Focus

DET 2019 Project 03

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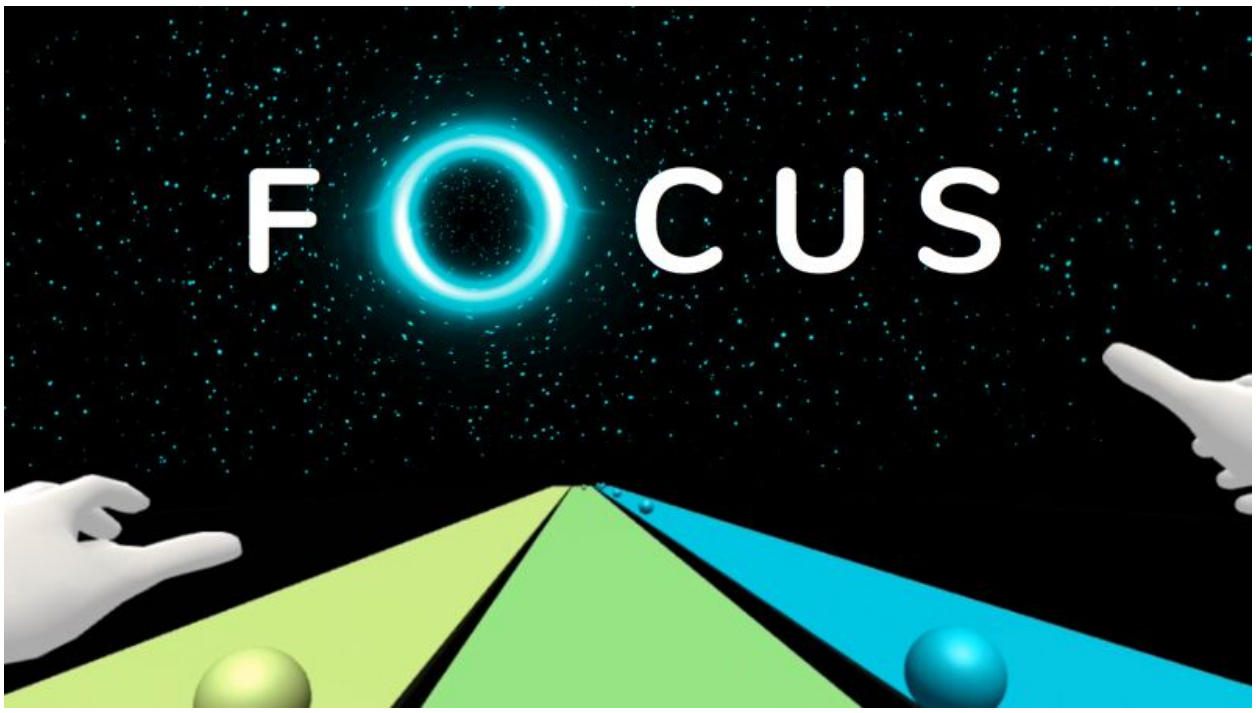


