Chapter 8

Treating Combat-Related PTSD With Virtual Reality Exposure Therapy

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Posttraumatic stress disorder (PTSD) is a chronic condition that occurs in a significant minority of persons who experience life-threatening traumatic events. It is characterized by reexperiencing, avoidance, and hyperarousal symptoms (American Psychiatric Association, 1994). PTSD has been estimated to affect up to 18% of returning Operation Iraqi Freedom (OIF) Veterans (Hoge et al., 2004). In addition to the specific conditions in Iraq and Afghanistan, an unprecedented number are now surviving serious wounds (Blimes, 2007). The stigma of treatment often prevents service members (SMs) and veterans from seeking help (Hoge et al., 2004), so finding an acceptable form of treatment for military personnel is a priority. The current generation of military personnel may be more comfortable participating in a virtual reality treatment approach than in traditional talk therapy, as they are likely familiar with gaming and training simulation technology. This chapter provides information on the development of and research on virtual reality (VR) as well as the application of VR to mental health treatments, including a protocol of virtual reality exposure (VRE) utilizing a virtual Iraq/Afghanistan system for combat-related PTSD.

The Military Health Care Challenge

War is perhaps one of the most challenging situations that a human being can experience. The physical, emotional, cognitive, and psychological demands of a combat environment place enormous stress on even the best-prepared military personnel. Since the start of the Operation Iraqi Freedom/Operation Enduring Freedom (OEF/OIF) conflicts in Iraq and Afghanistan, approximately 1.9 million troops have been deployed (Department of Defense [DoD], 2010a). As of December 2010, there have been 5,836 deaths and 41,583 SMs wounded in action (DoD, 2010b; Fischer, 2010). Of the wounded in action (WIA), the total includes 1,222 major limb amputations and 399 minor amputations and as of 2010,

traumatic brain injury (TBI) has been diagnosed in 178,876 patients (many of which are not included in the WIA statistics because mild TBI is often reported retrospectively, on redeployment home). The stressful experiences that are characteristic of the OIF/OEF war-fighting environments have produced significant numbers of returning SMs at risk for developing PTSD. In the first systematic study of OIF/OEF mental health problems, the results indicated 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, p. 13). Reports since that time on OIF/OEF PTSD and psychosocial disorder rates suggest even higher incidence statistics (Fischer, 2010; Seal, Bertenthal, Nuber, Sen, & Marmar, 2007; Tanielian et al., 2008). For example, as of 2010, the Military Health System has recorded 66,934 active duty patients who have been diagnosed with PTSD (Fischer, 2010) and the Rand Analysis (Tanielian et al., 2008) estimated that at a 1.5-million deployment level, more than 300,000 active duty and discharged veterans will suffer from the symptoms of PTSD and major depression. These findings make a compelling case for continued focus on developing and enhancing the availability of evidence-based treatments to address a mental health care challenge that has had a significant impact on the lives of our SMs, veterans, and their families, who deserve our best efforts to provide optimal care.

At the same time a virtual revolution has taken place in the use of VR simulation technology for clinical purposes. Technological advances in the areas of computation speed and power, graphics and image rendering, display systems, body tracking, interface technology, haptic devices, authoring software and artificial intelligence have supported the creation of low-cost and usable VR systems capable of running on a commodity level personal computer. The unique match between VR technology assets and the needs of various clinical treatment approaches has been recognized by a number of scientists and clinicians, and an encouraging body of research has emerged that documents the many clinical targets where VR can add value to clinical assessment and intervention (Glantz, Rizzo, & Graap, 2003; Holden, 2005; Parsons & Rizzo, 2008; Powers & Emmelkamp, 2008; Riva, 2011; Rizzo, Lange, Suma, & Bolas, 2011; Rizzo, Schultheis, Kerns, & Mateer, 2004; Rose, Brooks, & Rizzo, 2005). This convergence of the exponential advances in underlying VR enabling technologies with a growing body of clinical research and experience has fueled the evolution of the discipline of *Clinical Virtual Reality*.

Introduction to Clinical Virtual Reality

In its basic form, VR can be viewed as an advanced form of human-computer interface that allows the user to "interact" with and become "immersed" within a computer generated simulated environment (Rizzo, Buckwalter, & Neumann, 1997). VR sensory stimuli can be delivered by using various forms of visual display technology that integrates real-time computer graphics and/or photographic images/video with a variety of other sensory output devices that can present audio, "force-feedback" haptic/touch sensations and even olfactory content to the user. An engaged interaction with a virtual experience can be supported by employing specialized tracking technology that senses the user's position and movement and uses that information to update the visual, audio and haptic/touch stimuli presented to users to create the illusion of being immersed "in" a virtual space in which they can interact. One common configuration employs a combination of a head-mounted display (HMD), which consists of separate display screens for each eye, display optics, stereo earphones, and a head-tracking device that allows delivery of computer-generated images and sounds of a simulated virtual scene that corresponds to what the individual would see and hear if the scene were real. Other methods employ 3D displays that project on a single wall or on a multiple wall space (multiwall projection rooms are known as CAVES). As well, basic flat-screen display monitors have been used to deliver interactive VR scenarios that, although not immersive, are sometimes sufficient, cost-effective options for delivering testing, training, treatment and rehabilitative applications using VR. With the capacity of VR technology to create controllable, multisensory, interactive 3-dimensional stimulus environments, it is well suited to simulate the challenges that people face in naturalistic environments, and consequently can provide objective simulations that can be useful for clinical assessment and treatment purposes.

A short list of areas where clinical VR has been usefully applied includes fear reduction in persons with simple phobias (Parsons & Rizzo, 2008; Powers & Emmelkamp, 2008), treatment for PTSD (Difede et al., 2007; Difede & Hoffman, 2002; Rizzo et al., 2011b; Rizzo, Difede, Rothbaum, & Reger, 2010; Rothbaum, Hodges, Ready, Graap, & Alarcon, 2001), stress management in cancer patients (Schneider, Kisby, & Flint, 2010), acute pain reduction during wound care and physical therapy with burn patients (Hoffman et al., 2011), body image disturbances in patients with eating disorders (Riva, 2011), navigation and spatial training in children and adults with motor impairments (Rizzo et al., 2004; Stanton, Foreman, & Wilson, 1998), functional skill training and motor rehabilitation with patients having central nervous system dysfunction (e.g., stroke, TBI, SCI, cerebral palsy, multiple sclerosis), (Holden, 2005; Merians et al.,

2010), and for the assessment and rehabilitation of attention, memory, spatial skills and other cognitive functions in both clinical and unimpaired populations (Parsons & Rizzo, 2008; Rizzo et al., 2006; Rose et al., 2005). To do this, VR scientists have constructed virtual airplanes, skyscrapers, spiders, battlefields, social settings, beaches, fantasy worlds, and the mundane (but highly relevant) functional environments of the schoolroom, office, home, street and supermarket. In essence, clinicians can now create simulated environments that mimic the outside world and use them in the clinical setting to immerse patients in simulations that support the aims and mechanics of a specific therapeutic approach.

