Using Virtual Reality Exposure Treatment and Real-Time Physiological Monitoring to Address PTSD Symptoms in Veterans

Post-Traumatic Stress Disorder (PTSD) is a known problem in veterans transitioning from military service to civilian life, and has shown a rising trend in recent years. This research will explore whether post combat mindfulness training and controlled exposure to Virtual Reality (VR) imagery, simulating real-life, non-combat social anxiety situations, rather than the traditional in-vivo approach of reintroducing tense combat scenarios, increases resilience and decreases PTSD symptoms in combat veterans. More specifically, this study will: 1) identify non-combat, realistic, and commonly occurring scenarios that cause heightened anxiety in veterans with combat related PTSD, 2) develop immersive virtual environments that simulate these scenarios and cause a similar emotional response and 3) develop and evaluate quantitative metrics to assess emotional response effects of Virtual Exposure Therapy (VET) via the acquisition and processing of biosignals. The collected biosignals will be analyzed using machine learning algorithms, to quantitatively assess the exposure effects in terms of emotional response, and track variations over time. The effects of VR exposure will be measured in real-time by collecting physiological biosignals from the test subjects, using wearable sensors. Student veterans will be recruited as volunteers for focus and experiment groups. The Virtual Reality and Technology Lab at Texas State University will be used to achieve a high level of user immersion and psychophysical interaction. Our findings will be evaluated and compared against traditional psychological and PTSD scoring schemes. The MIRG results will serve as pilot data for identified requests for proposals.

Personnel Information

PI: **Vangelis Metsis**, PhD, Assistant Professor - Computer Science, Director of the Intelligent Multimodal Computing and Sensing (IMICS) Lab.
Duties on grant: Dr. Metsis will act as the principal investigator of this grant and will oversee the management of grant activates, budget, reporting, and research. Dr. Metsis will also conduct all physiological monitoring and biometric assessments and will assist with evaluating these measures and with final reporting.

Co-PI: **Kenneth Scott Smith**, PhD, LCSW, Associate Professor of Social Work, Director of Virtual Reality and Technology Lab.
Duties on grant: Dr. Smith will lead the Virtual Reality Exposure Therapy (VET) experiments at the Virtual Reality and Technology Lab and will also contribute in the development of virtual environments.

Co-PI: **Dan Tamir**, PhD, Associate Professor - Computer Science.
Duties on grant: Assist with the development of virtual environments, the programming of the environments, and the data analytics within the environments.

Co-PI: **Katherine Selber**, PhD, LMSW-AP, Professor - Social Work, Veteran Research Expert.
Duties on grant: Dr. Selber will utilize her strong connections in the surrounding community, at the VA, and with local providers that serve veterans to establish research collaboration and recruitment of participants. She will also provide relevant expertise in grant management and oversight of research projects related to veterans.

Co-PI: **Mark Trahan**, PhD, LCSW, Assistant Professor - Social Work
Duties on grant: Dr. Trahan will assist with developing treatment protocol using mindfulness training paired with virtual simulations. He will also conduct the treatments sessions with veterans during the evaluation period of this research.

Investigator: **Grayson Lawrence**, Assistant Professor, Communication Design.
Duties on grant: Mr. Lawrence will assist in the development of virtual environments and supervising graphic design graduate student.