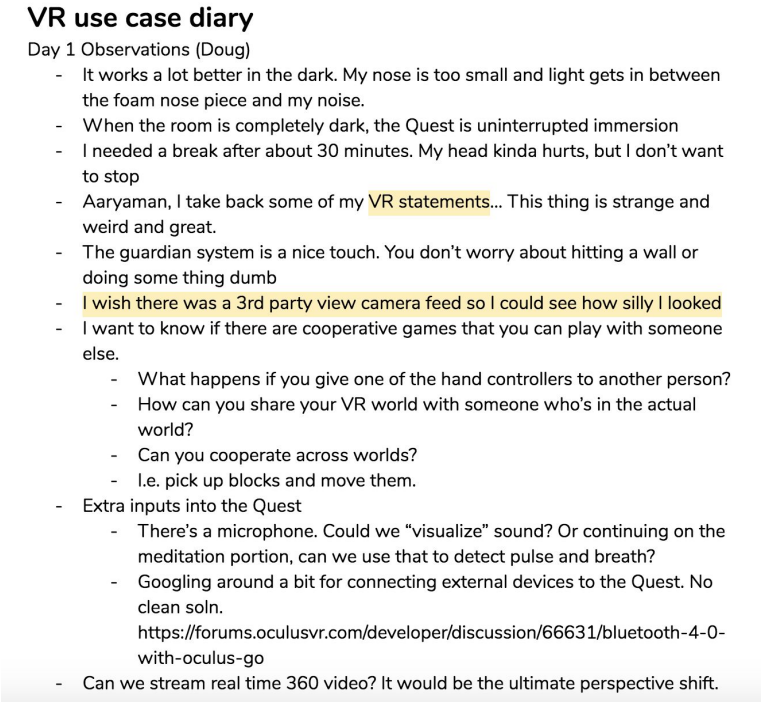
Introduction

FOCUS is a guided meditation application that helps users focus better using VR. It helps users practice mindfulness by providing haptic cues for breathing while distracting them with a simple task of rolling balls based on color. This combination is a key element for achieving meditative flow states in practices such as yoga. FOCUS examines the power of VR to improve introspective and to eliminate effects sensory stimuli. It is designed to be a modern form of meditation suited to the elevate concentration traits of people who are distracted by an overload of information.

Ideation

Exploration

We started by spending a few days brainstorming ideas individually. We also familiarized ourselves individually by taking turns on experimenting with the headset at home. We aimed to keep a VR use case diary to take notes of our experience, including observations, limitations and the capabilities of the headset and controllers.



VR use case diary

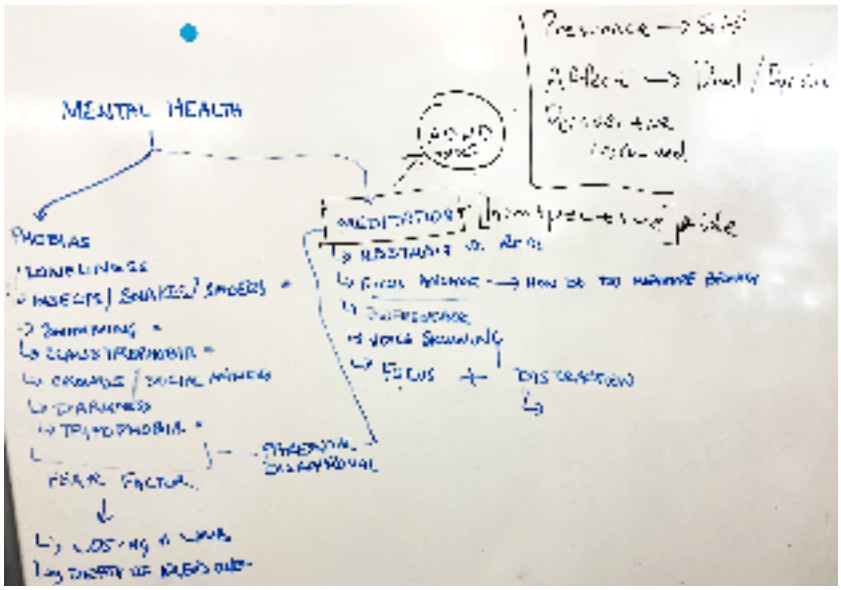
Day 1 Observations (Doug)

- It works a lot better in the dark. My nose is too small and light gets in between the foam nose piece and my noise.
- When the room is completely dark, the Quest is uninterrupted immersion
- I needed a break after about 30 minutes. My head kinda hurts, but I don't want to stop
- Aaryaman, I take back some of my VR statements... This thing is strange and weird and great.
- The guardian system is a nice touch. You don't worry about hitting a wall or doing some thing dumb
- I wish there was a 3rd party view camera feed so I could see how silly I looked
- I want to know if there are cooperative games that you can play with someone else.
    - What happens if you give one of the hand controllers to another person?
    - How can you share your VR world with someone who's in the actual world?
    - Can you cooperate across worlds?
    - I.e. pick up blocks and move them.
- Extra inputs into the Quest
    - There's a microphone. Could we "visualize" sound? Or continuing on the meditation portion, can we use that to detect pulse and breath?
    - Googling around a bit for connecting external devices to the Quest. No clean soln. https://forums.oculusvr.com/developer/discussion/66631/bluetooth-4-0-with-oculus-go
- Can we stream real time 360 video? It would be the ultimate perspective shift.

VR Use Case Diary

After everyone had gained some experience with the Quest, we came together in a group meeting to share our experiences and find common patterns in our ideas. As a result, we found that all of us were interested in mental health related subjects. Among this category, several topics we were most interested in exploring include:

- Helping people overcome phobias (claustrophobia, loneliness, trypophobia, etc.)
- Visualizing meditation experiences (e.g. measure and present breathing pattern)
- Helping people to manage symptoms of ADHD



Group Brainstorming Session

Concept Development

Debating between these three ideas, we started researching academic papers and looking into existing VR products related to these topics. Considering both our interests and feasibility within the time limit, we decided to focus on the meditation concept. During the next brainstorming session, we found a new possibility to merge the meditation concept and the focus concept into one idea: to develop a meditation tool to help people practice their ability to focus.