Virtual Reality Exposure

Among the many approaches that have been used to treat PTSD, cognitive-behavioral treatment (CBT) with prolonged exposure (PE) appears to have the best-documented therapeutic efficacy (Cahill, Rothbaum, Resick, & Follette, 2009; Institute of Medicine [IOM], 2008). PE is a program of exposure therapy based on Foa and Kozak's (1986) emotional processing theory, which posits that PTSD involves pathological fear structures that are activated when information represented in the structures is encountered. These fear structures are composed of harmless stimuli that have been associated with danger. Successful treatment requires emotional processing of the fear structures to modify their pathological elements so that the stimuli no longer evoke fear. Imaginal exposure entails engaging mentally with the fear structure through repeatedly revisiting the traumatic event in a safe environment. In practice, a person with PTSD typically is guided and encouraged by the clinician gradually to *imagine, narrate,* and *emotionally process* the traumatic event within the safe and supportive environment of the clinician's office. This approach is believed to provide a low-threat context where the patient can begin to process therapeutically the emotions that are relevant to the traumatic event as well as de-condition the avoidance learning cycle of the disorder via a habituation/extinction process. Expert treatment guidelines for PTSD published for the first time in 1999 recommended that CBT with exposure should be the first-line therapy for PTSD (Foa, Davidson, & Frances, 1999). The comparative empirical support for exposure therapy was documented in a review by the IOM at the National Academies of Science of 53 studies of pharmaceuticals and 37 studies of psychotherapies used in PTSD treatment (IOM, 2008). The report concluded that although there is not enough reliable evidence to draw conclusions about the effectiveness of most PTSD treatments, there is sufficient evidence to conclude that exposure therapies are effective in treating people with PTSD.

Although the efficacy of imaginal exposure has been established in multiple studies with diverse trauma populations, many patients are unwilling or unable to effectively visualize the traumatic event. This is a crucial concern because avoidance of cues and reminders of the trauma is one of the cardinal symptoms of PTSD. In fact, research on this aspect of PTSD treatment suggests that the inability to emotionally engage (*in imagination*) is a predictor for negative treatment outcomes (Jaycox, Foa, & Morral, 1998). To address this problem, researchers have recently turned to the use of VR to deliver exposure (VRE) by immersing clients in simulations of trauma-relevant environments in which the emotional intensity of the scenes can be precisely controlled by the clinician in collaboration with the patients' wishes. In this fashion, VRE offers a way to circumvent the natural avoidance tendency by directly delivering multisensory and context-relevant cues that evoke the trauma without demanding that the patient actively try to access his or her experience through effortful memory retrieval. Within a VR environment, the hidden world of the patient's imagination is not exclusively relied upon.

The first use of VRE for a Vietnam veteran with PTSD was reported in a case study of a 50-year-old, Caucasian male veteran who met *DSM-IV* criteria for PTSD (Rothbaum et al., 1999). Results indicated posttreatment improvement on all measures of PTSD, and maintenance of these gains were seen at a 6-month follow-up. This case study was followed by an open clinical trial of VRE for Vietnam veterans (Rothbaum et al., 2001). In this study, 16 male Vietnam veterans with PTSD were exposed to two virtual environments delivered in a head-mounted display, a virtual clearing surrounded by jungle and a virtual Huey helicopter, in which the therapist controlled various visual and auditory effects (e.g., helicopter flybys, explosions, day/night effects, men yelling). After an average of 13 exposure therapy sessions over 5 to 7 weeks, there was a significant reduction in PTSD and related symptoms in the treatment completers. Similar findings were discovered 6 months later, suggesting that VRE could be a promising component of a comprehensive treatment approach for Veterans with combat-related PTSD.

In the aftermath of the 9/11 terrorist attacks on New York City, many thousands of World Trade Center (WTC) survivors, including first responders and disaster recovery workers as well as civilians, were deemed to be at high risk for developing PTSD. In response to this, Difede and Hoffman (2002) developed a virtual WTC for treating survivors that gradually, yet systematically, exposes the client to a simulated attack on the WTC. A wait-list-controlled study, comprised of firefighters, disaster recovery workers and civilians, some of whom were not successful in previous imaginal therapy, found positive results from VRE (Difede et al., 2007). The VRE group showed both statistically and clinically significant improvement in the Clinician Administered PTSD Scale (CAPS) compared to the wait-list comparison group.

VR environments have been used worldwide to facilitate PTSD treatment in civilians. In Portugal, Gamito and colleagues (2007) developed a VR application in response to the estimated 25,000 survivors with PTSD from their 1961 to 1974 wars in Mozambique, Angola, and Guiné. This research group constructed a single virtual reality "ambush" scenario by modifying a common PC-based combat game. They reported having recently conducted an initial user-centered test with one PTSD patient who provided feedback suggesting the need for a system that provides more graduated delivery of anxiety provoking trigger stimuli. Josman and colleagues (2006) are currently implementing a virtual bus bombing PTSD treatment scenario for civilian survivors of terrorist attacks in Israel.

