

# AN IMMERSIVE VIRTUAL REALITY THERAPY APPLICATION FOR IRAQ WAR VETERANS WITH PTSD: FROM TRAINING TO TOY TO TREATMENT

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## ABSTRACT

Post Traumatic Stress Disorder (PTSD) is reported to be caused by traumatic events that are outside the range of usual human experiences including (but not limited to) military combat, violent personal assault, being kidnapped or taken hostage and terrorist attacks. Initial data suggests that 1 out of 6 Iraq War veterans are exhibiting symptoms of depression, anxiety and PTSD. Virtual Reality (VR) exposure treatment has been used in previous treatments of PTSD patients with reports of positive outcomes. The aim of the current paper is to briefly describe the rationale, design and development of an Iraq War PTSD VR therapy application created from assets that were initially developed for a combat tactical training simulation, which then served as the inspiration for the X-Box game entitled *Full Spectrum Warrior*.

## 1. INTRODUCTION

In 1997, researchers at Georgia Tech released the first version of the Virtual Vietnam VR scenario for use as a graduated exposure therapy treatment for PTSD with Vietnam veterans. This occurred over 20 years following the end of the Vietnam War. During that interval, in spite of valiant efforts to develop and apply traditional psychotherapeutic approaches to PTSD, the progression of the disorder in some veterans severely impaired their functional abilities and quality of life, as well as that of their family members and friends. The tragic nature of this disorder also had significant ramifications for the Veteran's Administration healthcare delivery system often leading to designations of lifelong service connected disability status. Just recently, the first systematic study of mental health problems due to the Iraq conflict revealed that "...The percentage of study subjects whose responses met the screening criteria for major depression, generalized anxiety, or PTSD was significantly higher after duty in Iraq (15.6 to 17.1 percent) than after duty in Afghanistan (11.2 percent) or before deployment to Iraq (9.3 percent)" (Hoge et al., 2004). With this history in mind, the USC Institute for Creative Technologies (ICT) has initiated a project that is creating an immersive virtual environment (VE) system for the treatment of Iraq War veterans diagnosed

with combat-related PTSD. The treatment environment is based on a creative approach to recycling virtual assets that were initially built for a combat tactical simulation scenario entitled *Full Spectrum Command*, and later inspired the creation of the commercially available X-Box game, *Full Spectrum Warrior*.

## 2. POST TRAUMATIC STRESS DISORDER

According to the DSM-IV (1994), PTSD is caused by traumatic events that are outside the range of usual human experiences such as military combat, violent personal assault, being kidnapped or taken hostage, terrorist attack, torture, incarceration as a prisoner of war, natural or man-made disasters, automobile accidents, or being diagnosed with a life-threatening illness. Typically, the initiating event involves actual or threatened death or serious injury, or other threat to one's physical integrity; or witnessing an event that involves death, injury, or a threat to the physical integrity of another person. The essential feature of PTSD is the development of characteristic symptoms that may include: intrusive thoughts and flashbacks, anger, isolation, emotional numbing, anxiety, depression, substance abuse, survivor guilt, hyper-alertness, suicidal feelings and thoughts, alienation, negative self-image, memory impairment, problems with intimate relationships and emotional distance from family and others. Symptoms of PTSD are often intensified when the person is exposed to situations or stimulus cues that resemble or symbolize the original trauma in a *non-therapeutic* setting. Such *uncontrolled* cue exposure may lead the person to react with a survival mentality and mode of response that could put the patient and others at considerable risk.

Prior to the availability of VR therapy applications, the existing standard of care for PTSD was *imaginal* exposure therapy. Such treatment typically involves the graded and repeated imaginal reliving of the traumatic event within the therapeutic setting. This approach is believed to provide a low-threat context where the patient can begin to therapeutically process the emotions that are relevant to the traumatic event as well as de-condition the learning cycle of the disorder via a habituation/extinction process. While the efficacy of

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imaginal exposure has been established in multiple studies with diverse trauma populations (Rothbaum & Schwartz, 2002), many patients are unwilling or unable to effectively visualize the traumatic event. In fact, avoidance of reminders of the trauma is inherent in PTSD and is a defining symptom of the disorder.