First we explored one of the most common reasons for having trouble focusing, ADHD. However we realized this was a sensitive and difficult topic to address since the experience can be vastly different for each individual. As an example, there are three classifications of ADHD: hyperactive-impulsive, inattentive, and combined. The experience becomes more complex as these classifications each come with unique symptoms. The challenge became more apparent when one of our team members who experiences symptoms of combined type, made an effort to familiarize us with her experience. It was at that point that we decided to pivot from centering perspective around ADHD and instead tried to make an effort to make an application that not only

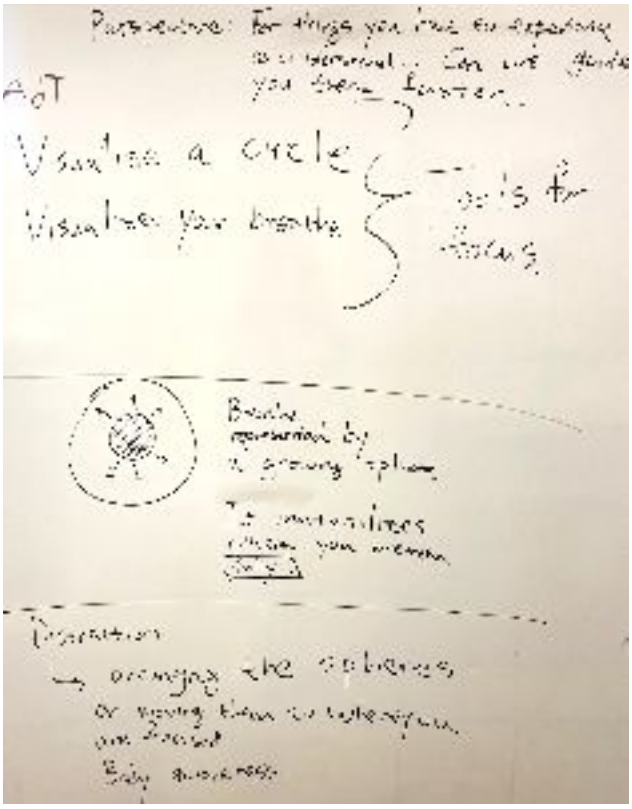
serves those who want to manage symptoms of ADHD, but also people who have difficulty focusing and meditating in a broader sense.

We drew inspiration from one of the most popular forms of eastern meditation: yoga. We broke down the process of yoga into two key components: a focus anchor (your breathing) and an activity that helps you achieve a state of flow (the exercise.) We wanted to design our system to mirror this, combining both elements to create a meditative experience. From looking at our own meditation experiences and those of our friends, we noticed that many forms of meditation ask the user to visualize a point of focus and sit still while trying to collect their thoughts. This proved to be difficult not only anecdotally, but also in research we looked at. We wanted to make the focus point very explicit to improve this experience. We also wanted to design an active meditation so as to target the issue of restlessness in still meditations.

Existing VR meditation tools also usually guide users to meditate in an immersive landscape with soothing sound. However, we envision to guide our users to meditate in a dark environment with minimal distraction to catch their attention. We wanted to introduce a glowing circle as the visual representation of user's breathing cycle.

Key Interactions

1. *Breath Measurement* - During the ideation phase, we thought that measuring and representing the user's breath was critical. Displaying a target breathing pattern and the user's actual breathing pattern at the same time would encourage the user to match the target breathing pattern.
2. *Physical Distraction* - Similarly, we wanted to create a target motion for each of the controllers to follow. This means that the user would have to focus on both breathing and moving their body.



Group Brainstorming Session

First Iteration

Group Roles

We divided our first iteration into separate tasks. Doug researched how to track and visualize breathing - if it was not feasible in the given time frame, we would need to pivot. Tina worked on creating a glowing ring in unity to represent breathing. Yejun focused on collecting and importing relevant assets online. Aaryaman figured out how to generate cubes and new object instances within Unity.