Virtual Reality Exposure Therapy Using Virtual Iraq/Afghanistan

In response to the growing numbers of veterans returning with combat-related PTSD from Operation Iraqi Freedom, development of a Virtual Iraq scenario was commenced in 2005 at the University of Southern California (Rizzo, Reger, Gahm, Difede, & Rothbaum, 2009) Institute for Creative Technologies (ICT). The *Virtual Iraq* application (and the new *Virtual Afghanistan* scenario) consists of a series of virtual scenarios designed to represent relevant contexts for VRE, including Middle Eastern–theme city and desert road environments (see Figure 8.1). In addition to the visual stimuli presented in the VR HMD, directional 3D audio, vibrotactile and olfactory stimuli of relevance can be delivered. The presentation of additive, combat-relevant stimuli in the VR scenarios can be controlled by a therapist via a separate "wizard of oz" clinical interface, while in full audio contact with the patient. The clinical interface is a key feature in that it provides a clinician with the capacity to customize the therapy experience to the individual needs of the patient. The clinician can place the patient in VR scenario locations that resemble the setting in which the traumatic events initially occurred and can gradually introduce and control real time "trigger" stimuli (visual, auditory, olfactory and tactile) as is required to foster the anxiety modulation needed for therapeutic processing and habituation. Initial usability studies and case reports were published with positive findings in terms of SMs acceptance, interest in the treatment, and clinical successes (Gerardi, Rothbaum, Ressler, Heekin, & Rizzo, 2008; Reger et al., 2007, 2011; Reger, Gahm, Rizzo, Swanson, & Duma, 2009; Wilson, Onorati, Mishkind, Reger, & Gahm, 2008).

Figure 8.1 Latest version of Virtual Iraq/Afghanistan scenarios [ch08f01]

Source: Courtesy of USC Institute for Creative Technologies.

An open clinical trial to evaluate the feasibility of using VRE with active duty participants who had previously engaged in PTSD treatments (e.g., group counseling, EMDR, medication) without benefit was conducted at the Naval Medical Center San Diego and at Camp Pendleton (Rizzo et al., 2011b). The standard treatment protocol consisted of two-times weekly, 90- to 120-minute sessions over 5 weeks. The VRE exposure exercises followed the principles of prolonged exposure (PE) therapy (Foa et al., 1999) and a manual developed for that study (Rothbaum, Difede, & Rizzo, 2008). Self-report measures were obtained at baseline and prior to sessions 3, 5, 7, 9, 10, and 1 week and 3 months posttreatment to assess in-treatment and follow-up symptom status. The measures used were the PTSD Checklist-Military Version (PCL-M) (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996), Beck Anxiety Inventory (BAI) (Beck, Epstein, Brown, & Steer, 1988) and Patient Health Questionnaire-Depression (PHQ-9) (Kroenke & Spitzer, 2002).

Analyses of the first 20 active duty service members to complete treatment (19 male, 1 female, Mean Age = 28, Age Range: 21–51) indicated positive clinical outcomes. The average number of sessions for the sample was just under 11. Two of the successful treatment completers had documented mild and moderate TBIs, which provide an early indication that this form of exposure therapy can be useful (and beneficial) for this population. Results from uncontrolled open trials are difficult to generalize and should be interpreted with caution. However, using accepted diagnostic measures, 80% of the treatment completers in the VRE sample showed both statistically and clinically meaningful reductions in PTSD, anxiety and depression symptoms that were maintained 3 months posttreatment. Also, anecdotal evidence from patient reports suggested that they saw improvements in their everyday life.

Other studies have also reported positive outcomes. Two early case studies have been published that reported positive results using VRE (Gerardi et al., 2008; Reger & Gahm, 2008). Following those studies, an open clinical trial with active duty soldiers (n = 24) indicated significant pre- and postreductions in PCL-M scores and a large treatment effect size (Cohen's d = 1.17). After an average of 7 sessions, 45% of those treated no longer screened positive for PTSD and 62% had reliably improved (Reger et al., 2011).

Currently three randomized controlled trials (RCT) are ongoing with the *Virtual Iraq/Afghanistan* system with active duty and veteran populations. Two RCTs are focusing on comparisons of treatment efficacy between VRE and

imaginal PE, while the third RCT investigates the additive value of supplementing VRE and imaginal PE with a cognitive enhancer called *D-Cycloserine* (DCS). DCS, a N-methyl-d-aspartate partial agonist, has been shown to facilitate extinction learning in laboratory animals when infused bilaterally within the bilateral amygdala prior to extinction training (Walker, Ressler, Lu, & Davis, 2002). The first clinical test in humans that combined DCS with VRE was performed by Ressler et al. (2004) with participants diagnosed with acrophobia (*n* = 28). Participants who received DCS + VRE had significantly enhanced decreases in fear within the virtual environment 1 week and 3 months posttreatment, and reported significantly more improvement than the placebo group in their overall acrophobic symptoms at 3-month follow-up and on a psychophysiological measure of anxiety.

The research on VRE has been supported by the relatively quick adoption of the VRE approach by approximately 55 Military, VA, and university clinic sites over the past 3 years.

Suggestions for the Use of Virtual Iraq/Afghanistan for VRE

. Research on VRE has led to the development of standardized treatment protocols for clinicians using VRE. These protocols provide important instructions and suggestions to clinicians for conducting VRE, as well as key considerations for clinicians before they engage patients in the treatment.

Prior to Initiating Treatment With Virtual Iraq/Afghanistan

When a possible referral for VRE is received, the following information should be elicited to make sure this is an appropriate treatment modality for this individual:

Referral source (how they heard about the program) and why specifically they are seeking treatment.

The basic nature of their symptomatology, that is, elicit whether a doctor diagnosed them with PTSD or do a basic screen to identify whether they may have symptoms of PTSD.

The nature of their exposure to the traumatic event. It is important before scheduling treatment to ascertain if the nature of their trauma seems appropriate for the virtual reality environment; however, one should not elicit their entire experience over the phone before the initial

Leaman, S., Rothbaum, B.O., Difede, J., Cukor, J., Gerardi, M. & **Rizzo, A.** (2013). Virtual Reality   113
Exposure Therapy: A Treatment Manual for Combat Related PTSD. In Coll, J., Rubin, A. & Weiss, E.
(eds.) *Handbook of Military Social Work*. John Wiley & Sons, Inc., Hoboken, NJ. *113-140.*

appointment. Currently, there are three virtual Iraq/Afghanistan environments: a virtual Humvee driving down a desert highway alone; a virtual Humvee driving down a desert highway in a convoy; and a Middle Eastern city foot patrol scene. If one of these environments would not be appropriate given the nature of the patient's traumatic event, you may want to consider prolonged imaginal exposure without the VR.

