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SPECIAL REPORT

On Healing and Prevention

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After commanding a transportation unit in Iraq, a National Guardsman returned home to California (Guthrie, 2005). He thought he was fine until the nightmares and night sweats started. He felt numb and detached from his family. When he drove to work, a bump in the asphalt triggered memories of improvised devices that exploded on Iraqi roadways. With the encouragement of his family, the Guardsman finally sought counseling.

Meanwhile, a 24-year-old gunner still in Iraq became withdrawn, listless and disinterested in eating (Myers, 2003). He would lie awake, remembering how four of his friends, fellow soldiers, had their bodies torn apart by a bomb packed inside a taxi. He was referred to counseling for his "combat stress reaction" and returned to duty with his unit.

The issues are challenging: How do you reduce or avert the psychological wounds of war and prevent long-term, service-connected disabilities?

At the recent 13th Annual Medicine Meets Virtual Reality Conference in Long Beach, Calif., researchers discussed the development of new technologies using virtual reality to treat soldiers returning from Iraq with posttraumatic stress disorder and to provide those being deployed with stress inoculation training. As defined by researchers working with veterans, "virtual reality integrates real-time computer graphics, body-tracking devices, visual displays and other sensory input devices to immerse a participant in a computer-generated virtual environment that changes in a natural way with head and body motion" (Rothbaum et al., 2001). Albert "Skip" Rizzo, Ph.D., research scientist and research assistant professor at the Institute for Creative Technologies (ICT) at the University of Southern California, told conference attendees that ICT is creating an immersive virtual environment system in which to treat Iraqi War veterans diagnosed with combat-related PTSD (Rizzo et al., 2004).

We put tremendous resources into training our troops for combat, now "we need to make a strong case for dealing with the aftermath," Rizzo said. "The military has an ethical responsibility to deal with PTSD."

At press time, there are some 150,000 U.S. troops in Iraq. Reports are emerging of some severe mental health problems among them. Of the nearly 12,000 soldiers being treated at the Landstuhl Regional Medical Center in Germany, between 8% and 10% had "psychiatric or behavioral health issues," according to hospital commander Col. Rhonda Cornum (United Press International, 2004). The hospital is the main transfer point and treatment center for those being medically evacuated from Iraq, Kuwait or Afghanistan.

Rizzo said a recent study focusing on mental health problems of U.S. military units involved in combat in Iraq and Afghanistan "gave his research a reason for being." He explained that the study prepared by the department of psychiatry and behavioral sciences at Walter Reed Army Institute of Research suggested that one out of six (16.7%) Iraqi War veterans is exhibiting mental health problems (Hoge et al., 2004), a number close to PTSD levels found among Vietnam War veterans (15.2%), when surveyed in the late 1980s.

According to the study, 17.1% of 882 Army soldiers and 15.6% of 813 Marines who served in Iraq met strict criteria for PTSD, major depression or generalized anxiety when they were screened three to four months after their return to the United States (Hoge et al., 2004). By comparison, 11.2% of 1,958 Army soldiers who served in Afghanistan had mental health problems.

More specifically, rates of PTSD (12.2% to 12.9%) were significantly higher after combat duty in Iraq than before deployment (5%) as assessed using the 17-item National Center for PTSD Checklist of the U.S. Department of Veterans Affairs. The rates of PTSD were significantly associated with having been wounded or injured or having engaged in one or more firefights.

Rizzo reminded attendees that PTSD is caused by traumatic events that are outside the range of usual human experiences, such as military combat, violent personal attacks and terrorist attacks. According to the DSM-IV-TR, PTSD is identified by clusters of symptoms such as cognitively re-experiencing the event (e.g., flashbacks, nightmares), persistent avoidance of things that remind the person of the trauma, numbing of general responsiveness and hyperarousal (e.g., the person is hypervigilant, has difficulty falling or staying asleep, or is always on edge).

A standard of nonpharmacological care for PTSD has been imaginal exposure therapy. Such treatment, Rizzo said, 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 imaginal exposure has been established in multiple studies with diverse trauma populations (Rothbaum et al., 2000), many patients have problems with it, according to Rizzo.

"The problem with imaginal therapy is that sometimes people have a hard time imagining some of these events," he said. "Also, avoidance and loss of memory of the events is part of the symptom package. So you are asking someone who has been traumatized in an extreme combat situation to start to remember it."

