Combating Stage Fright in VR using Gradual Lighting

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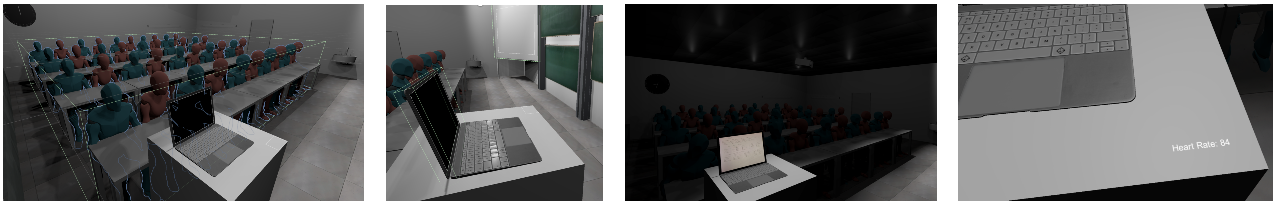

(a) (b) (c) (d)

Figure 1: Four images from our virtual classroom: (a) and (b) show the room with the constant light condition. (c) shows a dimly lit room at the beginning of the gradually increasing light condition. (d) shows the presenter's current heart rate display.

Abstract

The principle of exposure therapy is to gradually increase the exposure of an individual to the feared stimulus. In our study, we explore this approach to help people with stage fright to gradually notice the presence of a virtual audience in a classroom. We propose a Virtual Reality (VR) application where the users can rehearse their presentations in front of a virtual audience. Then, we test the influence of two different light conditions: 1) constant and 2) gradually increasing light, on reducing presenters' stress levels. Finally, we report results on our participants' preferences with the two conditions.

Index Terms: Virtual Reality, Stage fright, Presentation.

1 Introduction

Public speaking is a common fear experienced by many individuals. This fear, often referred to as Public Speaking Anxiety (PSA), can significantly impact an individual's ability to effectively communicate their ideas and engage with an audience [7]. Traditional methods, such as practicing in front of a mirror or with a small group of supportive friends, may not fully prepare an individual for the experience of presenting to a larger, potentially less familiar audience. Various prior works explored the use of VR technology as a controlled safe alternative environment to practice presentations and talks in front of virtual audiences. In their review covering 31 research publications between 2017 and 2022 on the use of Immersive Virtual Environments (IVE) for public speaking training, Hadi et al. [6] found that VR-based exposure could help with mitigating PSA. Different approaches were investigated to address this problem. For instance, the VR application for public speaking by Jinga et al. [4] offers personalized presentation scenarios, including different room types, seat occupancy, and audience profiles. In addition, their tool displays real-time and post-presentation feedback and evaluation to help users improve their presentation skills. Other studies [1, 3], focused on the speaker's voice tone and generated controlled audience reactions based on the emotions delivered by the presenter. Our project is motivated by the need for a more effective solution to reduce PSA during the presentation. Previous studies showed that the lighting in IVE plays a crucial role in creating a comfortable experience for people [5, 2]. Castilla et al. [2] found that lower illuminance levels enhanced students' memory and neurophysiological activation. Mostafavi et al. [5] also studied the influence of interior illumination on users' mood and behavioral responses in a virtual office. Their results confirmed that participants felt more comfortable under lower lighting conditions.

Therefore, we leverage the immersive capabilities of VR technology to simulate a realistic presentation scenario. Then, we control the classroom lighting by increasing its intensity over time. We opted for this approach to ensure that the presenter does not completely disconnect from the audience, but rather gradually acclimates to their presence. In this study, we evaluate the effectiveness of the gradually increasing light condition in improving the presenter's comfort and reducing stage fright during a presentation. We report quantitative measurements on participants' main gaze directions and heart rate data while presenting, in addition to post-presentation subjective feedback about the whole experience.

2 Approach and Design Choices

Our study design choices are rooted in creating an immersive and supportive environment for users to practice and improve their presentation skills and, at the same time, help reduce presenters' PSA.

2.1 Design of the Virtual Environment

We implemented our VR App with Unity 3D and designed our virtual presentation environment to simulate a real-world classroom.

3D Modeling and Reconstruction of the Classroom. We used a LiDAR 3d Scanner App to generate a 3D model of a real classroom in our institute. To ensures that the virtual environment matches not only the dimensions but also the visual details of the actual space, we applied textures from on-site photographs to the 3D models.

The Virtual Audience. We completed our setup with seating arrangements and audience members. To avoid the uncanny valley effect of a near-human appearance, we chose an audience that resembles bots that exhibits subtle, natural movements.