Components of Treatment

Most treatment sessions will include:

Review of patient's reactions and functioning (approximately 15 minutes)
Virtual reality exposure therapy (45 minutes)
Processing of material that emerged during exposure (20 to 30 minutes)
Assignment of homework for next session or conclusion of session (5 to 10 minutes)
Other components that may be used include:

Breathing relaxation
In vivo exposure
Cognitive restructuring
Pleasant events scheduling

Options for Treatment

There are slight variations on the exact protocols being used currently, and all seem to be effective at this time. We recommend VRE alone as the primary treatment component, matching the virtual reality to what the patient describes as the most traumatic memories in exposure from the start of treatment. Others have preferred to begin with imaginal exposure only for the first one to two sessions, followed by gradual exposure to the virtual environments allowing the patient to "wander" and explore the virtual environment while describing aloud any memories triggered by the virtual reality environment for one to two sessions. Then, finally, imaginal exposure to the most traumatic memories matching what the patient describes with the virtual reality. Still others prefer to start with imaginal exposure first to the most traumatic memories for one or two sessions prior to initiating VRE. All of the current studies begin with VRE.

VR Assessment

This chapter is written for clinicians using VRE with OIF or OEF veterans. At a minimum, we suggest administering the CAPS, the PTSD Symptom Scale

(PSS) (interview or self-report version), or similar measures such as the PCL-M to assess the patient's PTSD symptoms as well as the Beck Depression Inventory (BDI) or similar measures to assess depression before and after treatment. We also recommend administering the PSS self-report before every session to plot the patient's progress. Other assessment instruments may be useful depending on the setting.

Overview of VRE Using Virtual Iraq/Afghanistan

The following is part of a current protocol of VRE utilizing Virtual Iraq or Virtual Afghanistan (Difede, Rothbaum, & Rizzo, 2011). This description focuses on using VR during sessions but does not include imaginal or in vivo exposure homework assignments, which should be used when conducting a full protocol of VRE and can be found in other texts (e.g., Foa, Hembree, & Rothbaum, 2007; Rothbaum et al., 2008). Much of the treatment is presented here in the voice of the clinician making the text user-friendly for clinical application. When presenting the text to the patient, the clinician should "talk it" rather than read it or lecture it to the patient.

Session 1

Overview
1. Present session agenda (5 minutes)
2. Provide overview of treatment (30 minutes)
3. Gather information from patient (35 minutes)
4. Breathing retraining (15 minutes)
5. Assign homework and end session (5 minutes)

Present Session Agenda

"Today's session will be an introduction to our treatment. I'll tell you a bit about what to expect, some basic information about our treatment, and an overview of the interventions we will use and how they will target the symptoms and problems you are having. Then I'll ask you to tell me more about your symptoms, your experience, and yourself in general. Finally, we'll introduce and practice our first skill, a breathing technique, which should be helpful for you. This entire treatment is collaborative, so feel free to ask questions and express any concerns you might have. It's best we talk about everything openly to get the most

from our time together, so please feel free at all times to discuss honestly any problems, concerns, etc. that may arise. Before I begin, do you have any questions?"

Provide Overview of Treatment

Introduction: "Based on our assessment, we found that you have posttraumatic stress disorder, which we call PTSD for short, as well as . . ." (*List other diagnoses/problems*). "This treatment is designed to treat all of the symptoms of PTSD, but many of the interventions we will use are effective in reducing feelings of depression and generalized anxiety as well.

"The good news is that PTSD is a disorder for which there are effective treatments, and our treatment program includes several interventions that have been shown to be very helpful in reducing symptoms and helping people recover from trauma. I will review the treatment plan and interventions now, and we will discuss them in detail when they are introduced in later sessions."

Treatment Duration: "This treatment involves our meeting weekly for eight more sessions after today, nine total, and each session will be approximately 90 minutes long."

Goals of Treatment: "The goal of this treatment is to help you deal with what happened in Iraq [or Afghanistan] and to hopefully decrease the posttraumatic stress symptoms that you have been experiencing. The way we view PTSD is that someone is haunted by something that happened in their past. What we want to do in treatment is to help them process the traumatic experience and come to some peace with it. **To that end, several techniques will be utilized to address two of the primary factors that maintain posttrauma symptoms: avoidance and unhelpful thoughts and beliefs.** We know that avoiding thinking about the trauma can lead to symptoms of PTSD becoming chronic. When you allow yourself to think about the trauma in a safe environment, you are able to challenge some of the unhelpful thoughts and beliefs. The core of the treatment will be exposure therapy, not exposure as in wartime, but helping you confront the memory of what happened in a therapeutic manner so it gets easier. In trauma research, exposure therapy has been found to be the most effective technique for helping PTSD.

"Imaginal exposure requires a person to retell his or her trauma experience repeatedly in the present tense as if it is happening now. Therefore, the person is instructed to narrate the experience in the present tense, describing out loud everything that s/he sees, smells and hears. In order to enhance the reliving component, we are building on the traditional exposure technique by using the virtual reality as a tool for the exposure. The virtual reality helps to engage your senses, thereby enabling you to reexperience the memory of the trauma more

realistically. You will use the virtual reality to aid in the retelling of your experience repeatedly over the course of treatment. Though this may seem daunting and may indeed be a difficult task, it is a very important part of treatment that works to help you process what happened. By going through it repeatedly, it does get easier." (*Allow patient here to voice any concerns about treatment.*)

Breathing: Following a trauma, people often find that their bodies are at a constant state of alertness. Symptoms such as irritability, difficulty sleeping and trouble concentrating are common. Relaxation and breathing exercises are instrumental in addressing these symptoms. In this treatment, we use a brief breathing relaxation method to help our bodies relax and decrease these symptoms at times when it's not the right time to do exposure, like going to sleep, at work or while driving."

Cognitive distortions (unhelpful thoughts): A traumatic event can also change a person's view and perspective about him- or herself, about other people and about the world in general. Sometimes, these thoughts are inaccurate. During treatment, we will discuss whether your views about yourself, and about the world in general, have changed and evaluate the accuracy and helpfulness of these beliefs and thoughts."

Treatment Adherence: "As you may have already guessed, this treatment can be intense, and at times distressing. The reason that we do it, however, is because it is the treatment that has the most success. You might find yourself thinking of cancelling sessions or not showing up since you know the sessions might be tough. But this is a short-term treatment for only nine sessions. Your symptoms have been distressing and causing problems in your life for [length of time]. If you can bear with at the most, eight more appointments, hopefully you can have some relief from the problems that have been bothering you.

