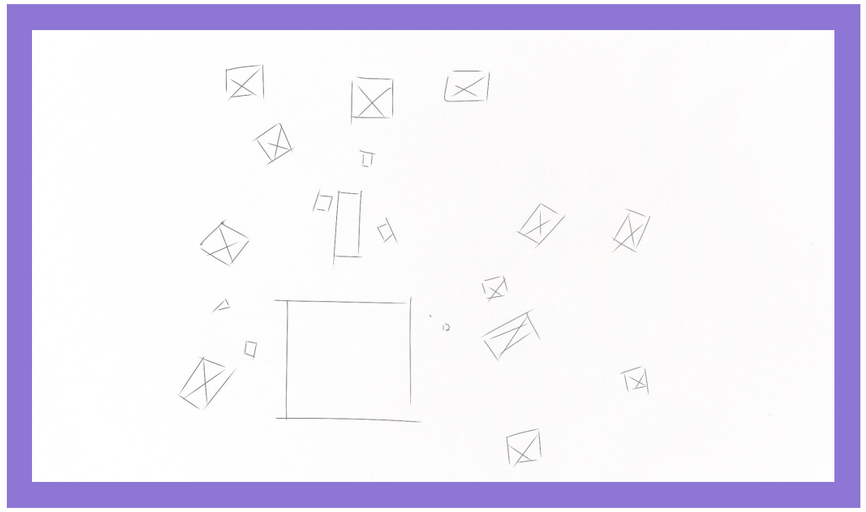


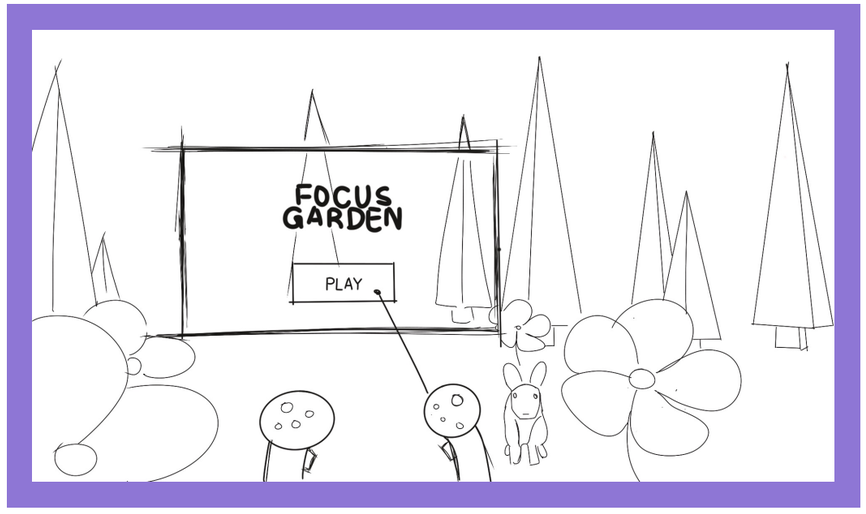
05
PROJECT

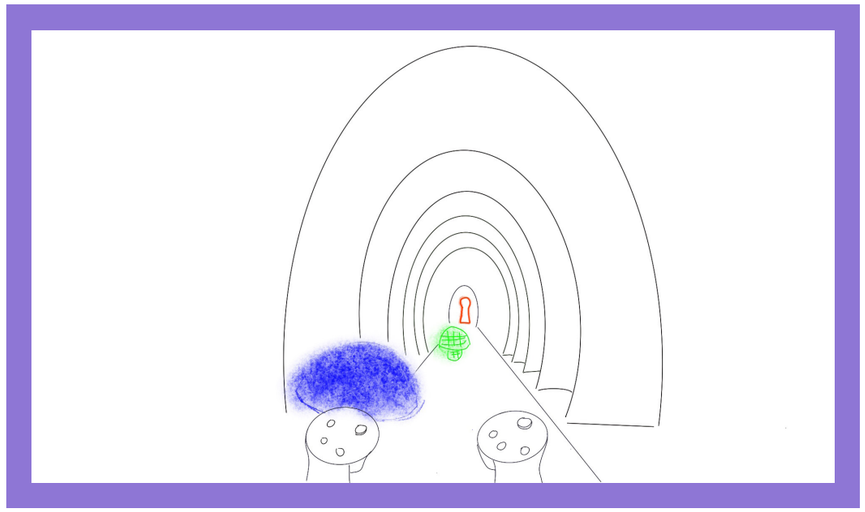
User Experience

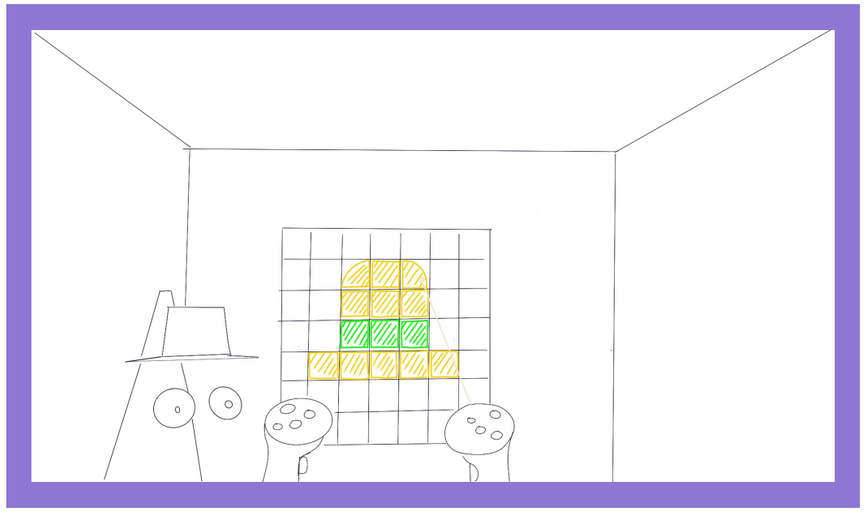
Story, Mechanics, Interaction

Storyboard



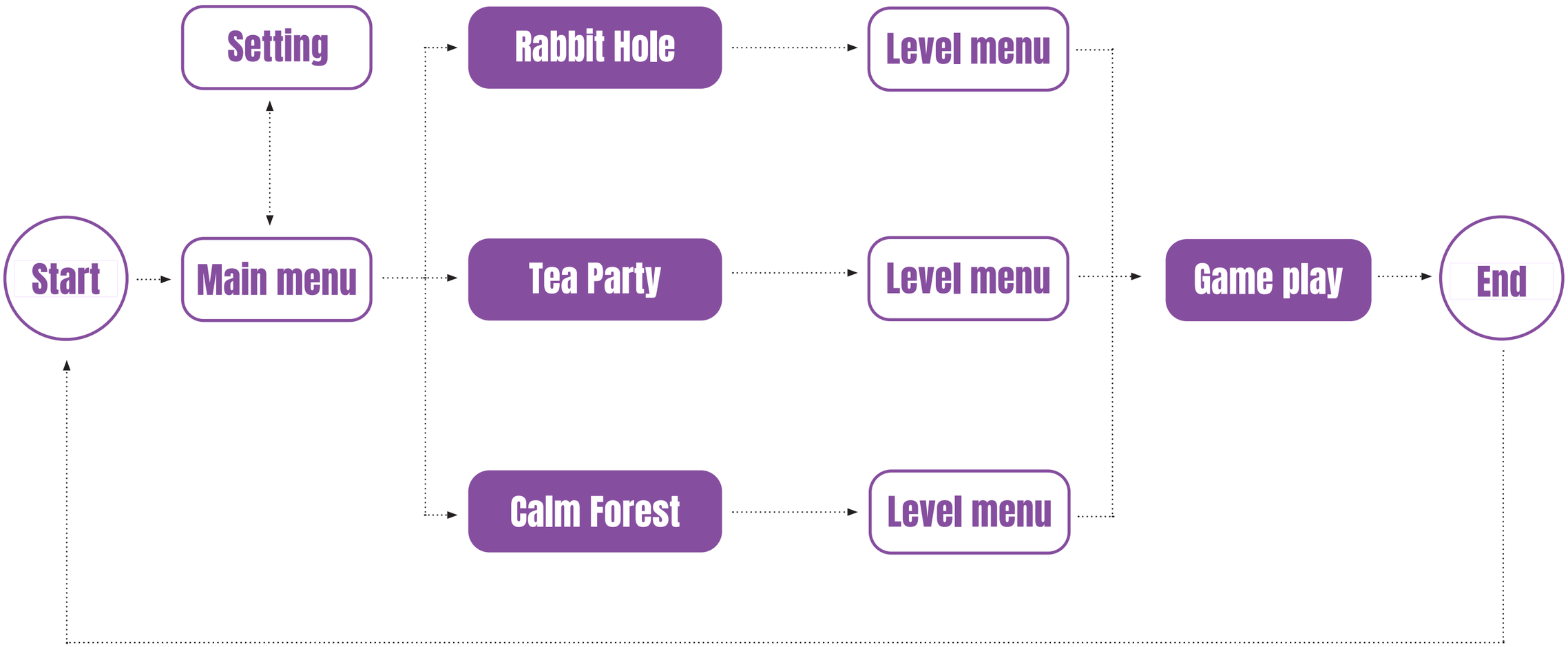






Game Structure

How players move through the main menus, levels, and core gameplay.



Visual Design

Establishing a clear visual identity through type, color, and geometric forms.

TYPOGRAPHY

Space Grotesk

ABCDE FGHIJ KLMNO
PQRST UVWXYZ
abcde fghij klmno
pqrst uvwxyz
1234567890
!@£$% &*()+ ---—“” ‘’?/

COLOR

# 8D75D4	# 723988
# FFF100	# 67D8FA
# 1CBB9E	# D47595

LOGO

FOCUS GARDEN

GEOMETRIC

3D Environment

Presenting the main 3D spaces created for the VR experience.

