A Virtual Reality-Based Calm Room for Individuals with Autism

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Introduction

Autism Spectrum Disorder (ASD) affects 1.5% of all children in the United States, but due to the high cost of current treatment and intervention programs, many families cannot afford the care that their child needs [1].

Calm rooms are controlled environments that give children with autism a space to calm down during or after sensory episodes.

Figure 1. A sensory calm room located at Dollywood, an amusement park in Pigeon Forge, Tennessee [2].

*Using smartphones and inexpensive Google Cardboards, this work aims to create a calm room using virtual reality (VR). This virtual version of the calm room would give parents a **portable** and **affordable** way to help their child recover from the stress and anxiety caused by a sensory-heavy world.*

Materials and Methods

Rooms were created using Unity software.

Assets were acquired either in the Unity Asset Store or created using Blender.

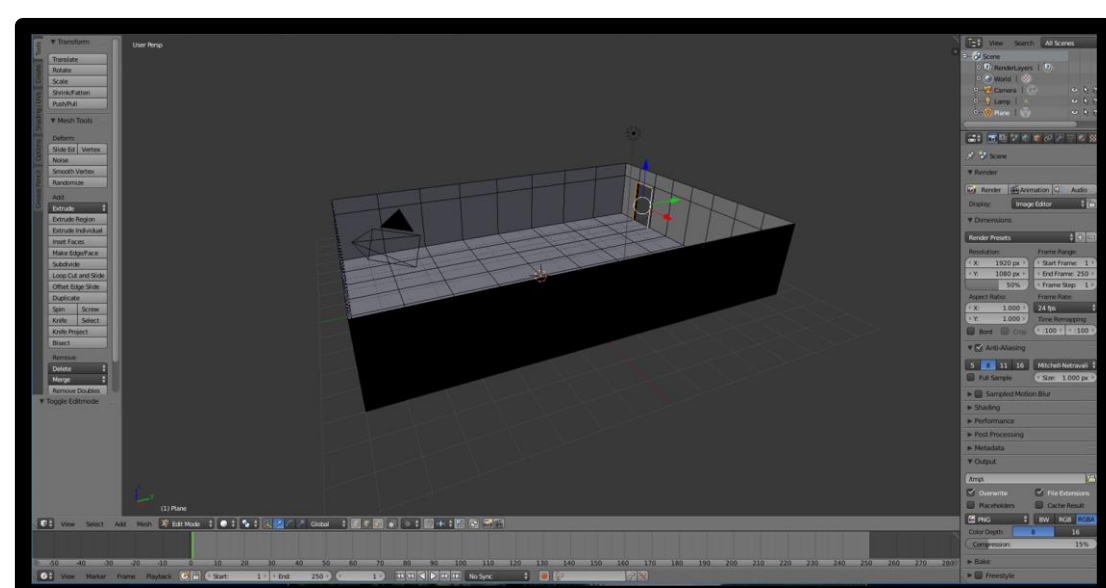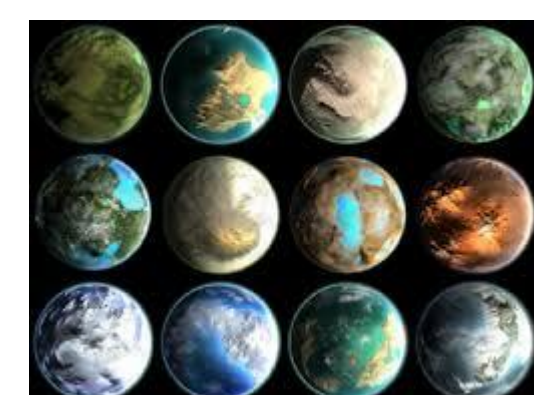Calm room applications were built for both Android and iOS.

Figure 2. Example calm room asset created using Blender and imported into Unity.

Color, contents and salient features were selected based on previous findings of physical calm rooms [3].

An interactive solar systems was included in the calm room to provide salient features for fixation and environmental control.
Informal and formal piloting of this application has been initiated.

Results

VR Calm Room

Below are two iterations of the VR Calm Room. Figure 3 demonstrates the original design, with changing planetary bodies and a timer that ends the experience after three minutes. Figure 4 shows a relaxing waterfront experience; the timer is also included in this version.

