

# Virtual Tour

Vanessa Marquez  
University of the Pacific  
3601 Pacific Ave  
Stockton, CA 95211

Norlan Prudente  
University of the Pacific  
3601 Pacific Ave  
Stockton, CA 95211  
1 (209) 637-1601

n\_prudente@u.pacific.edu

Malvika Sriram  
University of the Pacific  
3601 Pacific Ave  
Stockton, CA 95211

## 1 ABSTRACT

Virtual Reality can be used as a tool to create an environment in which individuals may be immersed in, to relieve their stress and anxiety. Our Product, Virtual Tour, was built using the Unity Platform, and is experienced by users using the Oculus Rift Headset and controllers. For our product evaluation, participants filled out a survey that measured their stress levels prior to experiencing Virtual Tour. After being immersed into three different worlds (forest scene, underwater scene, and space scene), a post-session survey evaluated the extent to which the Virtual Tour could calm the user down. Results demonstrated that the Virtual Tour reduced stress levels by almost 50% compared to the pre-tour survey average stress score. The average pre-session stress scores were a mean score of 3.3 and post-session stress scores had a mean score of 1.9. Seventy percent of participants said they would use the Virtual Tour again to relieve their stress.

**2 Keywords:** Oculus Rift, Teleportation, Unity, Virtual Reality, Immersion

## 3 BACKGROUND

Studies and experiments using virtual reality to reduce stress and anxiety disorders have been conducted multiple times in the past. For our project, we decided to use those existing studies to create a new experiment, with many more parameters and factors that could help alleviate stress. One of the previous studies that we used as a reference for building our game was a VR simulation about war, designed for people suffering from PTSD. The programmers used Virtual Reality to create a scene that closely resembled a war like setting.<sup>1</sup> To compare and contrast, another similar study was also conducted regarding the 9/11 incident. Participants were virtually exposed to an area that closely resembled the location of 9/11 in order to effectively treat patients suffering from anxiety after the incident.<sup>2</sup> The goal of our project is not to use exposure therapy, such as horror images, or trauma triggers, like the other studies. Instead, we use concepts of meditation and relaxation to expose our users to places that can relax them, no matter what kind of stress they may be feeling. We have added vocal drones and meditation audio using nature sounds in order to induce relaxation in an effortless manner. In fact, a study about nature sounds was conducted in the past, to see if it could potentially help participants in reducing their stress levels.<sup>3</sup> We used the sound study to come up with a rough vision on how to structure our audio in our environment. We also used yet another study about treating phobias using VR, combining technology and psychology to conduct psychotherapy.<sup>4</sup> In our application, we used surroundings and creatures that might have been scary in real life, but with the added scripts, dialogue, and textures, our creatures appear to be cute and friendly. Since we wanted our users to feel happy in their surroundings, we also

looked into a VR study that focuses on implementing emotion during Virtual experiences. Enhancing emotion can impact a participant's psyche significantly.<sup>5</sup> In our project, we utilize cute looking creatures combined with apt scenery in order to positively enhance the emotions of our users. Another topic of interest for our project was a study done on the potential of a virtual reality learning environment.<sup>6</sup> In other words, we used virtual reality to study its own capability to reduce stress, which is very similar to the reference mentioned above. We did it by immersing our users fully into our virtual environment, using many different environmental tactics that influenced how the users experienced their tour. Lastly, a very important reference that we used was an experiment regarding treating anxiety via full on virtual reality exposure therapy.<sup>7</sup> To add to that, another study on reducing generalized anxiety disorder was done through the use of virtual reality.<sup>8</sup> Similar to the first two studies mentioned in this write up, users were exposed to what causes their anxiety to kick in. Even though we used these two references as a starting point, we eventually ended up going in a different direction, opting for a more calming and relaxing area to let our participants forget about their anxiety. These are some of the sources and experiments that we used to create Virtual Tour.

## 4 INTRODUCTION

Virtual Reality is making large strides in the world of immersive stress and phobia therapy. Using the Oculus Rift headset and controllers, we are able to alter the mental state of users upon exposure to different situations that would be dangerous or costly to work within the real world. For instance, if the user is scared of heights, they could choose to undergo VR therapy, or actually experience height differences in reality, which can be undeniably dangerous. Similarly, for phobia treatment and stress therapy, a patient would feel a stronger effect by utilizing all of their senses to get over their mental blocks rather than simply listening to someone talking about them. Currently, numerous experiments are being conducted with one main goal in mind: to find the safest way to create virtual environments that users can mentally and physically benefit from, in the most optimized, effective, and realistic way possible. The purpose of our project was to explore these ideas and experiments in order to create our own virtual "safe space", for people with high levels of stress and anxiety. Our aim is to evaluate the extent to which the virtual environment we create can lower stress levels in our participants.