"If you experience urges to not come to your session, it is *very* important that we talk about it. I will *not* be offended. We know that it can be challenging for people to confront their worst fears, but we also know that the interventions included in this treatment, especially the exposure, are the most effective PTSD treatments out there and our experience is that most people who stick with the treatment find it worthwhile.

"These interventions really do work best if you come each week. This is really important once we start the exposure exercises. If for some reason your schedule changes or things happen in your life that makes regular attendance difficult, it is very important for us to talk about it and I will be as flexible as possible in scheduling the sessions to be convenient for you."

Elicit any questions: "I know that was a lot of information I just provided. Do you have any questions about anything at this point?" If the patient says he or

she is nervous or not sure that he or she wants to do this, the therapist can respond, "That's exactly why you need to do this. If it were easy or didn't bother you, we wouldn't need to do this. It does take courage and we don't use that word lightly. We define courage as being scared and doing it anyway because it's the right thing to do."

Gather Information From Patient

"Now that I've told you about the treatment, I'm going to ask you a bit about yourself. I'd like to learn about why you're seeking treatment, what problems you find most distressing, and a bit about yourself in general."

Information to elicit from patient:

Why did he or she seeks treatment.
What symptoms are most distressing.
Describe his or her deployment(s).
Some information on the most distressing trauma. If there is a close second, it can be noted and will be the focus of exposure if there's time for an adequate response.
Other trauma history.
Social situation and any current social stressors.
Occupational situation and any occupational or financial stressors.
Social support and resources he or she can rely on during this treatment.
Suicidal ideation and contracting for safety.

Breathing Retraining

The clinician will explain to the patient the association between anxiety and quick breathing demonstrating the usefulness of breathing slowly and calmly to reduce tension or stress. The clinician then takes the patient through a breathing exercise, teaching the patient a technique for engaging in slow, calming breaths. The patient will be given a recording of the breathing exercise made during the session to practice at home and develop the skill. For an example text, please refer to Foa, Hembree, and Rothbaum, (2007).

Assign Homework and End Session

The clinician assigns the following homework*:* (a) Practice breathing retraining 3 times per day, and (b) read "Rationale for Treatment by Prolonged Exposure" handout (see Foa et al., 2007). Remind patients that the more they practice the breathing, the better trained their body will be to relax and to use it when they really need it.

At the conclusion of the session, (a) elicit any questions, doubts, or concerns; (b) instill hope and excitement for starting this work together; (c) make sure that the next session time is scheduled, it is okay also to schedule all eight sessions and write them down for patient; (d) give therapist's card with contact information; and (e) give patient rationale for treatment by prolonged exposure handout.

Session 2

Overview
1. Review homework (5 minutes)
2. Present session agenda (5 minutes)
3. Discuss common reactions to trauma and normalize patient's reactions (45 minutes)
4. Present detailed rationale for exposure (20 minutes)
5. Introduce SUDS Scale (10 minutes)
6. Assign homework and end session (5 minutes)

Review Homework

The clinician will check in on the patient's week in general as well as check in on specific homework assignments. The clinician should also ask about the patient's perceptions regarding treatment.

Present Session Agenda

"This session we will focus in detail on common reactions to traumatic events, and see how your symptoms may or may not be similar to what we discuss. Then I will present a more detailed rationale for the exposure therapy that we will begin next week."

Discuss Common Reactions to Trauma and Normalize Patient's Reactions

The clinician should provide the patient with psychoeducation on PTSD while normalizing and validating the patient's symptoms. The clinician should discuss common reactions to a traumatic event (e.g., depressed mood, guilt, substance abuse) and give the patient a detailed handout on this information to review during the week. To review the "Common Reactions to Trauma" handout, please refer to Foa et al., 2007. It is important to make this a conversation rather than a lecture. This can be done best by asking the patient about his or her

experience, saying "Is that something you've been experiencing?" after each cluster of symptoms. At the end of the discussion, revisit the most distressing symptoms and/or suicidality as needed.

Present Detailed Rationale for Exposure

"As we have mentioned previously, exposure is the first line of treatment for PTSD because of its proven effectiveness. You may remember that during the exposure, you will relate your traumatic experience in as much detail as possible, repeatedly, in a structured way. I am going to take some time now to explain the mechanism by which exposure works."

The clinician may use different methods for explaining the rationale for exposure. Often using a metaphor is useful, for an example of a file cabinet metaphor, please refer to Foa et al. (2007).

"This technique may seem counterintuitive, as our natural reaction is not to dwell on disturbing memories; however, it has been shown to work. I have faith in this technique because I have seen it work with many patients, though I know you may doubt it because you have not seen it work as I have. But I am going to walk you through it and we'll work at a pace that you can manage. It is certainly not an easy task and takes courage to face these memories head on. However, avoiding the memories simply doesn't work. **Although avoidance may help reduce the anxiety for the moment (i.e., work in the short run), in the long run it maintains PTSD symptoms and prevents new learning.** This may be difficult, but it is the path to proper healing. It is also a short-term treatment. You have been living with these symptoms for an extended period of time. This treatment is only seven more sessions. Although it may be painful initially, it becomes less painful as exposure is repeated."

Distinguishing between exposure and intrusive thoughts: "Some people tell us that they think about it all the time anyway, so how is this different? The way most people with PTSD think about the traumatic event is not therapeutic. It's like if the event were a book, the book falls open and they read a line, and they hate it and slam the book shut. Then something opens up the book again, they read a line, and they hate it and slam the book shut again. In contrast, this treatment consists of therapeutic exposure. We will open the book and read it all the way through over and over again to try to make some sense of it and to help you feel in control if and when you want to read it.

"So the central idea behind this type of treatment is that the trauma needs to be emotionally processed, or digested and organized, so that it can become less painful. The process is similar to the grief process: When a loved one dies, it is extremely painful, but by experiencing and expressing that pain like through

crying and by spending the time focused on it at the funeral, it gradually becomes less painful. Eventually, we can think about that person without crying, although the loss will always be sad."