Track and Visualize Breathing

Doug took two approaches to breath tracking. The first was to look at existing devices on the market, and figuring out how to incorporate the device output as input into the Unity environment. Although there were many such devices on the market, he could not find a working solution for transferring data in our specific situation. The data

would need to go from USB-serial to bluetooth and communicate in real time with the Oculus Quest.

The second approach was to use the Oculus Quest controllers as a displacement sensor on the user's diaphragm. He worried about the sensitivity of the displacement data and wanted to physically magnify the displacement so he created a horizontal lever. One side was connected to the chest, the other held an Oculus controller.

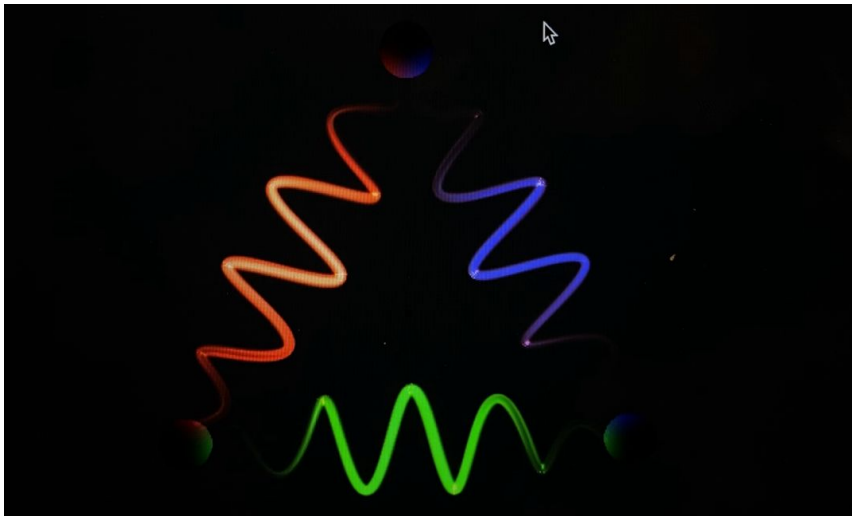
Magnifying displacement with a lever

This approach was abandoned because it was uncomfortable to use and distracted the user too much. We additionally tried strapping the controller directly to the chest with an elastic belt. However, we could not get displacement information from the controller, even though it was being tracked very nicely by the headset. After these efforts, we decided to eliminate breath tracking as a method of interaction.

Sewing together an elastic belt with velcro to hold the Oculus in place

Visualize Breath in VR

Initially we wanted to visualize breath as glowing line waves surrounding the user, so we researched existing line waves assets in Unity asset store and found something that matched our expectations. However, when we imported that asset and tested it out in the VR environment, we found it could actually become a source of distraction, because users are likely to constantly turn their heads around to watch the entire wave moving around them. It turned out to make us abandon this line wave idea and start brainstorming for other visual representations of breath in VR.



Glowing line wave asset from Unity Asset Store

We then agreed to visualize breath by a glowing breathing ring in darkness. With the glowing breathing ring in front of them, users would be able to focus on their breathing with minimal movement. This was achieved by arranging particle systems in a circle and looping generation of them and assigning color to different stages of their lifetime.

Grabbing Objects with Controllers

We used the built-in Oculus scripts for OVR Grabber and OVR Grabbable to make the cubes grabbable. We had some trouble with this step, but worked through it by modifying our colliders. We learned how to generate grabbable objects by creating a controller and tying it to the script.

Testing the grabbing function

Unity Onboarding

Learning Unity was a challenge. It was difficult to modify existing scenes like the one that Adam demonstrated in class, and it was also difficult to create new scenes from scratch following the official tutorials from Oculus and Unity and video tutorials from youtube. Most tutorials were written for the Rift and Go, or earlier versions of Unity or different versions of the Oculus integration. We struggled with basic implementation of grabbing and grabbable objects.

After we spent a long period of time on picking up a block, we discovered a basic Oculus Quest “Hello World” tutorial. https://github.com/Corysia/Unity-Oculus-Example. It helped us understand objects and object interaction, and how interactivity is added on layer by layer.

One of the key realizations was that the Unity interface is a mix of click and drag programming with hard to discover key parameters in form of check boxes. For example, if one implements a collider and do not check “is a trigger”, they won’t be able to grab objects.

We constantly referred to this tutorial, because the step by step process of adding objects, adding a player, and lastly adding interactivity helped us troubleshoot the main problems.

Besides the Unity Asset Store, we also found Google Poly really helpful for us to import free 3D assets to our scenes to test different possibilities. We all installed the Poly Asset API in Unity to quickly search and import assets.

