

## BACKGROUND

- High-fidelity simulation (HFS) is commonly used to train anesthesiology learners to manage high-stress situations
- Physiologic stress to HFS can enhance performance in subsequent simulation scenarios, but stress may hinder focus and knowledge retention during post-HFS debrief
- Mindfulness exercises have been suggested to maximize learning and decrease stress/anxiety to improve learning
- Currently, the ideal modality for mindfulness exercises following HFS has been established
- Eyes closed mindfulness exercises are common, but recently virtual reality (VR) guided mindfulness exercise have become more popular

## STUDY AIM

- Examine changes in focus, anxiety and EEG patterns in anesthesia residents immediately after a guided mindfulness exercise, with or without VR supplementation

## METHODS

- This study was approved by the Institutional Review Board at the Icahn School of Medicine at Mount Sinai.
- Anesthesiology PGY-2 trainees were enrolled in study during the 8 week introduction to anesthesiology boot camp curriculum
- Prior to each HFS, subjects completed baseline anxiety questionnaire (STAI)
- Following twice weekly HFS, subjects completed a 5 minute mindfulness exercise: half using eyes closed and half using immersive VR supplementation (Nature Trek VR [Greener Games], Figure 1)
- All subjects wore a consumer-grade EEG headband to monitor frontal EEG waveforms during the mindfulness exercises

## METHODS

- Focus level (VAS 0-100) and focus level (VAS 0-100) were assessed before and after mindfulness sessions and the differences in these values were recorded for each session
- A composite EEG score based on EEG data demonstrating calm or neutral brain states was measured during each mindfulness session for all subjects
- Primary outcome: change in focus ( $\Delta$  focus)
- Secondary outcomes: change in anxiety ( $\Delta$  anxiety) and mean composite EEG score per session



Figure 1: Screen shot of immersive virtual reality forest environment

## RESULTS

- Twenty-six anesthesiology PGY-2 residents completed the study protocol
- No significant difference in baseline anxiety levels (STAI) were found throughout the study period
- Results for primary and secondary are found in table 1
- Among all subjects, mindfulness exercises resulted in a significant decrease in anxiety levels by 19% ( $p < 0.001$ ). See Figure 2.

	VR	Control	p value
$\Delta$ Focus*	+4.8	+8.1	0.43
$\Delta$ Anxiety <sup>†</sup>	-16.4	-21.1	0.39
Composite EEG Score <sup>‡</sup>	491.5	489.0	0.96

Table 1: Results for primary and secondary outcomes.

\*: mean difference in focus level before and after mindfulness session bases on 0-100 VAS  
<sup>†</sup>: mean difference in anxiety level before and after mindfulness session based on 0-100 VAS  
<sup>‡</sup>: Mean composite EEG score based on percentage of time in neutral or calm EEG state

## RESULTS

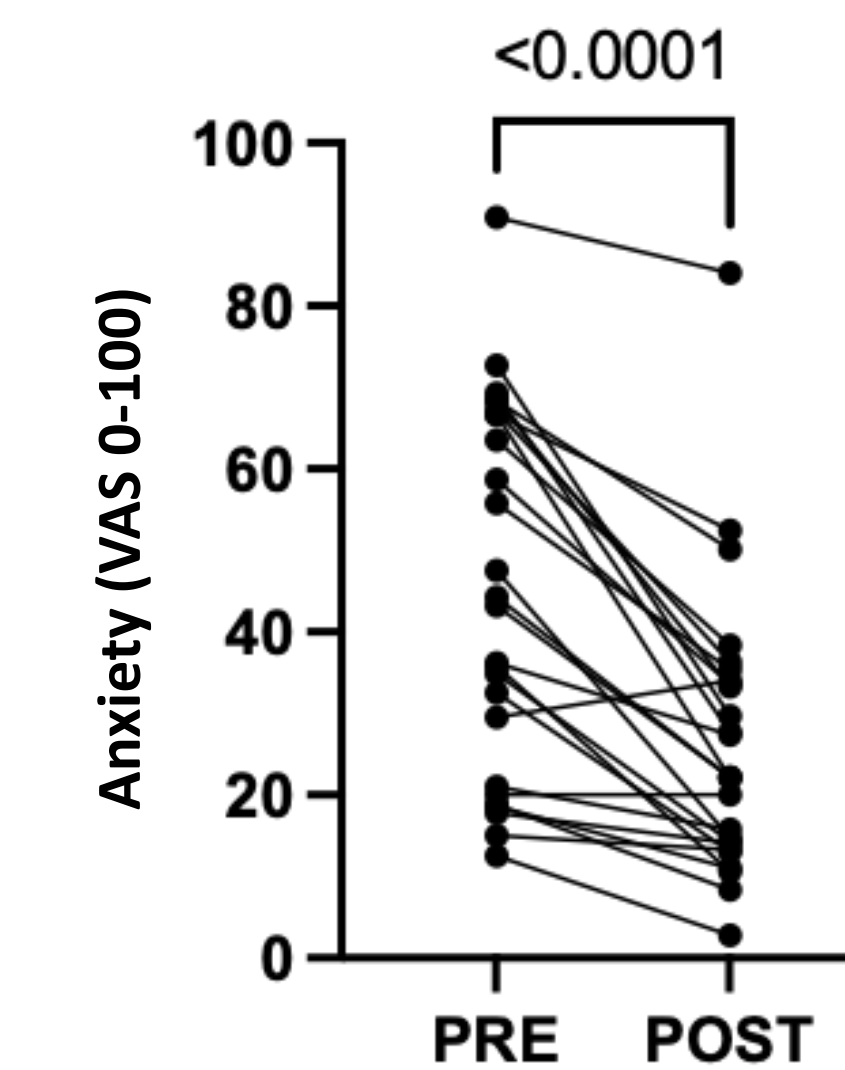


Figure 2:  $\Delta$ Anxiety for all subjects (VR + Control) showed a significant reduction in anxiety levels regardless of mindfulness modality used

## CONCLUSIONS

- The addition of VR had no significant effect on focus, anxiety, or composite EEG scores.
- Among all groups, mindfulness exercises resulted in significantly reduced anxiety levels, suggesting that mindfulness of any form is useful before a HFS debrief

## REFERENCES

1. Park CS, Rochlen LR, Yaghmour E, Higgins N, Bauchat JR, Wojciechowski KG, Sullivan JT, McCarthy RJ. Acquisition of critical intraoperative event management skills in novice anesthesiology residents by using high-fidelity simulation-based training. *Anesthesiology*. 2010;112(1):202-11.
2. DeMaria S, Silverman ER, Lapidus KAB, Williams CH, Spivack J, Levine A, Goldberg A. The Impact of simulated patient death on medical students' stress response and learning of ACLS. *Med Teach*. 2016;38(7):730-7.
3. Soh DJH, Ong CH, Fan Q, Seah DJL, Henderson SL, Jeevanandam L, Doshi K. Exploring the Use of Virtual Reality for the Delivery and Practice of Stress-Management Exercises. *Front Psychol*. 2021;12:640341.
4. Tarrant J, Viczko J, Cope H. Virtual reality for anxiety reduction demonstrated by quantitative EEG: A pilot study. *Front Psychol*. 2018;9:1-15.