Distinguishing between event and memory: "Your body is reacting to reminders of the event as if the event was happening again. Exposure to the memories helps the body to distinguish the memories from the event itself, recognize the memory is upsetting but not dangerous, and importantly, realize that you can handle the memories. Then, as you do the exposure repeatedly, the overwhelming emotion that accompanies it will decrease. So the memory will always be sad or upsetting, but not something overwhelming that controls your life.

"So to summarize, by confronting the memories through exposure, it helps to: (a) block avoidance; (b) process and organize the trauma; (c) discriminate the memories from the trauma itself; (d) make you realize that memories are not dangerous and that you can handle them giving you mastery over this experience; (e) decrease anxiety and distress as you repeatedly confront the memory through a process known as habituation; and (f) give you back a feeling of control and competence. Facing the exposure gives you control over the memories that feel like they are controlling you.

"In this process, you'll need to try to confront the memories and any emotions they bring up. Any attempts to distance yourself from those emotions can negatively impact the treatment. This is true both during the session, and for the day or so afterward when your brain is still processing the exposure. So for the duration of this treatment, feeling bad emotions isn't the enemy, but avoiding them is. For that reason, as much as possible you'll need to avoid taking medications or substances that you don't take on a regular basis that will interfere with this process. That includes benzodiazepenes like Xanax, Klonopin, Valium, and Ativan and pain medication that you take prn. If you take any of these medications, they should be taken on a regular schedule, and not in response to anxiety or distress that might come up from the session. If you don't take them on a regular schedule, you should not take them on the day of the session before the start of the session, or for about 24 hours after the session. This also includes alcohol or illegal drugs, which you should not take for the day or so prior to the session, since we don't want you coming in hung over, and for at least 24 hours following the session, or in response to distress that comes up from these memories. Do you have any concerns about that?"

Introduce SUDS Scale

"For your account of the trauma, we will be evaluating your discomfort at the time by using a SUDS scale. The acronym SUDS stands for subjective units of distress and the scale ranges from 0 to 100. Distress may mean feelings of anxiety, anger, fear or whatever emotion it may evoke. A SUDS rating of 100 informs me that you are highly distressed and 0 indicates no distress at all. I will be asking you for your SUDS before you begin the exposure, and then after it's completed I'll ask for your SUDS, and, at the end, I'll ask you to report the highest SUDS you reached during the exposure. You'll just give a number indicating how you are feeling right now, sitting in the room with me, not how you were feeling at that point in Iraq [or Afghanistan]." Elicit anchors from the patient of a "0"-rated time in his or her life and a "100"-rated time in his or her life.

Assign Homework and End Session

The clinician assigns the following homework: (a) continue to practice breathing retraining, and (b) read common reactions handout several times (see Foa et al., 2007) and discuss it with family and friends as desired.

Session 3

Overview
1. Review homework (10 minutes)
2. Present session agenda (5 minutes)
3. Present brief review of rationale for exposure (5 minutes)
4. Instructions for exposure (10 minutes)
5. Conduct exposure (30 to 40 minutes)
6. Process exposure and end session (15 to 20 minutes)

Review Homework

The clinician will check in on the patient's week in general as well as check in on specific homework assignments (breathing practice and reading common reactions to traumatic events). The clinician should also ask about the patient's perceptions regarding treatment.

Present Session Agenda

"This session we will start by briefly reviewing the rationale for the exposure. Then I will give you the specific instructions on how to do the exposure,

and we'll conduct our first exposure session. After the exposure, we'll spend some time processing it before the end of the session. Do you have any questions about the agenda?"

Brief Review of Rationale for Exposure

"Just to review from last time, in the long run, avoidance maintains PTSD symptoms. The goal of the exposure is to revisit the memory in a controlled and structured environment, to help you to process and organize this trauma memory so that it will no longer feel overwhelming to think about, nor will it intrude on your life. By repeatedly confronting your fear, and connecting the feelings about the event with the memory where it belongs, you will learn that the memories are not dangerous, and that you can handle the emotions associated with the memory, and be more in control of it. The repetition of the memory will facilitate habituation and decrease anxiety and other symptoms of PTSD. The memory and experience will remain a part of you, but you will be able to choose to think about it if/when you desire to do so." Elicit any questions or doubts about the rationale.

Instructions for Exposure

Relating narrative details: "I'm going to ask you to start at a point just prior to the incident and recount, in full detail, a narrative of the trauma. It is key to the exposure to really immerse yourself in the memory so that it feels almost like you're back there, even while you know that you are really here safe in this room and it is just a memory. We say it's like keeping one foot here (in the present) and one foot there (in the past). It is very important to try and experience all the feelings and emotions that are connected to this event, and that you not try to hold back the emotions though it might be your inclination to do so.

"In order to increase your engagement in the memory, you should tell it in the present tense as though it were currently happening, for example, 'I get my orders and find I am suppose to go to . . . I am driving down . . . I see . . .' As you relate the event, add every detail you can think of, using all of your senses to describe what you are seeing, hearing, smelling, thinking, and feeling throughout every aspect of the experience. As you relate the details, focus on putting yourself there and letting yourself feel any emotions that arise. Remember that avoidance is the enemy, not emotions, so if you feel negative emotions we don't want to avoid them, and in fact that means we are doing what we need to do. We are going to aim for a target time of 30 to 40 minutes for the exposure, since it has to be long enough for the habituation process to start occurring. That means that when you're done, I'll ask you to start again right back at the beginning without taking yourself

out of the memory. I may also ask some questions or clarifications, but I'll try to minimize that since I don't want to disrupt your immersion in the memory."

The patient will recount the most traumatic memories while immersed in the virtual world. The patient will recount his or her memories with eyes open and the therapist will match the virtual reality environment to the patient's recounting as much as possible. Though one of the clinician's goals is to re-create a virtual scenario with as much content as possible that matches the patient's reported traumatic memories, it is not likely, nor necessary, that the clinician match the scenario exactly to the trauma. In this first session, the therapist should minimize the amount of VR sensory elements that are added, and may utilize less intense elements; for example, a small explosion instead of full IED stimuli or keeping the volume low. Depending on the patient's engagement, he or she may just stay in the environment without many added elements.