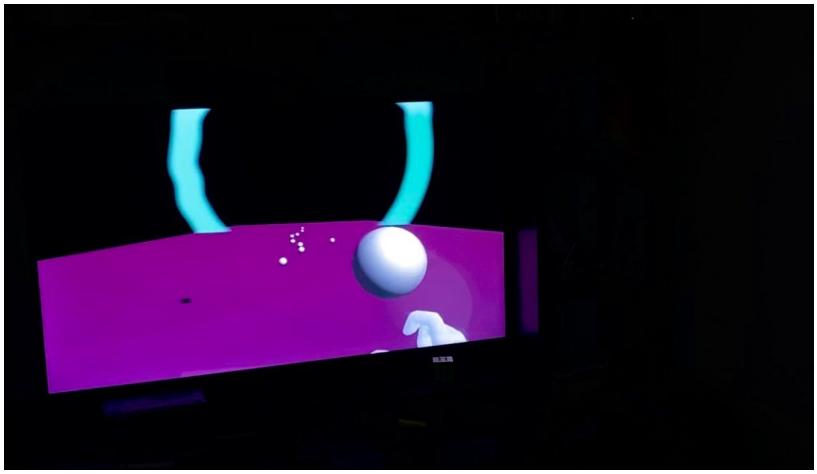
Randomly Falling Objects

We used the Instantiate function in Unity as well as in-game timer to create blocks every 5 seconds. We placed them at a height to create a visually appealing aesthetics that made it look like they were dropping into this world from the sky. We also added a random element to spread the cubes across our playing field.

Second Iteration

First Scene

Built upon what we learned from the first exploration, we created our first scene. Facing a giant breathing ring, users can catch a falling sphere every two seconds and throw it into the breathing ring. We also found it quite meditative to watch the spheres slowly falling down through the incline and gradually disappear in the darkness.



Throwing balls into breathing ring

Scoreboard

During the second iteration, we wanted to incorporate some idea of progress and implemented a scoreboard. The scoreboard helped keep track of time and how many cubes we picked up and instantiated. However, we were not able to fully incorporate it into the world. Text in VR can be part of some of some user interface similar to a heads up display, or they can be part of the world and the world's objects.

However, implementing a scoreboard was very helpful. It was the only way that we could gain insight into the running instance of the APK, so we used it as a console and would "print" values to it as a way to debug scripts that were not working correctly.

Final Design

Converge to one concept

Our work until this point followed the theme of meditation, but there were several critical assumptions that proved to be incorrect. First, we were not able to map the user's breath in real time and needed to implement some way to help the user pay attention to their breathing. Second, we wanted to visualize breathing as an expanding and contracting ring, but it forced the user to constantly break their visual focus from the act of sorting colored balls. Lastly, we thought the experience would be intuitive and natural. However, even the act of transitioning from the actual world to the virtual one was disorienting. We needed some sort of guide.

Our final concept addressed all three of these faulty assumptions.

Repetitive Activity as a Fidget to Focus

Studies have found that people who have trouble focusing typically find a fidget (such as a spinner) to engage in repetitive activity to help them better concentrate on their work. Built upon that concept, we wanted to evolve the fidget into a simple challenge that most users can complete with low cognitive load. The more we repeated this

challenge, the less we were aware of it and could focus better on our own breath. We finalized an activity that allows users to grab randomly falling spheres in different colors, and to throw them easily to respective slides to match the colors. Based on our usability tests, we adjusted the distance between the falling spheres and the spot users are sitting at, so users can easily grab the spheres with minimal movement of the entire body. We also adjusted the size of the slides to place them exactly in front of users without moving the head to see all of them. We found matching the color of a sphere with that of a slide was quite meditative and watching them slowing merging into the darkness was even more soothing and relaxing.

Expanding and Shrinking Breathing Ring

We dedicated some time to thinking about the placement and dynamics of our breath visualization. Initially, we had considered having this be a real-time, one-to-one mapping of the user's breath. However, with some inspiration from Triangle breathing, we realized that we could instead create a visual guideline to actively affect and enforce user's breathing pattern. This way, we could enable the user to pay attention to their breathing by following our visualization. For this induction, we needed some sort of two-step mechanism, a visual element that could switch between indicating an inhale and an exhale. Our first attempt at this was to use the breathing ring we previously made and have it expand for an inhale and contract back to its original size for the exhale. To do this, we used a script that modified the size of the particle system based on a state variable (=inhale or =exhale).