Virtual Reality Exposure

Virtual reality exposure treatment has been used to treat patients with PTSD with positive outcomes. In 1997, 20 years after the Vietnam War, researchers at Georgia Tech released the first version of "Virtual Vietnam VR" for use as a graduated exposure therapy treatment for PTSD with Vietnam War veterans (Rothbaum et al., 2001). In an open clinical trial, it was used to treat 10 Vietnam War combat veterans who had PTSD as diagnosed by *DSM-IV* criteria. In eight to 16 sessions, the patients were exposed to two virtual environments: a virtual Huey helicopter flying over a virtual Vietnam and a clearing surrounded by jungle. Reductions in PTSD symptoms ranging from 15% to 67% were reported at six-month follow-up by all eight participants interviewed.

Rizzo said his project involves the use of virtual assets that were initially built for a combat tactical simulation scenario and later licensed to create a commercially available video game. Rizzo had seen a trailer for the game and was able to obtain access to the graphic assets of the game. With the help of programmer friends, he cobbled together a variety of graphic assets to create the prototype for the virtual reality exposure application for Iraqi War veterans. The software is being designed so clinical users can be teleported to highly realistic and emotionally evocative settings (e.g., city and rural village scenes, traffic checkpoints, building interiors, and desert roads) that most closely match the patient's combat-related experiences.

Once the scenario is selected, different user perspectives can be taken, such as a soldier walking alone, being with a patrol, or riding in a HMMWV (or Humvee) or helicopter. According to Rizzo, the clinician can also control time of day and trigger stimuli, such as weapons fire, explosions, being shot at, seeing dead bodies or human remains, or being wounded or injured.

The prototype has a *Wizard of Oz*-type clinical interface, Rizzo said. The interface enables the clinician to see what the patient is seeing and control "trigger" stimuli. It also allows for the monitoring of the patient's physiological status. All of this is with the "goal of customizing the graduated exposure based on the client's needs," Rizzo added.

The virtual reality exposure PTSD project, now in design testing, will not only help in the treatment of PTSD but also in its assessment, Rizzo said.

One of the findings of the 2004 Hoge et al. combat duty study was that those who most needed mental health care were not receiving it out of fear of being stigmatized, prompting the study authors to call for PTSD screening. Instead of having returning soldiers and Marines just complete a symptom checklist, Rizzo suggested that they could participate in an initial debriefing procedure that integrates the virtual reality exposure PTSD application with physiological recording. Past research has suggested differential physiological responses in people with PTSD, so the virtual reality exposure PTSD could be used to spot people who do not self-report that they are having problems. Additionally, if indicators of substantive physiological reactivity are present during an initial virtual reality exposure, the soldier could be referred for continued "debriefing care."

Stress Inoculation

Stress inoculation training is another area being explored for Wiederhold before they are deployed to Iraq. Brenda Wiederhold, Ph.D., and her husband, Mark Wiederhold, M.D., Ph.D., of the Virtual Reality Training Center in California are conducting stress inoculation training research under a contract with the Pentagon's Defense Advanced Research Projects Agency. They are developing a hybrid approach combining virtual reality simulations with live training, while monitoring the physiology of warriors in tactical situations. By analyzing tactical decision making under stress, the Wiederholds hope to develop techniques to help trainees control fear and anxiety; in effect, to inoculate them against stress.

Mark Wiederhold told attendees at the Medicine Meets Virtual Reality sessions that they have trained several Marine Corps battalions with stress inoculation techniques involving virtual reality games and live experiences, and those troops are now in Iraq and Afghanistan.

"We will be able to compare rates of PTSD among troops that received stress training versus groups that have not," he said.

The whole idea of using virtual reality for therapy translates very effectively for using virtual reality for training the military, said Mark Wiederhold. He continued by saying that they're looking at training combat medics using a video game.

"Despite using a single video game, we were able to get physiological arousal with significant increases in both respiration and heart rate when [the medics] were playing it. The game essentially requires them to take care of these wounded individuals in the field. It then provides divided attention tasks where they have to break away from caring for the wounded and shoot at enemies that are shooting at them," he said.

The trainees are then tested in the real world to determine if the skills learned in simulated environments do indeed generalize to the real world.

(For more on virtual reality, see accompanying sidebar on p9 of this edition--Ed.)

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