HOME ENVIRONMENT

RABBIT HOLE

TEA PARTY

CALM FOREST

Home environment

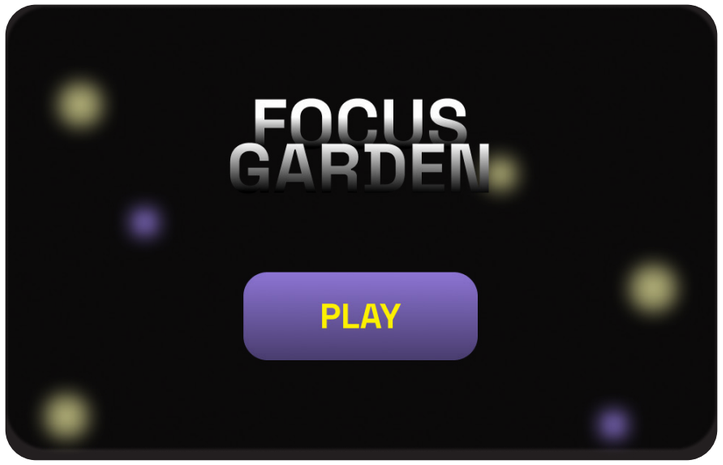
Skybox

Home

The Home environment skybox uses a warm sunset palette to create a welcoming and reassuring introduction to the VR world. Soft orange clouds blend into a calm blue horizon, providing a gentle transition before players enter the more task-focused training scenes. This atmosphere helps children settle emotionally, offering a sense of safety and curiosity as they begin their journey in Focus Garden.

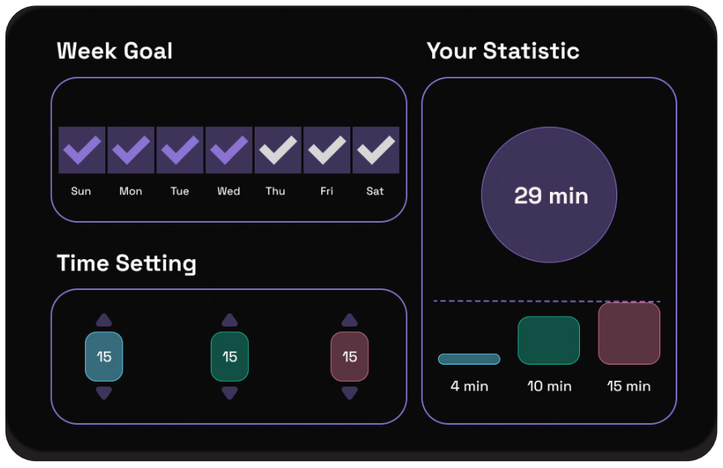
GUI design

Start

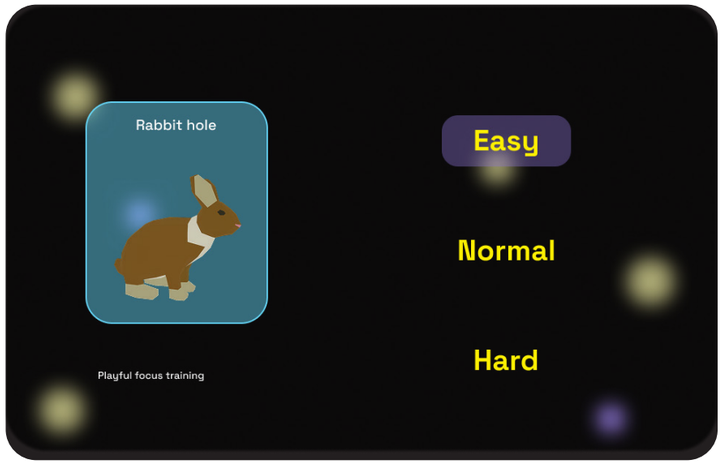


Main menu

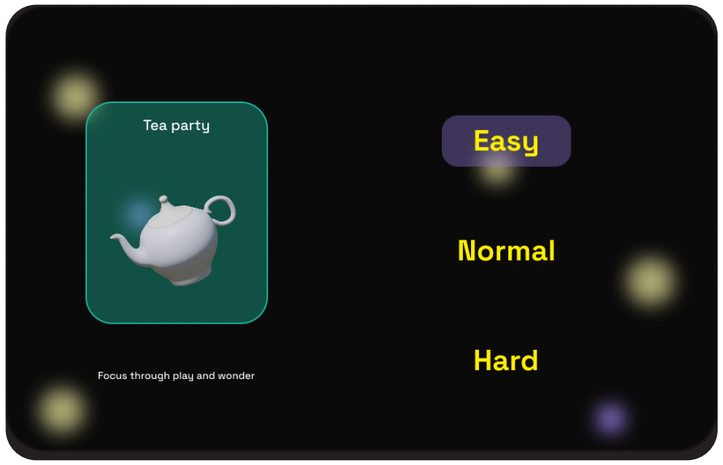
Setting



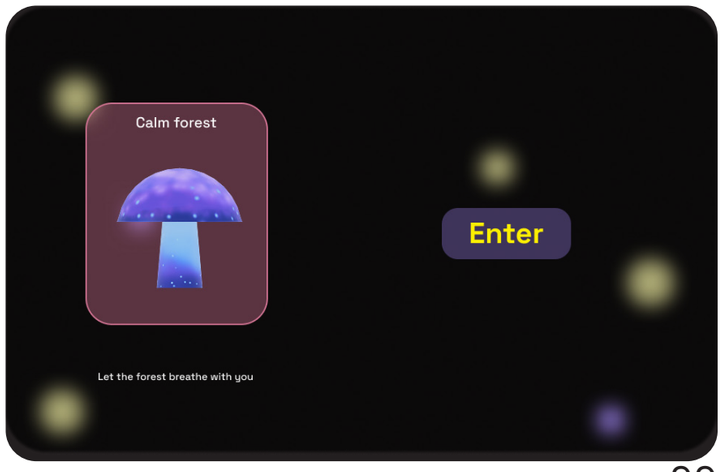
Level



Level



Level



Rabbit hole environment

Skybox

Rabbit hole

The skybox for the Rabbit Hole scene is designed to create a sense of depth, mystery, and gentle disorientation. Its glowing central light and scattered particle effects evoke the feeling of being drawn into an unknown but inviting dimension. The soft gradients and floating orbs guide the user's attention toward the center, reinforcing the scene's metaphor of focus, curiosity, and controlled immersion.