The issue we found in testing this system was that the placement of the ring was suboptimal in actual VR Gameplay. Paying attention to the ring meant that the user had to look up from their default state, which interfered with their manipulation of the balls. Since we needed these two activities to blend together and be in sync to achieve the meditative effect, we decided to iterate on this system and improve it.

Replace Breathing Ring with Haptic Feedback

We chose to replace the breathing ring with haptic feedback from the Oculus controllers. We manually set the vibration through a script and made it a weak 4-second burst of flat vibrations for the inhale followed by a 4-second rest for the exhale. This allowed the breathing to be a permanent presence throughout the VR experience. It also proved to be far less distracting from the manipulation task because haptic patterns can be processed in one's cognitive background.

To further synchronize the breathing with the manipulation, we adjusted the instantiation of a new ball to coincide with an inhale, which allowed the ball to be dropped on the ramp on the exhale. The visual metaphor of letting go of the ball added a satisfying feeling to the exhale. We also added a fade in effect to the vibration to make it less jarring.

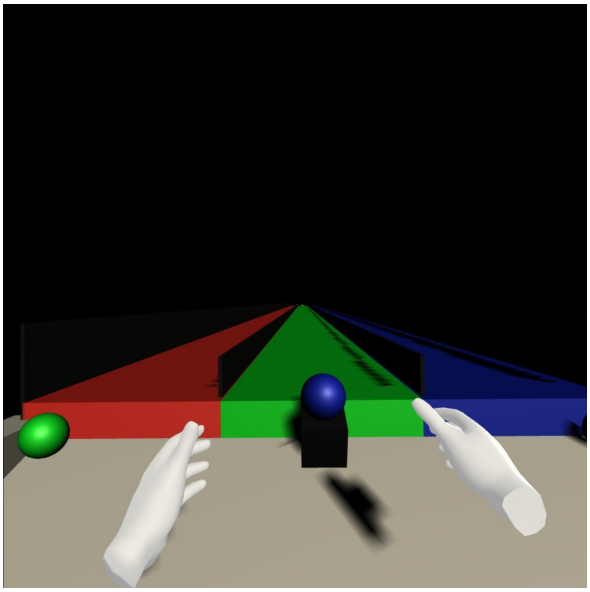
Voice Over Meditation Instruction

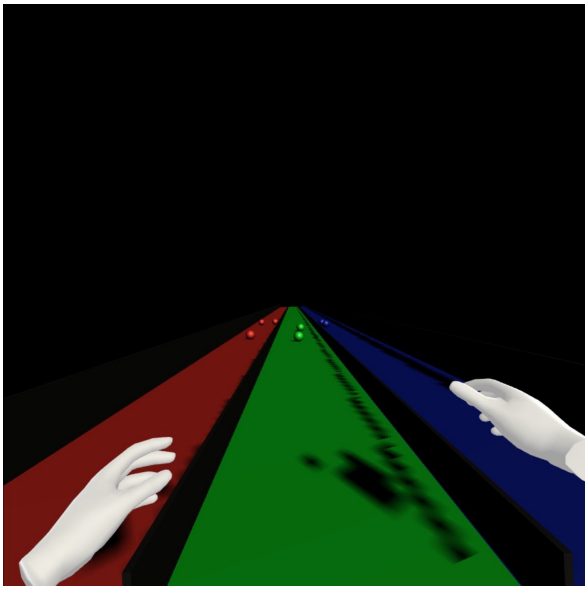
Once the interaction and world was complete, we realized that we lacked instructions for how to use this application. Following the tradition of meditation practice, we decided to use voice instructions. Doug was selected to narrate the instructions since his deep low voice felt the most soothing. We recorded the instructions using QuickTime and synchronized the instructions to the haptic breathing cues. The end result is a set of voice instructions that gently introduce the user to our world and breathing interaction. If we had to do it over again, we would also explain the grabbing and sorting of the colored balls. It was not immediately clear what the user was expected to do aside from following the haptic breathing cues.