## 5 PRODUCT DESCRIPTION

Our product, "Virtual Tour", has been designed to combat an epidemic that plagues many students and working individuals in our increasingly competitive society: Stress and Anxiety. The product was built using the Unity Platform, and can be experienced to its fullest potential through the use of the Oculus

Rift Headset and controllers. Virtual Tour has three beautiful worlds that can be explored by users, through the use of teleportation. This means that users are free to stay seated during this experience, and navigate through the environment using the joystick on the Rift controllers.

### 5.1 Forest Scene

**Figure 1** is the introductory position of the player, as they are placed in the first of the three worlds: The Forest scene. Behind the player in **Figure 1** is a small shed, which has some interactable objects, like light switches. The Fox in the picture is one of the characters of the Tour, and he will guide you in the Forest using verbal cues. Before and after interacting with the Fox, the user can explore the Forest, and experience all of the different sights and sounds before heading back to the Fox. The sun also moves across the sky, and the user may also spend a little extra time gazing up at the stars during darkness, which is displayed in **Figure 2**. Once the user is ready to move onto the next world, they can follow the path near the fox and walk into the water. **Figure 3** displays the player's view of the world as they step into the water.



Figure 1: Intro Forest Scene with Fox



Figure 2: Forest Night Scene

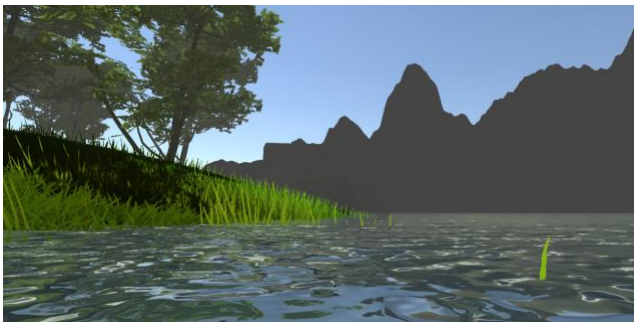


Figure 3: Water Forest Scene

### 5.2 Underwater Scene

At this point, the user would have reached the second world, which is the Underwater Scene. **Figure 4** displays what the user first sees when they go under the water. The path leads them to a bed of rocks and underwater life. In the center of the world, there is a large frog that speaks to users endearingly to help them calm down and relax. After the Frog is finished talking to the user, a Transporter opens up behind it, which can take the user to the last world. The Transporter is displayed in **Figure 5**. Users are encouraged to take their time and explore the Underwater world, and enjoy the beautiful sights and sounds. They can also leave the water and continue to explore the forest. Once the user is done exploring and returns to the Frog's position, they will manually teleport to the center of the Transporter to move on.



Figure 4: Underwater Scene with Frog

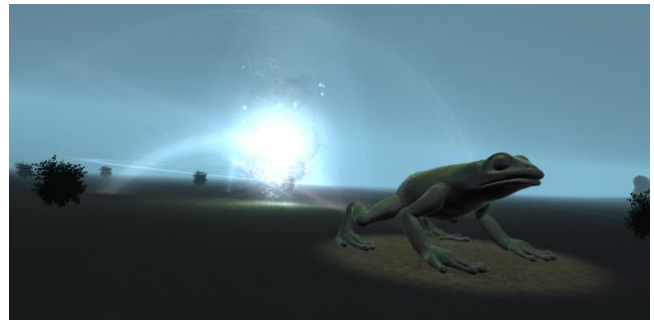


Figure 5: Underwater Teleportation

### 5.3 Space Scene

After entering the Transporter, the user is taken into the Space, which has a fully scaled model of the Solar System with a beautiful outer space skybox that represents a neighboring galaxy.. **Figure 6** is what the user will first see when they are transported to space. The visual has a sun with rotating planets. The closest planet in this picture is Venus. The user can experience complete immersion when they watch it fly right above them on the headset. In Space, the user can only teleport to two specific indicated locations: the location in which they landed, and next to the alien (**Figure 7**). Once the user teleports to the alien's location, the alien will speak. After the alien speaks, the user can spend as much time as they want exploring the space environment. Once you enter space, there is no way to go back to other worlds, and hence, the virtual tour ends.