Lighting Setup. We used two types of light sources: we placed 6 white color point-light sources with moderate intensity above the audience and 3 white color spotlight sources directed to the stage. During the gradual lighting condition, only the 3 spotlights are initially lit to help the presenter orient themselves (Fig. 1, (c)).

Interaction with Virtual Slides. The presenter can navigate through their slides by moving the VR controllers' joystick to the left and right side. Slides are displayed simultaneously on a virtual laptop screen in front of the user, and on a beamer behind them.

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2.2 Performance Monitoring and Physiological Tracking

Our goal was to provide presenters with feedback during and after the presentation in order to help them evaluate their performance.

Gaze Detection. To assess the engagement of the presenter with their surroundings (e.g., audience, slides), we tracked their gaze direction. We created bounding boxes around key elements within the virtual environment, such as the audience (Fig. 1, (a)), the laptop, and the projector screen (Fig. 1, (b)). Then we computed the total time (in seconds), a ray emitted from the camera intersects with each of these boxes. By the end of the presentation, we displayed a summary of the total time spent looking at each element.

Anxiety Levels Tracking. We asked participants to wear a Samsung Galaxy smartwatch during the presentation to measure their Heart Rate (HR) data. During the presentation, participants could see their current HR data on the presenter's table (Fig. 1, (d)).

3 Study

We conducted a within-subjects study with two presentation conditions: constant and gradually increasing light.

3.1 Participants

We recruited five participants, 2 women and 3 men, with an average age of 25 years old. On a scale from (1: Not confident at all to 5: Very confident), four participants rated their confidence levels about their presentation skills as 3 and one participant as 2.

3.2 Study Task and Conditions

Each participant performed a presentation under the two light conditions. Presentations took less than 5 minutes each. At the end of the study, participants were asked to fill out a questionnaire to report on their performance and preferences.

Constant Light Condition During this condition, the classroom remains consistently lit throughout the presentation (Fig. 1, (a)).

Gradually Increasing Light Condition The presentation starts in a dimly lit room, which initially obscures the audience (Fig. 1, (c)). As the user advances through their presentation, the light level of the 6 point-light sources in the room gradually increases over time.

4 Results

Gaze Direction. The results about gaze direction were diverse and did not show clear patterns related to the two lighting conditions. However, they indicated some individual patterns. While some participants (P1 and P4) spent almost the same time looking at the audience under the two conditions, Others (P2 and P3) looked longer at the audience with the constant light condition (4× longer for P2). In contrast, P5 viewed the audience more than 2× longer in the gradually increasing light condition than in the constant light condition. Moreover, not all participants looked at the beamer, and its viewing periods were the shortest compared to the other targets.

Heart Rate (HR) Measurements. Average HR measurements were slightly different between the two conditions. One possible explanation for this can be the order of execution of the two conditions. We think that in the second trial, participants got more comfortable with the presentation, and consequently, their average HR decreased in most of the cases. For instance, P2, P3, and P5 took the gradually increasing light condition first. Due to technical issues, we lost the heart rate measurements for P1.

Effect of Light Changes on Comfort Level. All participants were very comfortable with the gradual light change effect with an Avg. of 4.8 on a scale of (1: Very uncomfortable to 5: Very comfortable).

Effectiveness of Gradual Light Changes. The majority of participants (3) found that the gradual light technique was effective to very effective in reducing stage fright. Moreover, four out of five participants preferred the gradually increasing light condition. Participants reported that the dimly lit room felt more comfortable and helped them focus on the presentation especially at the beginning.

Realistic Audience Preference. Opinions on the virtual audience were mixed. Two participants liked the bots appearance, while three preferred a more realistic audience.

Dashboard Summary. All participants found the gaze direction and duration summary shown at the end of the presentation useful. Two participants reported being surprised that the summary results after their presentation were different from their expectations. Therefore, a more detailed dashboard with visualizations could be very helpful for a post-presentation data analysis.

5 Discussion and Conclusion

We conducted a first evaluation of using gradual light to reduce stage fright. Although preliminary results do not show clear patterns of the influence of incorporating gradual light on participants' stress levels and gaze direction, their feedback was mostly positive with the gradually increasing light condition. In addition, one participant's (P5) results showed promising findings. P5 was the least confident about their presentation skills (rate: 2/5), looked elsewhere most of the time during presentations, and reported feeling extremely anxious (rate: 5/5) even after presentations. However, we found that the time they spent looking at the audience during the gradually increasing light condition doubled compared to the constant light condition. Future studies should increase the sample size and target people who experience PSA. Moreover, various lighting conditions, such as a consistently dim room, should be simulated to compare how different combinations of lighting properties (e.g., color, and temporal variation) influence presenters' stress levels in virtual settings and to what extent these effects translate to real-world.

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