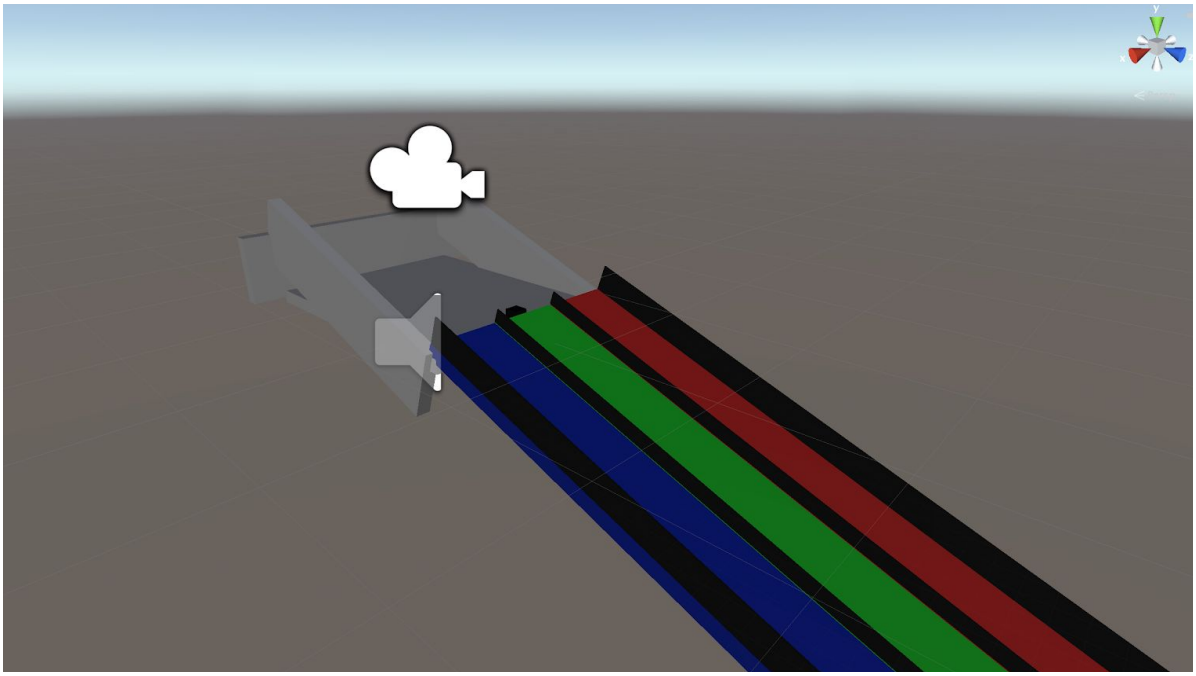
Ambient Sound

Lastly we added soothing music to the experience to make it complete. This music serves as a calming white noise that helps users clarify their mind and focus on breathing and simple physical task.