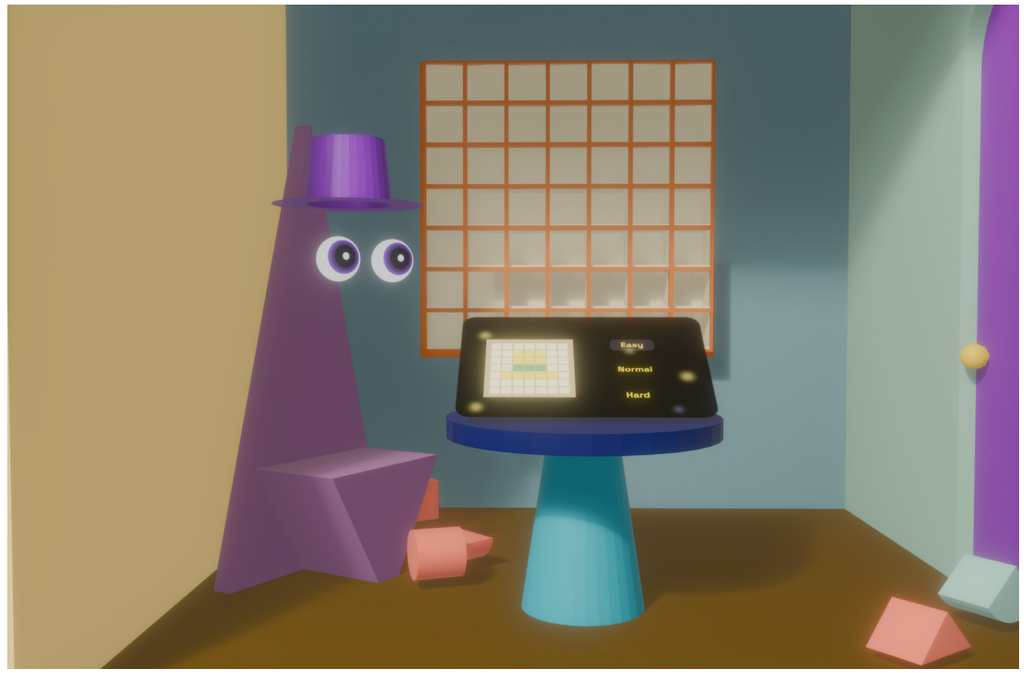
Tea party environment

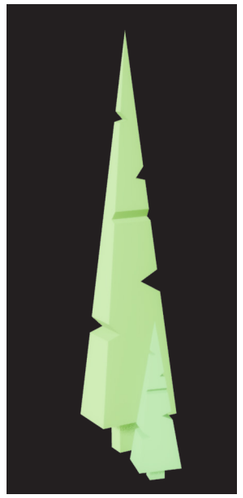
Skybox

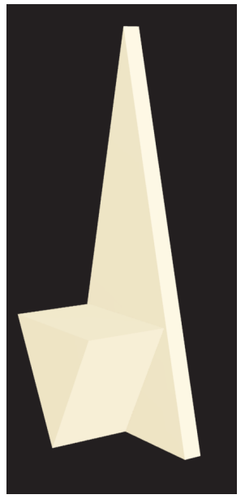
Tea party

The Tea Party skybox is designed to create a playful yet calm environment, using soft gradients and warm pastel tones inspired by a surreal afternoon sky. The expansive clouds and open horizon evoke a sense of spaciousness that supports attention tasks without overwhelming visual complexity. This minimal, whimsical atmosphere mirrors the unpredictable yet gentle nature of the Tea Party scene, helping maintain engagement while avoiding overstimulation for children with ADHD.