"We will be using the virtual reality to aid in the exposure exercise. You will focus on your own experience and tell it while immersed in a virtual environment. Let me explain the function of each piece of equipment. You will be wearing headphones and a head mounted display (HMD) that will allow you to view 3-dimensional computerized images. The virtual world is programmed such that I control what you experience in VR by touching preprogrammed keys on the keyboard and you can control your movements by looking around and moving with a joystick. As you view the scenes through the HMD, I will be watching the same images simultaneously on the computer screen. I will speak into a microphone that will allow you to hear me through your headphones, and I can hear when you speak to me. In addition to the sights and sounds, you will be sitting on a platform that may vibrate in conjunction with certain sounds to add a tactile element. The sensory elements will be added gradually throughout the sessions, at a pace individualized for you. The elements and environment may not be a perfect match for what you experienced, but our experience has shown us that a match is not necessary, and an approximate environment or cues that trigger your memory are sufficient. We are using the virtual reality to help you engage with the memory. If certain aspects aren't a great match, try not to let yourself get distracted by them. Do you have any questions before we begin?" (The clinician should direct the patient to sit in the appropriate chair and put on the headphones and HMD while introducing the patient to the HMD and other VR components.)

"Okay, so as we discussed, you'll begin describing the events leading up to the incident on that day, describing the sights, sounds, smells, your thoughts and feelings, and as many details of the experience as possible, speaking in the first person and the present tense. Before we start, can you tell me your SUDS score right now sitting in the room?" Record the patient's response on a SUDS rating

form. "Okay, let's get started. Its [date] and you are [location]. Tell me what's happening now."

Conduct Exposure

During the exposure, prompt for present tense if necessary by repeating patient's last phrase back to them in the present tense, for example, "I am driving back to the FOB." Offer periodic encouragement such as: "You're doing great," "Stay with it," "What happens next," "This is exactly what you need to be doing; keep going," "You're safe here, go on," or "I know this is very painful for you to talk about, but you're doing a good job."

At the end of the exposure ask for a final SUDS score and an estimate of the peak SUDS that was reached during the exposure. Record these numbers into the SUDS form. The target time for an exposure exercise is 30 to 40 minutes.

Process Exposure and End Session

Instructions for clinician: In addition to fear extinction, which occurs during exposure therapy, you are attempting to help the patient to emotionally and cognitively process the event by placing it in a broader context, allowing it to be examined from different vantage points, to eventually gain a sense of peace with the experience. You are trying to make certain experiences explicit, for example, that by staying with the memory repeatedly, it becomes less distressing. You will try to identify unhelpful thoughts and help the patient challenge them and identify paths that he or she needs to take to think about them differently.

Following completion of the imaginal exposure, ask the patient for his or her reactions, using an open-ended query such as, "How was that experience for you?" Often they may express surprise at the intensity of the feelings experienced, or about some of the details that were recalled during the exposure. Allow them to sit with how they are feeling and validate these reactions. Always acknowledge the difficulty of the task and reinforce the effort to complete the exposure exercise and tolerate the affect. Remind them again that this processing of emotions is what could not happen at the time of the trauma, but needs to happen now.

It is also helpful to then share some of your observations, such as noting increasing amount of detail present in the narration over consecutive recountings, noting how much was going on (thoughts and feelings) in a short amount of time, noting changes in levels of distress, or noting particular areas of difficulty. It also may be helpful to assist the individual in labeling some of his/her feelings.

Approach areas of difficulty with a Socratic questioning approach: for example, if the patient is questioning whether he or she might have done

something to prevent a given outcome, ask specifically about what that might be, how he or she might have anticipated the event, or what other factors might have been relevant to the outcome. Another important query might be regarding the patient's assessment of his/her own and others' performance in doing their jobs and making decisions under such stressful conditions which may lead to the acknowledgment of being in a position in which there was often no good choice to make. With this approach, your goal is to have the patient begin to entertain other interpretations of the way the events transpired, and to begin to challenge some assumptions or judgments that may be inaccurate.

Sometimes an obvious topic will emerge, and you may judge that the patient is not yet ready to discuss it or hear alternative approaches; in which case you may choose not to raise it until a later session. You can acknowledge it and bookmark it, for example, "It sounds like you are really struggling with. . . . I think that is going to be an important part for us to work on and we will come back to it."

Common themes to explore include feelings of guilt or blame, anger and grief related to the incident, as well as generalizations drawn from the incident to current behavior like hatred of an ethnic group or questions of own or command competency.

Session 4

Overview
1. Check-in (10 to 15 minutes)
2. Present session agenda (5 minutes)
3. Conduct exposure (30 to 40 minutes)
4. Process exposure (30 minutes)
5. End session (5 minutes)

Check-In

The clinician will check in on the patient's week in general as well as check in on any changes in symptoms in the past week, including more frequent thoughts of trauma. The clinician will normalize any changes, telling the patient that symptoms may increase logically since the patient is facing something he/she has tried to avoid but that indicates the treatment is working. The clinician should also check-in on the patient's perceptions regarding treatment.

Present Session Agenda

"This session we will get right into the exposure and focus on the exposure and processing pieces. You did a great job last time. This time we're going to dig even deeper, and I want you to include everything in your memory and all sensory elements." As needed, the clinician will ask more questions to flesh out details or evoke emotion.

Conduct Exposure

Conduct exposure to entire trauma memory, the same as last time. Add more sensory elements using VR as needed. The target time for the exposure session is 30 to 40 minutes. At the end of the exposure ask for a final SUDS score and an estimate of peak SUDS that was reached during the exposure, while recording the numbers.

Process Exposure

Following the exposure session, ask the patient, "How was that for you? Did you notice anything in particular?" In addition, you may check in on discussions from previous weeks and/or you may raise themes that you have noticed.

End Session

Schedule next session.

<u>Session 5</u>

Overview
1. Check-in (10 minutes)
2. Present session agenda (5 minutes)
3. Introduce and identify hot spots (10 to 15 minutes)
4. Conduct exposure (30 to 40 minutes)
5. Process exposure and end session (20 minutes)

Check-In

The clinician will check in on the patient's week in general as well as check in on any changes in symptoms in the past week, including more frequent thoughts of trauma. The clinician will normalize any changes, telling the patient that

symptoms may increase logically since the patient is facing something he or she has tried to avoid but that indicates the treatment is working. The clinician should also ask about the patient's perceptions regarding treatment. Lastly, the clinician should identify potential hot spots, such as by asking "Have you noticed any parts of the memory bothering you more than others?"

