UNIVERSITY OF ILLINOIS CHICAGO
Honors College

The Effects of Virtual Reality Environments on Physiological Stress: A Platform Comparison Between Room-Scale Displays and Desktop Computers

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Introduction

Background

- Existing studies have reported that forest therapy utilizing sensory stimuli increases the activity of the parasympathetic nervous system and decreases the activity of the sympathetic nervous system.

Purpose

- To observe the effects of guided scenic meditation in a virtual reality environment on physiological stress.
- To perform a platform comparison by deploying the same meditative experience and testing its effectiveness using a room-scale display and a desktop computer.

Significance

- Rather than using a headset, the study uses a room-scale display — the CAVE2 Hybrid-Reality Environment — to test the effects of virtual reality environments on stress reduction.
- The platform comparison intends to showcase that, if proven effective, the product is accessible, as desktop computers are far more affordable ($400 - $1000) and widely available relative to room-scale displays ($1 million+).

Methods

After the development of a 3D model of a forest environment in the game engine Unity, ten participants were asked to engage with a guided scenic meditation application using both a desktop computer and a room-scale display. During both sessions, hosted a week apart from one another, they were asked to do the following:

1. Complete a survey about subjectively perceived stress using Likert scales.
2. Engage with the Unity-built guided scenic meditation application simulating the sights, sounds, and smells of a forest.
3. Measure their heart rate before and after engagement using a Fitbit.
4. Measure their blood pressure before and after engagement using a blood pressure monitor.
5. Provide suggestions for the application.

Platform Images

Fig 1. On the left is the CAVE2 version of the application.

Fig 2. On the right is the desktop version of the application.

Results

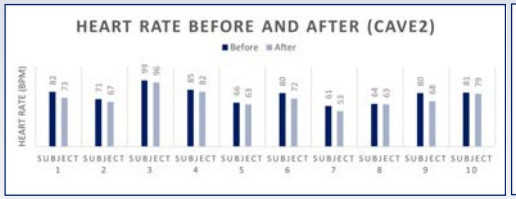


Fig 3. Bar chart showcasing heart rate before and after CAVE2 application use.

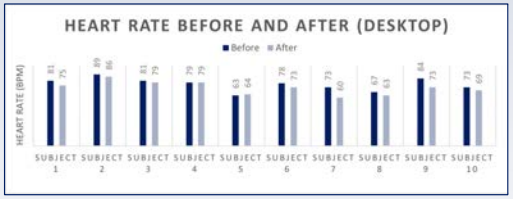


Fig 4. Bar chart showcasing heart rate before and after desktop application use.

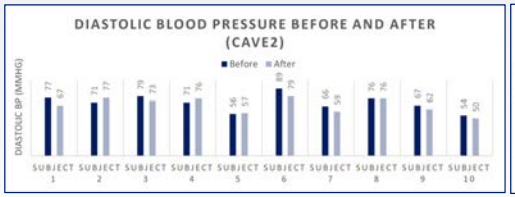


Fig 5. Bar chart showcasing blood pressure before and after CAVE2 application use.

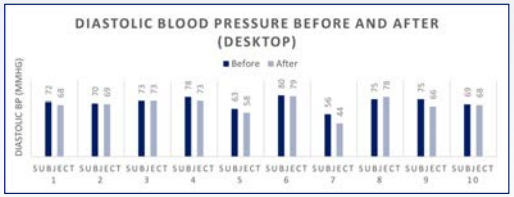


Fig 6. Bar chart showcasing blood pressure before and after desktop application use.

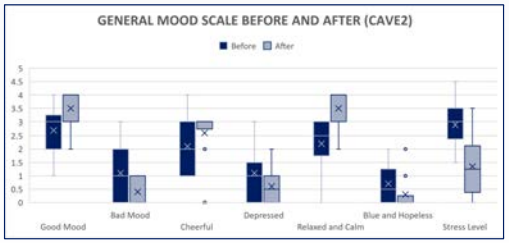


Fig 7. Box and whisker plot showcasing perceived moods and stress levels for CAVE2.

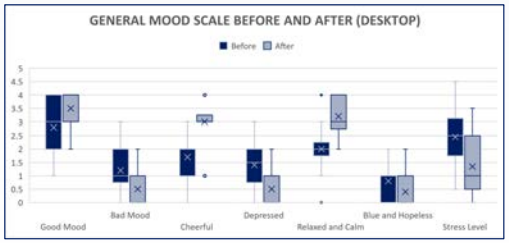
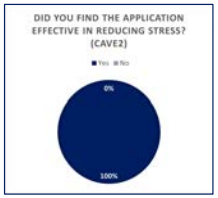


Fig 8. Box and whisker plot showcasing perceived moods and stress levels for desktop.



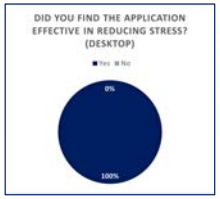
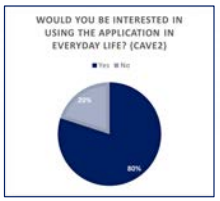
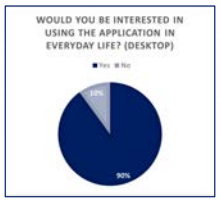


Fig 9. and 10. Subjective evaluation of application's effectiveness in reducing stress for CAVE2 and Desktop.

Fig 11. and 12. Pie charts showcasing whether participants would use application in their everyday for both platforms.





Conclusion

- The participants experienced a decrease in heart rate after engaging with the application on both platforms.
- A decrease in diastolic blood pressure is observed among 60% of the participants for the CAVE2 and 80% for the desktop.
- The subjectively perceived moods and stress levels of the participants improved after engaging with the application.
- All participants concluded, from their experience, that the application is effective in reducing stress, majority of which would like use it in their everyday.

Acknowledgements

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