The use and value of Virtual Reality for the treatment of cognitive, psychological and physical disorders has been well specified (Glantz et al., 2003). The first use of VR for a Vietnam veteran with PTSD was reported in a case study of a 50-year-old, Caucasian male veteran meeting DSM-IV criteria for PTSD (Rothbaum et al., 1999). Results indicated post-treatment improvement on all measures of PTSD and maintenance of these gains at a 6-month follow-up. This case study was followed by an open clinical trial of VR for Vietnam veterans (Rothbaum et al., 2001). In this study, 16 male PTSD patients were exposed to two HMD-delivered VEs, a virtual clearing surrounded by jungle scenery and a virtual Huey helicopter, in which the therapist controlled various visual and auditory effects (e.g. rockets, explosions, day/night, yelling). After an average of 13 exposure therapy sessions over 5-7 weeks, there was a significant reduction in PTSD and related symptoms. Similar positive results have also recently been reported for VR applied to PTSD resulting from the bombing of the World Trade Center (Difede & Hoffman, 2002). This initial evidence suggests that VR may be a promising component of a comprehensive treatment approach for combat-related PTSD.

### 3. FULL SPECTRUM VR PTSD SCENARIO

The aim of the current project is to use the already existing ICT Full Spectrum Warrior graphic assets (go to: [http://www.ict.usc.edu/disp.php?bd=proj\\_games\\_fsw](http://www.ict.usc.edu/disp.php?bd=proj_games_fsw) for video demo) as the basis for creating a clinical VR application for the treatment of PTSD in returning Iraq War military service personnel. Thus far, a prototype VE has been created which was designed resemble a middle eastern city, and outlying village and desert areas (Figs. 1-4). The scenario will also support a variety of user perspectives including, walking alone or within a patrol, and from the vantage point of being inside a vehicle (i.e., HUMVEE, helicopter, etc.). This VE will be used initially for user testing to gather feedback to further refine the scenario. A prototype of a “wizard of oz” type clinical interface (Fig. 5) has also been created. This interface is a key element for the application in that it

will provide the clinician with the capacity to monitor a patient’s behavior and customize the therapy experience to their individual needs by placing them in VE locations that resemble the setting in which the traumatic events initially occurred. The interface also allows for the gradual introduction and control of “trigger” stimuli in the VE in real time that is required to foster the anxiety modulation needed for therapeutic habituation. Clinical trials are expected to begin in early 2005. An extended version of this paper is available from the first author.

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### REFERENCES

Hoge, C.W., Castro, C.A., Messer, S.C., McGurk, D., Cotting, D.I. and Koffman, R.L. (2004). Combat Duty in Iraq and Afghanistan, Mental Health Problems, and Barriers to Care. *NE J. Medicine*, 351 (1):13-22.

DSM-IV. (1994). American Psychiatric Association, Washington, D.C.

Rothbaum, B.O., & Schwartz, A.C. (2002). Exposure therapy for posttraumatic stress disorder. *American J. of Psychotherapy* 56:59-75.

Glantz, K., Rizzo, A.A. & Graap, K. (2003). Virtual Reality for Psychotherapy: Current Reality and Future Possibilities. *Psychotherapy: Theory, Research, Practice, Training*, 40, 1/2, 55-67.

Rothbaum B., Hodges, L., Alarcon, R., Ready, D., Shahar, F., Graap, K., Pair, J., Hebert, P., Gotz, D., Wills, B., & Baltzell, D. (1999). Virtual reality exposure therapy for PTSD Vietnam veterans: A case study. *J. Traumatic Stress* 12, 263-271.

Rothbaum, B., Hodges, L., Ready, D., Graap, K. & Alarcon, R. (2001) Virtual reality exposure therapy for Vietnam veterans with posttraumatic stress disorder. *J. of Clinical Psychiatry* 62, 617-622.

Difede, J. & Hoffman, H. (2002). Virtual reality exposure therapy for World Trade Center Post Traumatic Stress Disorder. *Cyberpsychology and Behavior*, 5:6, 529-535



Fig. 1 City view

Fig. 2 Desert view

Fig. 3 Interior view

Fig. 4 Helicopter view

Fig. 5 Clinical interface