3D elements



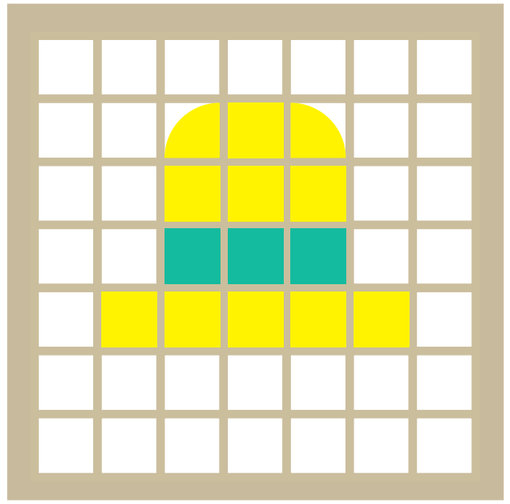




Puzzle design

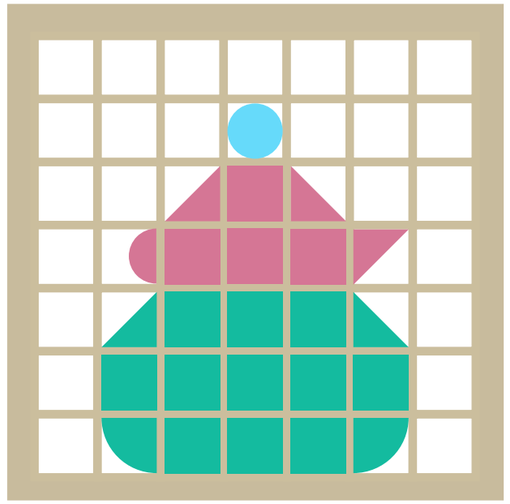
Easy

Collect 2 simple geometric objects in the scene to complete a puzzle.
all objects can be found indoor



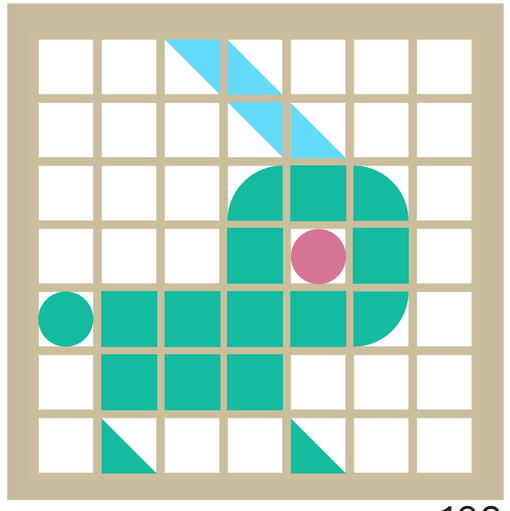
Normal

Collect 4 geometric objects to complete a puzzle.
Objects are mainly found inside the room and around the outdoor table.



Hard

Collect more than 4 geometric objects to complete a puzzle.
Objects are widely distributed across the space.

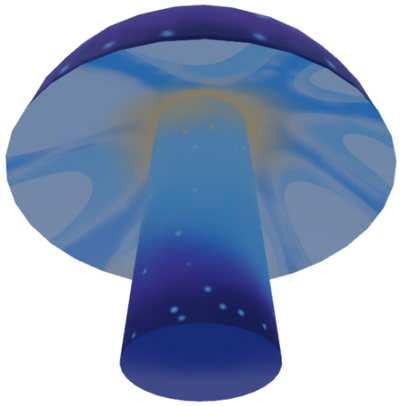


Calm forest environment

3D elements

Texture

The textures for the 3D elements were designed to support the minimal, calming aesthetic required for ADHD-friendly environments. Soft gradients, low-contrast color transitions, and subtle dotted patterns were used to create a sense of depth without visual overload. Each texture avoids sharp edges or excessive detail, ensuring that the environment remains soothing and easy to process during gameplay.



Glowing highlights and gentle color shifts are added selectively to guide attention—particularly for interactive objects such as mushrooms or dynamic elements. These light-based cues help children intuitively understand which objects are important, supporting focus training while maintaining an immersive, dreamlike atmosphere.

Skybox

Calm forest

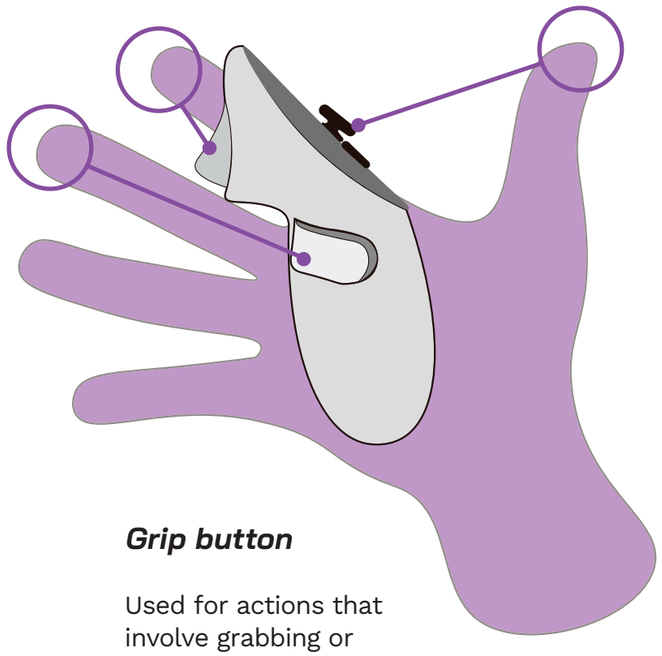
The skybox for the Calm Forest scene is designed as a soothing, immersive backdrop that supports emotional regulation and sustained attention. The gradient night sky, soft cloud shapes, and scattered light particles create a peaceful atmosphere without visual overload. The simplified silhouettes of trees and the wide horizontal layout help maintain clarity in VR, reducing distractions while guiding the user's focus toward breathing and rhythm-based interactions. This minimal aesthetic ensures that the environment remains calming, supportive, and functionally aligned with the goals of attention training.

