A Pilot and Feasibility Study of Virtual Reality Guided Meditations in First-Year Medical Students

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Introduction and Purpose

Virtual reality (VR) is a popular technology that places users in an interactive 3D environment. VR has been used to enhance surgery training, rehabilitation of brain injury survivors, and telepsychiatry.

Integrating wellness into the medical school learning environment is a current major focus of medical educators. Training medical students to foster self-wellness is thought to be essential to preventing burn-out and developing physicians who can fully attend to their patients' needs. A number of approaches using mindfulness exercises as a means to personal wellness have been developed, but motivation to practice mindfulness exercises can be lacking.

Our aim for this study is two-fold: 1) assess the feasibility of practicing guided meditations using virtual reality and biofeedback in first-year medical students and 2) examine the perceptions of first-year medical students regarding the value of the VR modality on stress reduction, both immediate and long-term.

Methods

We recruited 10 volunteer participants. Each participant completed a guided meditation using a commercially available VR headset paired with a meditation app and biofeedback device that approximates a heart rate variability (HRV) index. Noise-cancelling headphones were provided as well to minimize distraction during the exercise.

Participants were assigned a room or cubicle at the Himmelfarb Library during their session where they would be debriefed and assisted by the research coordinator. The meditations are centered on mindful breathing. Participants are immersed in a 3D/360° scenery of their choice.

Each meditation was five minutes long and participants were asked to do the exercise once a day for five consecutive days. At the end of each session, the biofeedback feature of the VR headset calculates an HRV index that the user can see. Participants completed surveys before and after each meditation exercise. A follow-up survey was administered two months later.

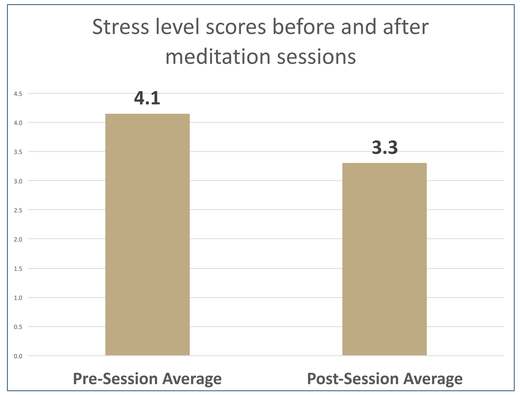

Figure 1. Participants were asked the following question before and after completing the exercise: "How would you describe your stress level right now on a scale of 1-7 (1= low, 7=high)?"

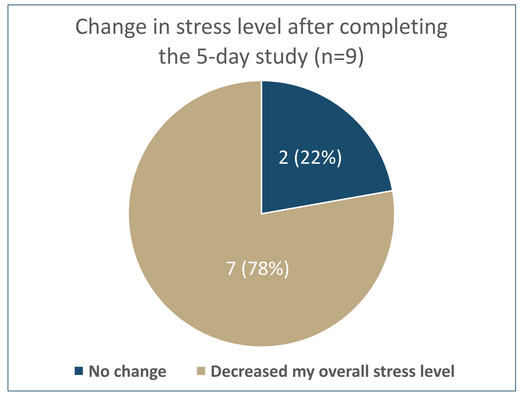

Figure 3. On the last day of the study, the participants were asked: "Over the past week, how did the breathing exercises affect your overall stress level?"

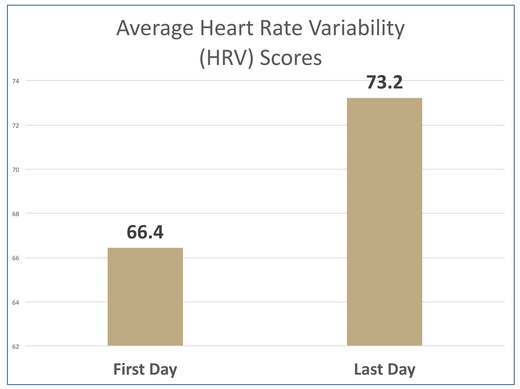

Figure 2. The biofeedback feature of the VR headset approximates an HRV index (maximum 100). The average score of participants is 66.4 on their first day of the study compared to 73.2 on their last day of the study, showing a 10% increase.

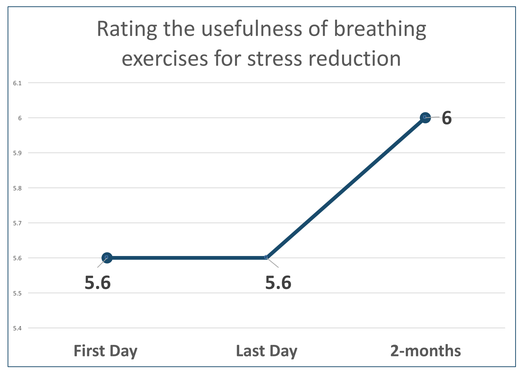

Figure 4. Participants were asked the following question on the first day, last day, and two months post-study: "At this time, how useful do you think breathing exercises are for managing stress? (1=low, 7=high)"

Positive elements of the VR experience	Areas of improvement
Background sound; simple instructions; simple set up; easy to be engaged	*More scenes, maybe option for music (rain vs. ocean, etc)*
Taking a few minutes away from my day of studying, the calming music, the 3D graphics	*I found the heart in the center of the circle to be distracting, I think the circle is enough of a visual cue*
It was immersive, calming, and a pleasant way to unwind.	*The graphics could be a little nicer, particularly for the beach scene. It would have been nice to see undulating waves. Some of the other graphics were quite realistic though*

Figure 5. Participants were asked to note 2-3 things that they liked and disliked about the VR experience. We highlight some of these feedback on the table above.

Results

Of the 10 participants, seven completed the five-minute meditation exercises for five consecutive days; three performed the exercise for four consecutive days. Every participant except one completed all of the required surveys (1-7 scale, 7 high). Participants gave their stress level before each meditation, reporting a mean score of 4.1; after each meditation, the average stress score decreased to 3.3. On the last day, seven participants (78%) reported a decrease in overall stress; two (22%) reported no change.

Over the course of the study, the average HRV index increase was 10%. During the two-month follow-up, six (60%) volunteers reported a decrease in their overall stress compared to seven (78%) on the last day of the study. When asked about the usefulness of the intervention on managing stress, participants reported an average score of 6.0—a slight increase from the rating of 5.6 given before beginning the study.

Participants generally described the VR experience as engaging and relaxing. One user noted that it was a "pleasant way to unwind." Constructive feedback highlighted the need for more realistic and higher quality graphics. Having more scenes to choose from was also expressed as a room for improvement.

Discussion and Conclusion

Participants perceived that the VR program decreased their stress levels in the short and longer term—after each five-minute VR exercise, at the end of the five-day study and during the two-month follow-up. Their perception regarding the usefulness of breathing exercises prior to the study remained favorable for two months post-intervention.

The increase in HRV index throughout the study objectively supports the feedback that the intervention was useful for stress reduction. This is particularly noteworthy considering that current research shows HRV positively correlates with mental and physical well-being.

Our pilot results highlight the feasibility and promising impact of guided meditations using virtual reality and biofeedback on first-year medical students. Future studies should examine the impact of this intervention with a larger sample size and varying meditation durations. These studies should also look at changes in HRV measures among participants as well as other indicators of physical, mental, and emotional well-being.