



THE INTEGRATION AND EFFECTS OF MEDITATIVE VIRTUAL REALITY IN FIRST RESPONDER WELLNESS

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Introduction

First Responders experience higher rates of anxiety, depression, PTSD, burnout, substance use disorders, suicidal ideation, and suicide when compared to the general public^[1]. There is a historic lack of attention and resources allocated to the mental health of First Responders^[2]. The First Responder community has also historically been characterized by a pervasive stigma surrounding seeking psychological support^[3]. By integrating meditative VR technology, the pilot study seeks to assess its effectiveness in reducing perceived stress and biological stress indicators within First Responders. These results will provide a foundation for further studies and insight into effective social work interventions for working with this population.

Objective

The purpose of this research was to test the effects of **meditative VR technology** on **bioindicators of stress** such as **blood pressure (BP)**, **heart rate (HR)**, and **respiration rate (RR)**. Researchers want to understand if employing use of this technology immediately following a **call for service (CFS)** can have either short-term or long-term positive effects on the health outcomes of **first responders (FRs)**. This research seeks to contribute to the knowledge base on **FR mental and physical health outcomes** as a result of **occupational stress**.

Methodology

- This study employed a **quantitative approach** to investigate the effects of **5-minute meditative VR sessions** on BP (measured in mm Hg), heartbeats per minute (BPM), and RR.
- Data was collected through **self-report surveys** and **biomedical vitals readings**. Data was stored in a **secure and confidential server** for the duration of testing and analysis.
- The sample size consisted of **20 participants** selected using a both **purposive sampling** (limited to first responders) and **convenience sampling** (volunteers from nearby departments).
- The study utilized **biometric data** (blood pressure, heart rate, and respiratory rate), alongside **psychological scores from stress assessments**. Data analysis techniques included **statistical analysis**, using t-tests to compare pre- and post-intervention means, correlations to examine the impact of employment length, and **ANOVA to compare results across job types**.
- The methodological rigor of the study was ensured through **qualified researcher construction, collaboration, and revision**. Quality assurance measures such as **informed consent of participants** and **data cleaning/scrubbing** were taken.

Measure	After-Call Mean	Post-Intervention Mean	Significance
Blood Pressure	101.7	97.13	Significantly Lower
Heart Rate	84.3	72.7	Significantly lower than baseline
Respiratory Rate	15.3	13.6	Significantly Lower

Assessment	Pre-test Mean	Post-test Mean	Effect Size	Result
Stress (PSS)	2.24	2.47	0.71	Marginally Significant
Burnout	2.26	2.43	0.51	Notable Effect Size
Compassion	3.8	3.84	0.08	No Difference
PDI	0.78	0.74	0.09	No Difference

Key findings:

- Firefighters** exhibited **lower Blood Pressure** at baseline and post-intervention compared to Dispatch & Police.
- Firefighters** also showed a **significantly lower baseline** Respiratory Rate (12) compared to Police (15.2) and Dispatch (14).
- VR effectively lowered Blood Pressure and Respiratory Rate** compared to measures taken immediately after a call.
- While HR did not drop significantly compared to after-call levels, it was significantly lower than the baseline (coming onto shift)
- More years on the job** correlated with **higher stress scores** (0.41 pre-test; 0.70 post-test).
- Experience was related to higher BP and RR after calls, and marginally higher HR post-intervention.

Results

The study investigated the impact of Virtual Reality (VR) interventions on the physiological and psychological well-being of public safety personnel (Police, Fire, and Dispatch). Due to the small sample size (n=26 total across various stages), results should be interpreted with caution.

Correlations were found between years of employment and physiological stress responses:

- More years** on the job correlated with **higher stress scores** (0.41 pre-test; 0.70 post-test).
- Experience** was related to **higher BP and RR** after calls, and **marginally higher HR** post-intervention.

Analysis

VR as a Physiological "Reset": The data suggested that VR serves as an effective physiological intervention for personnel following high-stress events (after-calls). The significant reduction in BP and RR indicates that the intervention may help mitigate the "fight or flight" response triggered during duty.

The "Baseline" Crisis: A critical finding was that personnel arrive for their shifts with elevated heart rates (Baseline HR = 83), significantly higher than their initial consent or pre-test measures. This suggests that the mere act of "coming on to shift" acts as a stressor. The VR intervention successfully lowered these heart rates, suggesting its utility not just after calls but also as a preventive tool at the start of a shift.

Long-term Occupational Impact: The correlation between "years on the job" and higher stress/BP suggests a cumulative physiological toll on public safety workers. Veterans in these fields may experience more intense biometric spikes after calls compared to newer recruits, highlighting a need for targeted interventions for long-tenured staff

Immediate Next Steps:

- Expand Sample Size:** The notable effect sizes for burnout and stress (0.51 and 0.71) suggest that significant results would likely be achieved with a larger participant pool.
- Weekly Data Analysis:** Analyze the "weekly tests" dataset (currently excluded) to determine if the benefits of VR are sustained over time or if they are purely acute.
- Medical Screening Integration:** Further explore the relationship between existing medical conditions and biometric responses to VR

Conclusion

This pilot study provides preliminary evidence that meditative virtual reality may serve as a promising intervention for reducing physiological stress among First Responders. Following calls for service, the use of VR was shown to decrease biologic stress indicators and perceived stress levels. These findings not only highlight the need for further research but also suggest meaningful implications for integrating innovative mental health interventions within First Responder support systems.

Key Sources & Acknowledgements

Thank you to our UNH faculty advisor, Dr. Katherine Godshall! We also want to thank our research assistants, Elle Ramos and Skylar Samanica! Thank you to Kendra Lewis, the Center for Innovative Health Technology, the Salema Group, and the Hamel Center for Undergraduate Research. Finally, thank you to all of the local departments and First Responders who participated in our study!

References are available upon request.