

STRIVE: Stress Resilience in Virtual Environments

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ABSTRACT

The Stress Resilience In Virtual Environments (STRIVE) project aims to create a set of combat simulations (adapted from existing Virtual Iraq/Afghanistan exposure therapy system) that are part of a multi-episode narrative experience. Users can be immersed within challenging combat contexts and interact with virtual characters within these episodes as part of an experiential learning approach. Such approaches, often referred to as Stress Inoculation Training, have been found to reduce the neuroendocrine response, increase coping competence and reduce cortisol response. STRIVE is currently developing three combat modules with a narrative arc that includes increasingly intense combat situations, relational development, stress and loss, and emotional trauma. The goal is to raise the service member's threshold for the stress of combat.

Keywords: Virtual Reality, stress inoculation training, resilience, virtual environment, psychoeducation, allostatic load.

Index Terms: J.3 [Computer Applications: Life and Medical Sciences]: Health; J.7 [Computer Applications: Computers in other systems]: Military.

1 OVERVIEW

The incidence of posttraumatic stress disorder (PTSD) in returning OEF/OIF military personnel is creating a significant healthcare challenge. This has served to motivate research on how to better develop and disseminate evidence-based treatments for PTSD. One emerging form of treatment for combat-related PTSD that has shown promise involves the delivery of exposure therapy using immersive Virtual Reality (VR). Initial outcomes from open clinical trials have been positive and fully randomized controlled trials are currently in progress to further validate this approach.

Based on our research group's initial positive outcomes using VR to emotionally engage and successfully treat persons undergoing exposure therapy for PTSD, we have begun development of a similar VR-based approach to deliver stress resilience training with military service members prior to their initial deployment.

STRIVE consists of three combat scenarios (Fig. 1), each followed by a session with a virtual mentor (Fig. 2) who employs a variety of cognitive behavioral techniques to further enhance the service member's ability to undergo a stress response without long-term negative consequences. The techniques include psychoeducation, anxiety management, mindfulness and cognitive restructuring. By understanding the stress response and the tools

available to resolve stress effectively we hypothesize that service members will be able to reappraise enemy threats as challenges, maintain composure, view the entire battlefield to choose the most effective actions and to process the emotional, psychological and spiritual consequences of combat.

The STRIVE project aims to present this approach to service members prior to deployment as part of a program designed to better prepare military personnel for the types of emotional challenges that are inherent in the combat environment. During these virtual training experiences users are monitored physiologically as part of a larger investigation into the biomarkers of the stress response. One such construct, allostatic load, is being directly investigated via physiological and hormonal analysis from specimen collections taken immediately before and after engagement in the STRIVE virtual experience. In addition, the user's acute response to stress is measured during virtual training with EEG, EKG and GSR. Overall goals of STRIVE include building resilience to combat as well as identifying allostatic load profiles that are associated with the most effective stress responses.



Figure 1. Initial STRIVE combat scenario in a HUMVEE



Figure 2. Psychoeducation module between combat scenarios

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2 MEDICAL VR GROUP – USC INSTITUTE FOR CREATIVE TECHNOLOGIES

The MedVR Group at the University of Southern California Institute for Creative Technologies is devoted to the study and advancement of uses of virtual reality (VR) simulation technology for clinical purposes. In diverse fields including psychology, medicine, neuroscience and physical and occupational therapy, the ICT MedVR Group explores and evaluates areas where VR can add value over traditional assessment and intervention approaches. Areas of specialization are in using VR for mental health therapy, motor skills rehabilitation, cognitive assessment and clinical skills training.

Two of the MedVR group's four research labs are the Mental Health Lab and the Game-Based Rehabilitation Lab. Both research groups will be presenting their latest work at IEEE VR 2012.

2.1 Mental Health Lab

The Mental Health Lab is focusing on the research and development of virtual reality systems for treatment of post-traumatic stress (PTS) disorder. Bravemind (Fig. 3,4), also called *Virtual Iraq/Afghanistan*, is a system that uses virtual reality to deliver exposure therapy aimed at providing relief from this clinical condition. Exposure therapy, in which a patient, guided by a trained therapist, confronts their trauma memories through a re-telling of the experience, is now endorsed as an evidence-based treatment for PTS. The system is currently in use at over 50 clinical sites, including VA hospitals, military bases and university centers — with additional randomized controlled studies ongoing — the *Virtual Iraq / Afghanistan* exposure therapy approach has been shown to produce a meaningful reduction in PTS symptoms. In addition to further developing applications that can be used in assessment, training and treatment, the Mental Health Lab is expanding into various areas of neuroscience by incorporating measures of allostatic load into the ongoing work with resilience and PTS disorders. Stress resilience and factors influencing stress responses (e.g. allostatic load) are the main foci of the group's most recent project STRIVE, which is part of this demo proposal.

2.2 Game-Based Rehabilitation Lab

The Game-Based Rehabilitation Lab's research is centered on the use of game technologies, off-the-shelf games and gaming devices as well user research for clinical applications. In the past the group has evaluated off-the-shelf technologies and games for use in physical rehabilitation. To address limitations of off-the-shelf applications, more recent projects were focused on the development of prototypes for rehabilitation games and tracking/interaction technologies like the Nintendo Wii, Wii Balance Board, Novint Falcon (Fig. 5) or the Microsoft Kinect (Fig. 6). The aim of these prototypes is to effectively improve motor skill rehabilitation of a range of functional deficits. The group's design approach focuses on the creation of flexible VR system/tools that can address both assessment and training tasks in a more comprehensive fashion than is currently available within the clinic and home settings. JewelMine is the group's most recent application to make extensive use of the depth-sensing technology of the Microsoft Kinect.



Figure 3. Setup for the Bravemind PTSD treatment



Figure 4. Bravemind scenario for exposure therapy



Figure 5. Bimanual manipulation training using two Novint Falcons

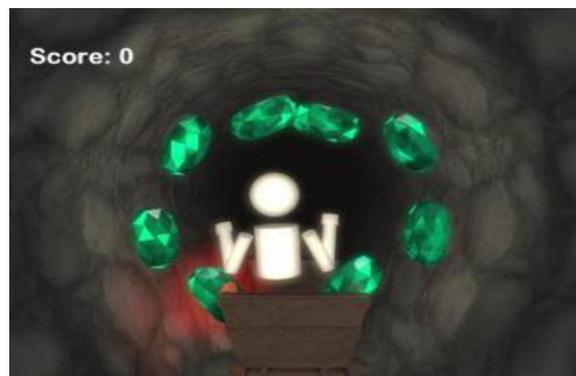


Figure 6. JewelMine application for physical therapy