Interaction Prototype

Showing the controller and hand-tracking interactions used in the VR experience.

Trigger button

Used to trigger primary actions such as shooting or confirming.



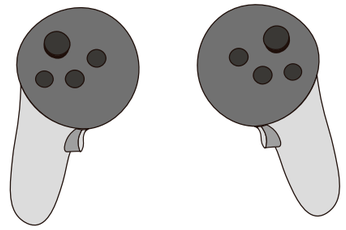
Thumbstick

Used to control movement or directional navigation.

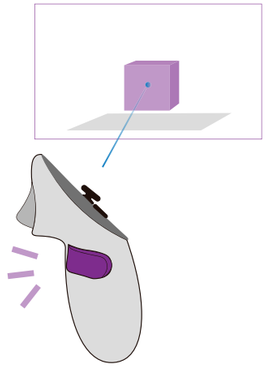
Grip button

Used for actions that involve grabbing or holding objects.

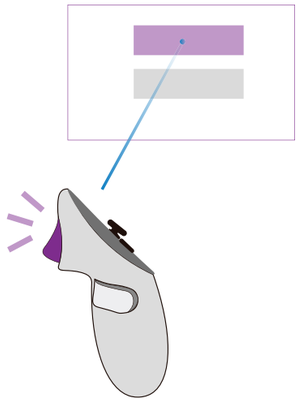
CONTROLLER



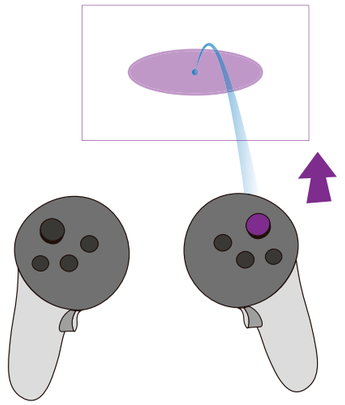
while holding the controller, touch interactive objects



Hold the grip button to grab interactive objects



Press the trigger button to select interface elements

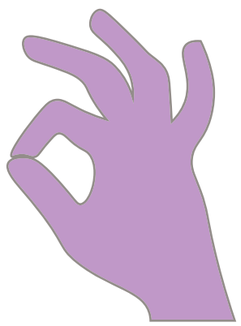


Thumbstick forward or backward to move forward or backward, and push it left or right to rotate the view

HAND GESTURE

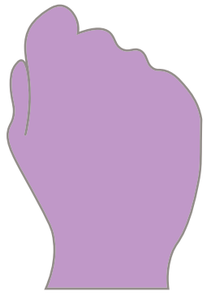
Pinch

The pinch gesture is made by touching the thumb and index finger together while keeping the other fingers extended.
A pinch can be used to select when the fingers make contact, or to manipulate objects by maintaining the gesture and moving the hand.



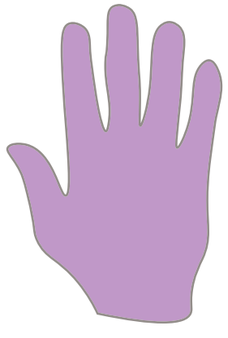
Grab

The grab gesture is performed by placing your hand in front of the camera and closing your fist. This gesture is used to grasp and manipulate nearby volumetric objects.

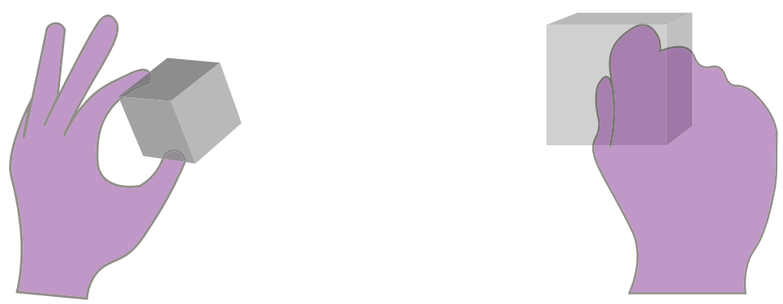


Open hand

The Open-Hand gesture is a neutral pose, performed by extending the hand with the fingers spread and the palm facing away from the camera. It is typically used to activate a raycast for interacting with distant elements. This gesture can be used to display the raycast or to release objects.

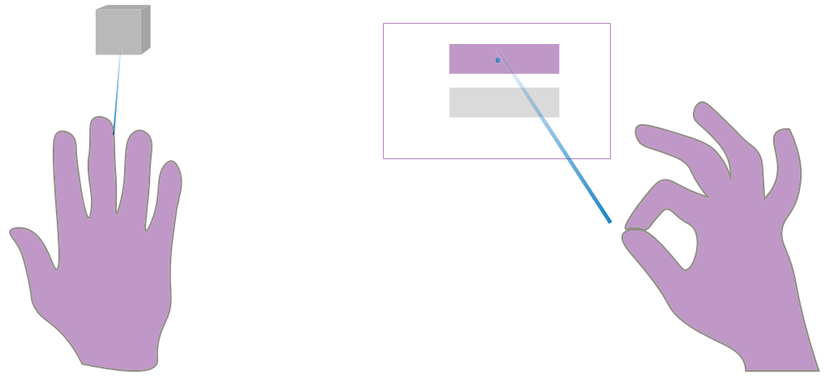


Proximal Interaction



Pick up and release objects using a thumb–index pinch, or by grabbing with a closed fist.