Figure 6: Space Scene



Figure 7: Space Alien

## 6 METHOD

Prior to beginning the tour, participants signed a consent form that clearly stated the benefits and harms to participating in our study and informed them that they were free to stop the session whenever they wanted. After that, they filled out a pre-session survey (Figure 10). Following the pre-session survey, our evaluator, Vanessa, clearly stated the instructions on how to proceed with the application and how to use the equipment. Additionally, if the participants had any questions, our team member, Malvika, answered them. Upon finishing the application, the participants filled out a post-session survey (Figure 11). We had ten participants in total. We gathered data, before the use of our application, such as age, gender, employment status, major, year in college, units currently being taken, average stress levels in life, and their current stress level. Data taken after the use of the application consisted of measuring the stress level after the use of the application, effectiveness of the Virtual Tour on reducing their stress level, and how likely they would be to use our application again to reduce their stress. To analyze our data, we took the average of participant's stress levels before and after the use of Virtual Tour and demonstrated the results in Figure 12. Additional analysis that was done was the effectiveness of how the Virtual Tour lowered one's stress level. It was measured using a likert scale, grouping the score together, and showing the distribution in a pie chart (Figure 13). Lastly, we measured the likeliness of the participants reusing our application to reduce their stress levels. Similarly, these results were demonstrated through the use of a pie chart (Figure 14). Overall, all of our data and analysis demonstrated that the Virtual Tour reduces the stress levels of our participants and that they would likely use the application again.



Institutional Review Board  
IRB Research Application

Verbal recruitment script:

Hello, my name is <recruiter name> and I am part of a computer science virtual reality class that is conducting research to see whether or not our project can meet our goal of reducing stress in college students. It may take up to 20 minutes. Would you like to participate?

Figure 8: Verbal Recruitment Script



Institutional Review Board  
IRB Research Application

Moderator script:

Hello <participant name>. My name is Vanessa and today I'm going to be walking you through this session. We're testing the extent to which this Virtual Tour actually helps college students minimize stress, as well as to see how well people can access and use this tour. Don't worry about making mistakes. We want to listen to you as you give us feedback, so think out loud! If need, please feel free to ask questions or make comments along the way.

Figure 9: Moderator Script



Institutional Review Board  
IRB Research Application

Pre session survey

1. Age: \_\_\_\_\_
2. Gender: \_\_\_\_\_  
☐ Female  
☐ Male
3. Do you have a job? \_\_\_\_\_  
☐ No  
☐ Part-time  
☐ Full-time
4. What is your major? \_\_\_\_\_
5. What class are you in? \_\_\_\_\_  
☐ Freshman  
☐ Sophomore  
☐ Junior  
☐ Senior  
☐ Graduate student
6. How many units are you taking this semester? \_\_\_\_\_
7. Are you a commuter or resident?  
☐ Commuter  
☐ Resident
8. Rate your personal level of stress in your life on average:  
☐ No stress  
☐ Slight stress  
☐ Average  
☐ Above average  
☐ Hard core
9. How do you feel at your present level of stress?  
☐ No stress  
☐ Slight stress  
☐ Average  
☐ Above average  
☐ Hard core

Rev: August 2017  
(00079604.3)

16

Figure 10: Pre Session Survey



Post session survey

1. Now that you have completed the session, rate your level of stress:
  - ☐ No stress
  - ☐ Slight stress
  - ☐ Average
  - ☐ Above average
  - ☐ Hard core
2. This virtual reality tour was effective in reducing my stress.
  - ☐ Strongly disagree
  - ☐ Disagree
  - ☐ Neutral
  - ☐ Agree
  - ☐ Strongly agree
3. I would take this virtual reality tour again to help reduce my stress.
  - ☐ Strongly disagree
  - ☐ Disagree
  - ☐ Neutral
  - ☐ Agree
  - ☐ Strongly agree

Figure 11: Post Session Survey

## 7 CONCLUSION

Virtual Reality has been tested to see how effective it is in helping individuals overcome phobias or other illnesses, like PTSD. The aim of our study was to evaluate the extent to which the Virtual Tour reduced stress in our target population. Through pre- and post-surveys we evaluated the extent to which our project was effective in reducing stress. We found that prior to taking the Virtual Tour, individuals had more stress ( $M = 3.3$ ) compared to after taking the tour ( $M = 1.8$ ). (Figure 12). Additionally, more than half (60%) of participants claimed that the Virtual Tour was effective in reducing their stress and even more (70%) said that they would use the tour again to relieve their stress (Figure 13 and 14). We also found that sound was a limitation in our study. We did not appropriately test how well users would be able to hear our characters talking over the background music. Many of the participants commented that it was kind of “hard to hear” what the characters were saying over the too loud background music. Future research should take that into consideration when setting the volume of their sounds. Additionally some of the participants got lost in our tour due to the lack of direction. There was a trail leading two different ways but no arrow or map indicating the direction to which to go. We assumed that one of our characters telling them where to go would be enough, however, participants were not listening the the entirety of the character’s script and would have been lost had they not been warned prior to beginning the session. Future researchers should take precautionary steps to ensure that their participants can easily find their way through the virtual environment. The space scene only had two small cube platforms to teleport back and forth between. We realized that many users asked if they can explore around this scene or see the plants up close, however there was no way to teleport around because there was no existing terrain. Future improvements of this tour should include ways to easily access and explore all areas of the environment. Also, once entering the Space scene, there was no way to teleport back into the previous scenes. A portal or teleportation component should be added.