Figure 3. Original Calm Room. The room was designed to mimic physical calm rooms in color and content. Planetary bodies offer low-sensory stimulus for children. Auditory components and a timer have been added to ease transition.
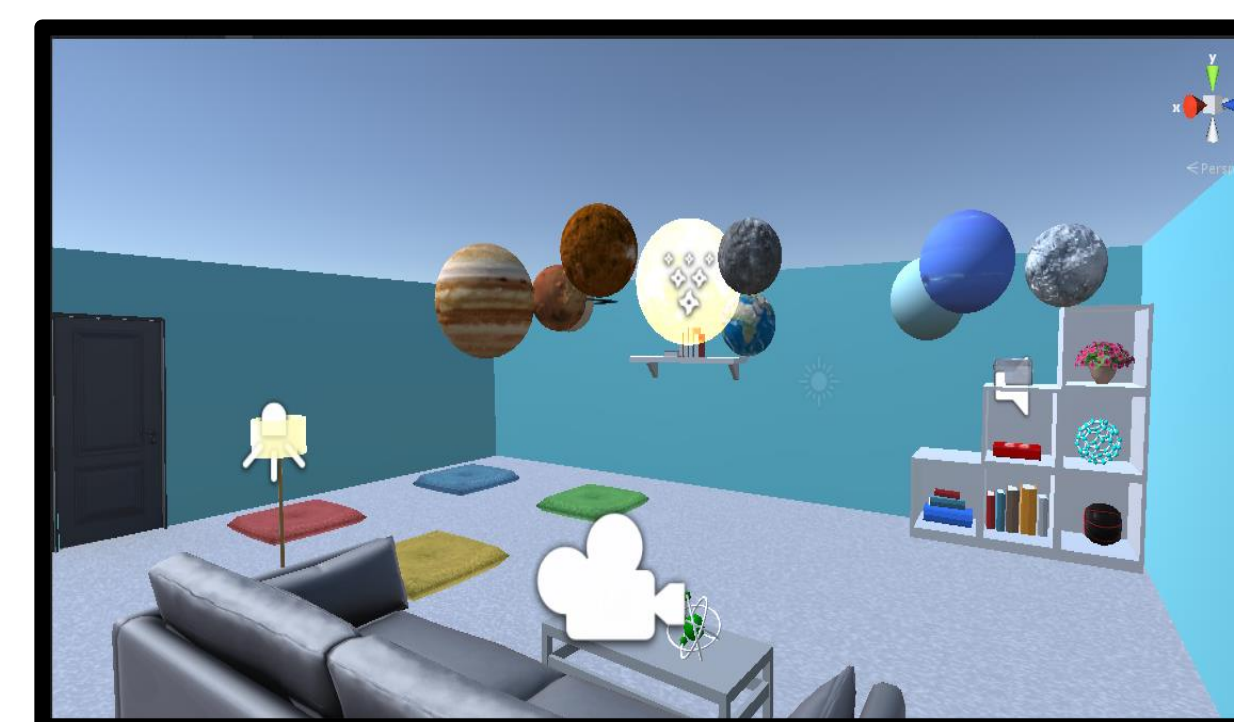
Figure 4. Waterfront Calm Room. This experience includes the sound of waves as well as butterflies for salient features. The timer is also included in this "room" to ease transition.

User Feedback

In general, this app has been well received. There have been suggestions to use it for a wider audience. Children with autism have also respond positively.

Table 1. Calm Room Feedback Population Sizes

Population Description	N
General population (healthy, adult controls)	25
General population (healthy, teen controls)	15
Specialists in Field	3
Children with ASD	7
Total	50

*Quantitative survey data is currently being collected on beta testing population

Example Feedback:

- "They LOVED it. Two [students] were upset at the time of use and it immediately calmed them down....The nice thing about your app, though, was that it blocked out other sensory stimuli.When I took the headset off, she was able to move on with her class activity."
- "[Another] student was screaming and slapping the wall initially. He put on the headset and calmed down immediately. He looked all around and figured out that the planets changed all by himself without me telling him!"
- One child with ASD, said that he would like to use it "if I'm angry maybe to calm down" upon his first time seeing the calm room.

Conclusions and Future Directions

In this work, a virtual version of the calm room has been created that would give parents a **portable** and **affordable** way to help their child recover from the stress and anxiety caused by a sensory-heavy world.

Based on preliminary testing of various populations, the following modifications are future directions:
- Correct latest calm room iOS build
- Multiple variations of calm room incorporated into one suite
- Adjustable user-defined timer
- Increasing planetary interaction
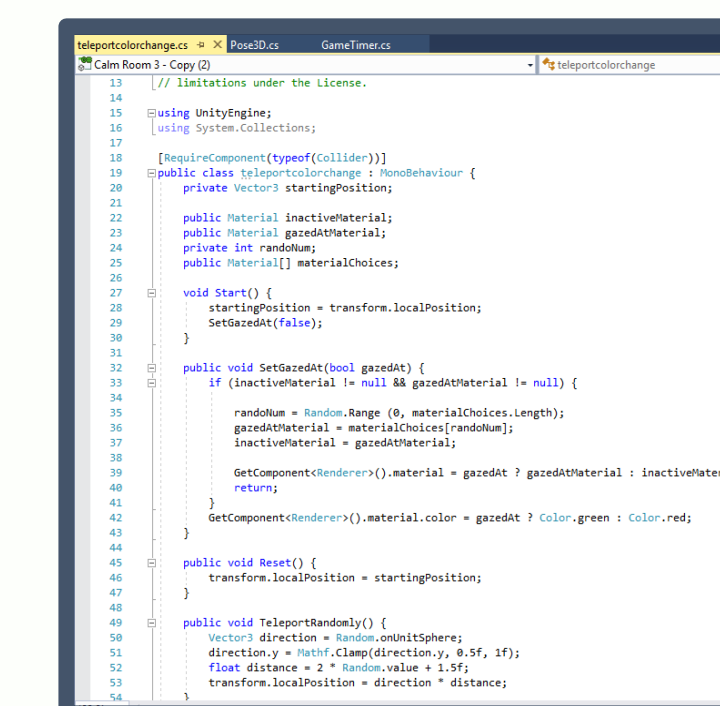- Additional interactive elements

Figure 5. Part of the code used to teleport and change the color of the planets.

Additional user feedback is needed for all populations. The calm room will also be expanded to suite the needs of more diverse populations. For example, the application will be piloted at a community center where children suffer from anger management issues in order to diffuse volatile situations. We also aim to publish the application to the public iOS and Android stores in the future.

Acknowledgements

Works Cited

1. "Autism Spectrum Disorder (ASD)." *Centers for Disease Control and Prevention.* Centers for Disease Control and Prevention, 11 July 2016. Web. 17 May 2017.
2. Strutner, Suzy. "Theme Park Adds Special Features For Kids With Sensory." *The Huffington Post*, TheHuffingtonPost.com, 1 July 2016, www.huffingtonpost.com/entry/dollywood-autism-room_us_57765e09e4b0a629c1a97fd1.
3. "Environment and Surroundings." *The National Autistic Society*, 19 Mar. 2018, www.autism.org.uk/environment.aspx.