Distal Interaction

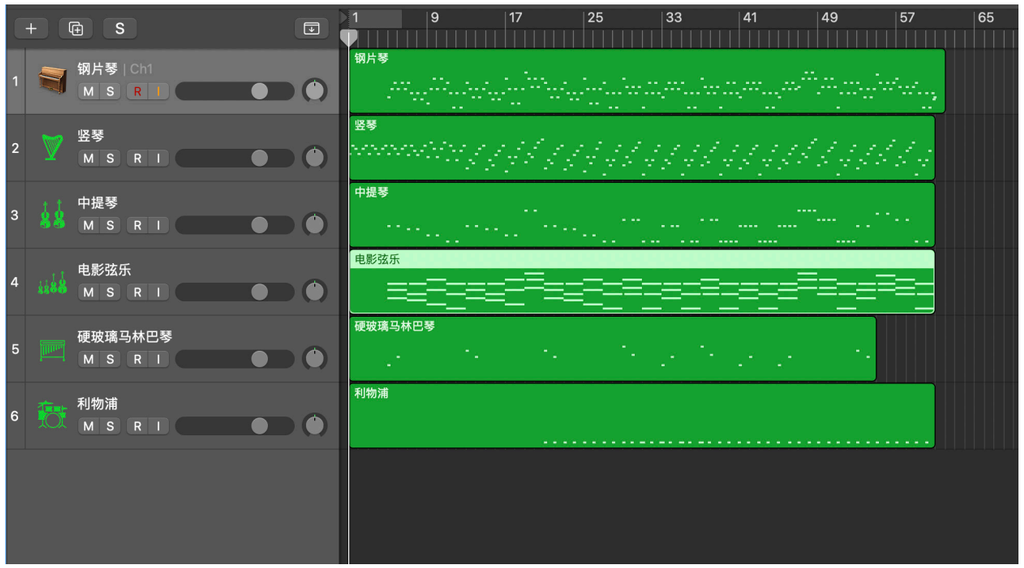


To use the distal interaction feature, users must bring a hand into the headset's field of view. When detected, a ray that allows to aim at interactable objects appears. The reticle at the end of the ray allows users to target and refine the precision of the interaction. The pinch gesture activates the selection to manipulate the targeted object.

Music Production

Original music composed for the VR experience.

Produce original music with Logic Pro



First music

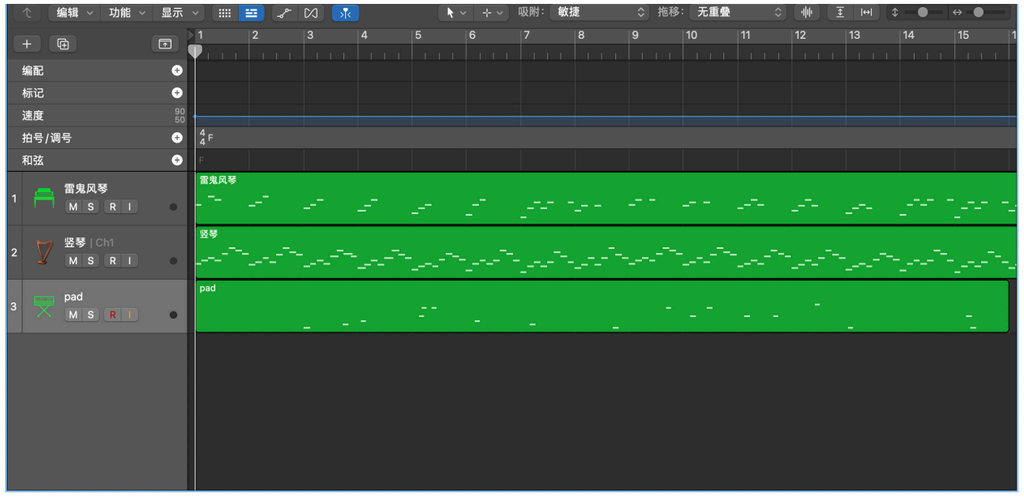
The first piece was composed to support rhythm-based attention training, in the Rabbit Hole. The track uses a 6/8 meter with lightweight percussive accents to provide clear temporal cues that guide users' reaction timing. the music combines light percussive textures with plucked synthesizers and harp-like timbres, creating a playful yet structured sound environment.

This rhythmic design mirrors the whimsical instability of Wonderland while maintaining a stable cognitive anchor, ensuring that the soundtrack enhances both narrative immersion and attention engagement.

Second music

The second music employs long sustained pads, soft plucked tones, and minimal melodic movement, allowing the rhythmic simplicity of 4/4 to function as a gentle anchor for the user's breath. By avoiding strong accents and maintaining an even pulse, the composition minimizes cognitive load and encourages a calm, meditative state.

This auditory design effectively transforms the breathing exercise into a soothing sensory experience, helping children regulate arousal levels and achieve physiological balance within the VR environment.