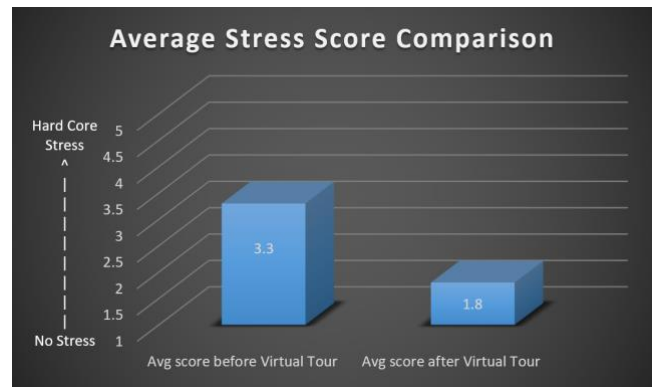


Figure 12: Average before and after Scores

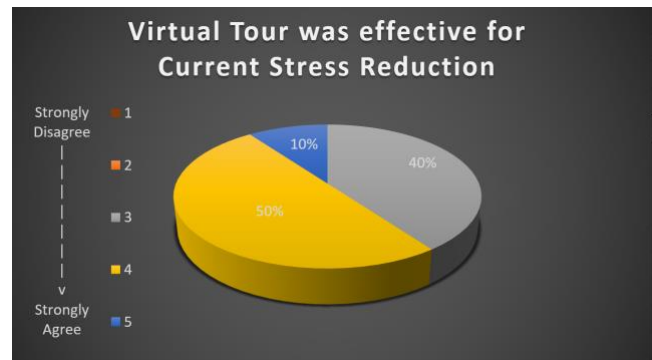


Figure 13: Was Virtual Tour effective?

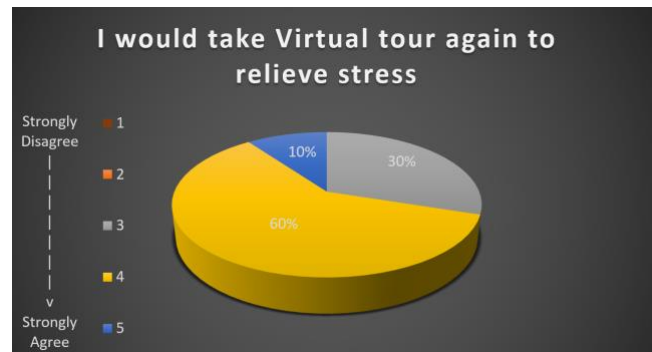


Figure 14: Will the study group use Virtual Tour again to combat stress?

## 8 REFERENCES

- [1] Difede, J., Hoffman, H.G. (2002). Virtual Reality Exposure Therapy for World Trade Center Post-traumatic Stress Disorder: A Case Report. CYBERPSYCHOLOGY & BEHAVIOR.
- [2] Difede, J., Cukor, J., Jayasinghe, N., Patt, I., Jedel, S., Spielman, L., Giosan, C., Hoffman, H.G. (2007). Virtual Reality Exposure Therapy for the Treatment of Posttraumatic Stress Disorder Following September 11, 2001. PHYSICIANS POSTGRADUATE PRESS, INC.
- [3] Annerstedt, M., Jonsson, P., Wallergard, M., Johansson, G., Karlson, B., Grahn, P., Hansen, A.M., Wahrborg, P. (2013). Inducing physiological stress recovery with sounds of nature in a virtual reality forest — Results from a pilot study. Physiology & Behavior.
- [4] Riva, G., (2005). Virtual Reality in Psychotherapy: Review. CYBERPSYCHOLOGY & BEHAVIOR.
- [5] Riva, G., Mantovani, F., Capideville, C.S., Preziosa, A., Morganti, F., Villani, D., Gaggioli, A., Botella, C., Alcaniz, M. (2007).

Affective Interactions Using Virtual Reality: The Link between Presence and Emotions. CYBERPSYCHOLOGY & BEHAVIOR.

- [6] Byrne, C.M., Meredith, B. (1992). Summer Students in Virtual Reality: A Pilot Study on Educational Applications of Virtual Reality Technology. Human Interface Technology Laboratory.
- [7] Powers, M.B., Emmelkamp, P.M.G. (2007). Virtual reality exposure therapy for anxiety disorders: A meta-analysis. Journal of Anxiety Disorders.
- [8] Gorini, A., Pallavicini, F., Algeri, D., Repetto, C., Gaggioli, A., Riva, G. (2010). Virtual Reality in the Treatment of Generalized Anxiety Disorders. Studies in Health Technology and Informatics.