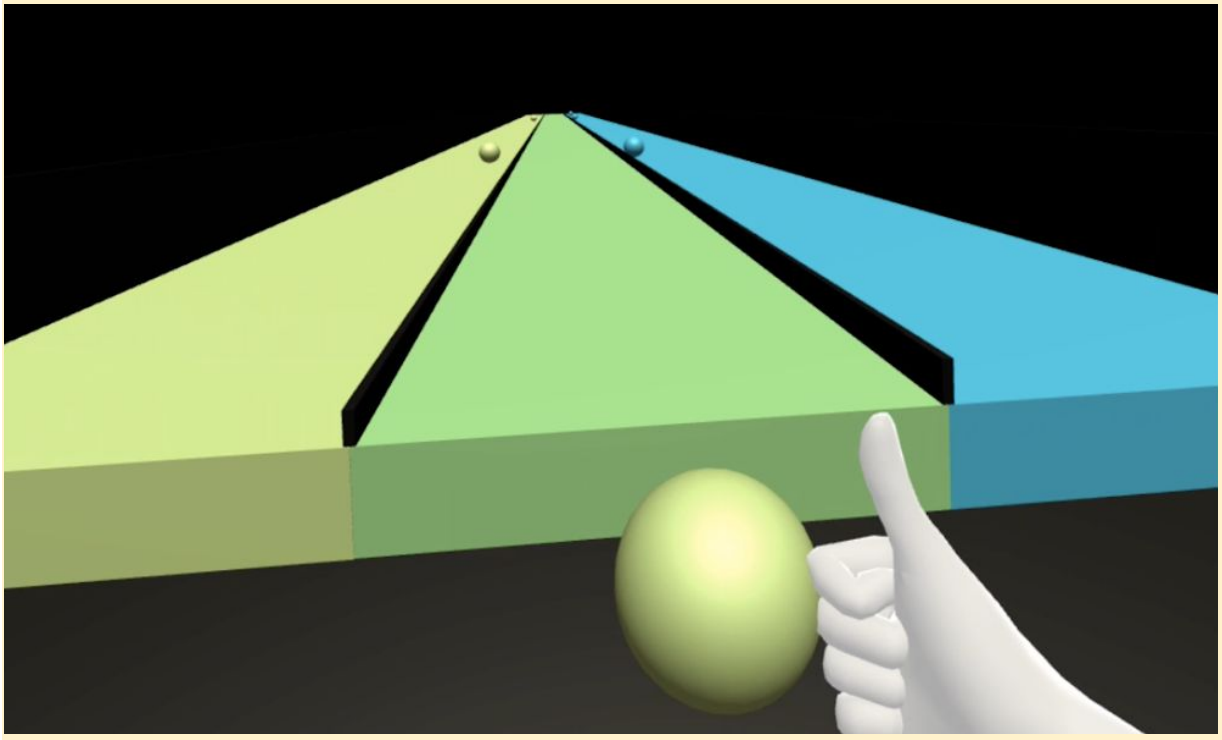
Images of Demo Prototype

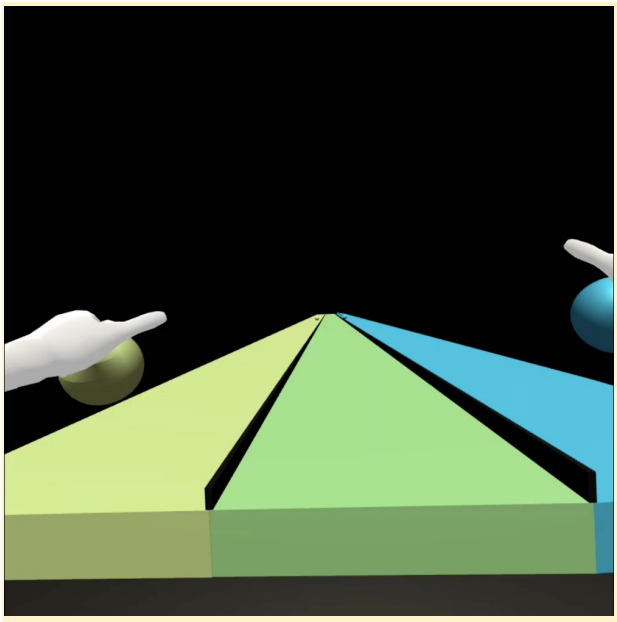


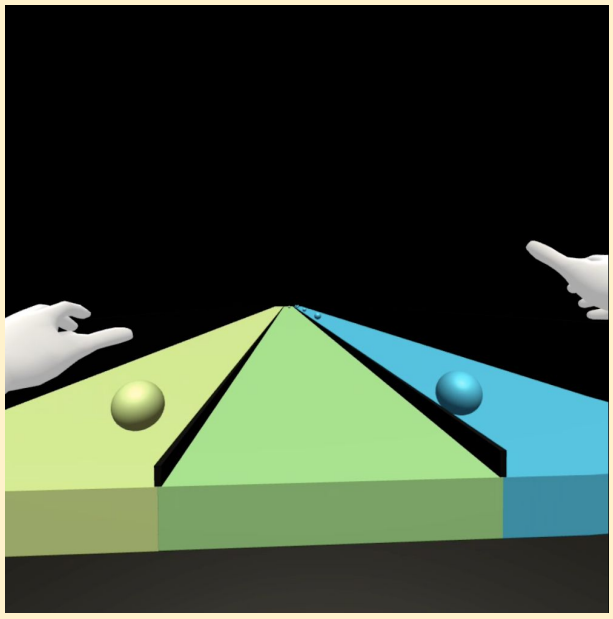




Images of Final Prototype







Future Thoughts

Due to the time limit, we didn't eventually implement the scoreboard to count the accuracy users are matching the spheres for each color. In the future, we would like to add an evaluation aspect to the current project to assess focusing skills. We have considered scoring users by their attention on matching colors but we believe this topic can be discussed and explored even further.

We would like to explore the idea of representing perspective of an individual dealing with ADHD in future after doing more research and conducting comprehensive sets of user studies to get a deep understanding of their struggles and various descriptions and metaphors.

Another idea that we wanted to achieve was tracking user's breathing and once that is achieved, that can also be used as a factor in the evaluation.

Our prototype explores one particular physical activity. In the future, we would like to build and test other simple tasks to evaluate them within our framework.