06
CONCLUSION

Feedback

Follow-up Interview Findings

Follow-up Interview with Parents

To further validate the early design directions identified in the initial interviews, a follow-up session was conducted with the five parents previously involved in the study. The goal of this session was to verify whether the visual concepts, narrative flow, and interaction structure aligned with their expectations and with the needs of children with ADHD.

During this session, parents were presented with:

Environment	Video	Intentions
Updated 3D environment and visual concepts	A short video demonstration illustrating the intended gestures, object interactions, and pacing of each module	An overview of the therapeutic intentions behind each task (attention shifting, visual search, breathing regulation)

General Reactions

Parents' responses remained highly consistent with their earlier impressions:

Simplified visuals were described as less distracting and friendlier for younger children.

The narrative framing (Alice-inspired symbolic journey) was perceived as motivating and emotionally comforting.

Parents felt the metaphorical environments (tunnel, tea party, forest) created a low-stress atmosphere that could potentially reduce resistance to training.

The rhythmic pacing of tasks seemed easy for children to follow, especially compared to rigid traditional training exercises.

Perceived Limitations of Concept-Only Evaluation

Despite the positive reactions, parents emphasized that their feedback was inherently limited because the demonstration was video-based rather than interactive. Without experiencing real-time gestures, object manipulation, and rhythm-based responses, it was difficult for them to fully evaluate:

01 Usability	gesture comfort, clarity of instructions
02 Physical	motion sickness, headset fatigue
03 engagement	Sustained engagement across repeated sessions
04 Cognitive	Cognitive load during fast or multi-step tasks

Conclusion

Summarizing the project's outcomes, user reflections, constraints, and next steps.

Restate the aim

This thesis explored how virtual reality can support attention training in children with ADHD through game-based, emotionally engaging experiences. Using literature review, parent interviews, and case studies, the research identified key principles that informed the creation of Focus Garden, a VR prototype inspired by Alice in Wonderland. The project combines human-centered design with immersive storytelling to propose an approach for designing therapeutic VR learning environments.

Interview Feedback

In a follow-up session, parents were shown updated visual concepts and a video demonstration of the intended interactions. Their reactions were consistent with earlier impressions: the simplified visuals, narrative structure, and rhythmic pacing were viewed as engaging and easy for children to follow. Parents also noted that the metaphorical environments felt less stressful than traditional training tasks and could potentially reduce resistance.

However, they emphasized that their feedback was limited to conceptual and video-based presentations, making it difficult to judge usability, comfort, or sustained engagement without a fully interactive build. Several parents expressed interest in seeing how children might respond once real-time gestures and object interactions are implemented. This follow-up feedback underscores the need for future testing with children and therapists and highlights the importance of completing full interactivity before evaluating effectiveness.

Limitations

The prototype was developed and tested primarily from a design perspective rather than through clinical validation. The sample size of interviews was limited to parents, without direct participation of children or therapists.

Preliminary informal feedback from parents and educators indicated that the visual simplicity, symbolic storytelling, and rhythmic interaction concepts were perceived as promising for supporting children's focus and emotional engagement. However, these responses reflect design-oriented impressions rather than cognitive or therapeutic outcomes.

Due to time constraints, the interactive components of the VR prototype were not fully implemented. Only partial feasibility tests were conducted, and the interactive experience was presented through video-based demonstrations rather than a fully functional build.

Future Development

Building on these reflections and limitations, several directions emerge for future development. Future work should focus on expanding the prototype into a fully interactive VR experience with real-time gestures, object interaction, and adaptive feedback. Completing the technical implementation will allow the system to function as a playable and testable training tool.

Further studies should involve children, therapists, and educators to evaluate usability, emotional comfort, and attention-related outcomes. Direct testing will provide essential evidence about how well the system supports real cognitive improvements.

Additional levels, simplified visual environments, and metaphor-driven worlds can further enhance immersion without overwhelming the user. Expanding the narrative will allow the training journey to grow with the child's attention development.

Bibliography

Salari, N., Ghasemi, H., Abdoli, N., Rahmani, A., Shiri, M. H., Hashemian, A. H., ... & Mohammadi, M. (2023). The global prevalence of ADHD in children and adolescents: a systematic review and meta-analysis. Italian journal of pediatrics, 49(1), 48.

Liu, A., Xu, Y., Yan, Q., & Tong, L. (2018). The prevalence of attention deficit/hyperactivity disorder among Chinese children and adolescents. Scientific reports, 8(1), 11169.
National Center for Health Statistics. (2024, March). Number 499 – Prevalence of ever diagnosed ADHD among children ages 5–17 years: United States, 2020–2022 (Data Brief No. 499). U.S. Department of Health and Human Services.

Cunha, F., Campos, S., Simões-Silva, V., Brugada-Ramentol, V., Sá-Moura, B., Jalali, H., ... & Trigueiro, M. J. (2023). The effect of a virtual reality based intervention on processing speed and working memory in individuals with ADHD—A pilot-study. Frontiers in Virtual Reality, 4, 1108060.
Parsons, T. D., & Phillips, A. S. (2016). Virtual reality for psychological assessment in clinical practice. Practice Innovations, 1(3), 197.

Hamari, J., Koivisto, J., & Sarsa, H. (2014, January). Does gamification work?--a literature review of empirical studies on gamification. In 2014 47th Hawaii international conference on system sciences (pp. 3025-3034). Ieee.