Present Session Agenda

"This session we are going to move to the next step in the exposure, where we focus on hot spots. We'll spend a bit of time discussing hot spots, and then we will do the exposure and processing." The clinician should only start with hot spots once the patient is ready.

Introduce and Identify Hot Spots

Hot spots are the specific moments in the trauma memory that cause more anxiety than the rest of the narrative. It is often the moment the explosion occurred, or gunfire started, or when the patient or a comrade was injured or thought he or she would die. There are usually several hot spots in any trauma narrative. The therapist should make notes during exposure about which moments seem to be the hardest for the patient, and talk to the patient about what bits of the memory trigger more anxiety during the exposure in session.

Explanation for patient: "We've spent a couple of sessions going over the entire memory from start to finish. Now we'll start focusing on smaller pieces of the experience, which we call hot spots. I'm going to ask you to identify two to three parts of the trauma that were the most intense emotionally. This could be a 10-minute segment or a 10-second segment. Then we will choose one to begin with, and you will conduct the exposure on just that one segment of the experience. You'll try to uncover every detail of that hot spot, and retell it repeatedly, possibly retelling it 8 times in one session. By focusing on the most intense pieces of the trauma, you can really facilitate habituation to that part. It has been shown that as you habituate to the hot spots your arousal to the less intense parts of the memory decreases as well.

"We think about it a bit like getting a massage. If you're having back discomfort and go for a massage, the massage therapist may work on your whole back, but if she finds a knot, she will focus on that knot and go over and over it in order to work it out. We're going to do the same thing—we'll focus on the area which is the most distressing and go over and over it to address it. Does that make sense to you?Can you tell me what those hot spots might be for you?"

Have the patient identify his or her hot spots and rate them from least to most intense. Start with the worst and repeatedly expose the patient to that in minute detail, as if in slow motion, over and over until it gets easier. At that point, move on to the next highest hot spot and repeat as above.

Conduct Exposure

Conduct exposure to the specified hot spot. Allow patient to tell it once through, and then help them to flesh it out in subsequent retellings, leaving no stone unturned, by asking questions like: "What thoughts are going through your head at that moment?", "What kinds of feelings are you having at that moment?", "What is your body feeling at that moment?", "What other sounds do you notice?", and/or "Describe the details of . . ." (may be clothing, person's face, dead body, wreckage, etc). The discussion should be focused on the hot spot. VR sensory elements should be used to match the hot spot. At the end of the exposure ask for a final SUDS score and an estimate of peak SUDS that was reached during the exposure, and record the numbers into the SUDS form. The target time for the exposure is 30 to 40 minutes.

Process Exposure and End Session

Ask the patient "How was that for you? Did you notice anything in particular?" You may check in on discussions from previous weeks and/or raise themes that you have noticed. Schedule next session.

Sessions 6–8

Overview
1. Check-in (10 to 15 minutes)
2. Present session agenda (5 minutes)
3. Conduct exposure to hot spot (30 to 40 minutes)
4. Process exposure (30 minutes)
5. End session (5 minutes)

Check-In

The clinician will check in on the patient's week in general as well as check in on any changes in symptoms in the past week, including more frequent thoughts of trauma. The clinician will normalize any changes, and ask about the patient's perceptions regarding treatment.

Present Session Agenda

"This session we will continue with the hot spots and try to really engage in everything which is there. Do you have any questions before we begin?"

Conduct Exposure to Hot Spots

Conduct exposure to hot spot. If patient has shown habituation to the last hot spot, then continue with the next one. If not, repeat the last hot spot, with goal of completing all hot spots by end of Session 8. By end of Session 8, aim for description of all details and habituation to all sensory elements. If habituation is not occurring, troubleshoot with consultants or supervisors to facilitate habituation. At the end of the exposure ask for a final SUDS score and an estimate of peak SUDS that was reached during the exposure, and record the numbers into the SUDS form. The target time for the exposure session is 30 to 40 minutes.

Process Exposure

Ask the patient "How was that for you? Did you notice anything in particular?" You may check in on discussion from previous week and/or raise themes that you have noticed. Process all themes that have emerged.

End Session

Schedule next session.

Session 9

Overview
1. Check-in (10 minutes)
2. Present session agenda (5 minutes)
3. Conduct exposure to entire trauma memory (25 to 30 minutes)
4. Process exposure (15 minutes)
5. Review treatment program and patient's progress (20 to 30 minutes)
6. Termination (10 minutes)

Check-In

Check in on the week in general.

Present Session Agenda

"This session is our final one. We will conduct our final exposure to wrap up the whole exposure exercise and note the differences between the first time you did the exposure and this time. Then we will review the skills we introduced in treatment, your progress over the course of therapy, and how to continue working for further improvement. Do you have any questions before we begin?"

Conduct Exposure

Conduct exposure to entire trauma memory, from start to finish for the last time, as many times as time allows up to 30 minutes. (Note: This may be one time through, or may be more than once depending on the length of the trauma.) The target time for this exposure session is 30 minutes.

Process Exposure

Ask the patient: "How was that for you? Did you notice anything in particular?" Ask the patient: "How was that different than your first exposure? And how was it different after working on the hot spots?"

Review Treatment Program and Patient's Progress

Review of skills: "We introduced a couple of skills in this protocol. We began by describing what PTSD is and how it manifests itself. We spent a long time describing the rationale behind the exposure therapy. We utilized a breathing exercise to help induce a relaxation response when necessary. Then we focused on the exposure exercises, and implemented processing to evaluate themes, emotions, and changes in cognitions that were due to the trauma. Were any of those in particular helpful or not helpful for you?"

Review of progress in treatment: "There were some major changes that occurred over the course of treatment." Review any changes here, including: PTSD symptom changes, comorbid disorder symptom changes, relationship/quality of life changes, and habituation to exposure. If applicable, say, "I know there is more you would like to improve. There is evidence that in many cases symptoms continue to improve after the end of treatment."

Symptom exacerbation: "It is not uncommon for people to have periods of time when a flare up of symptoms occurs again. It may be due to a certain trigger like an anniversary or meeting someone connected to the event, or come out of the blue. It is important in those situations to remember you are able to

handle the emotions related to the event. Make sure not to avoid or isolate. Make sure to use breathing skills, and process your own reactions."

Positive feedback about work: "This was a very difficult treatment, and you should give yourself a lot of credit for facing this head on and giving it your all. I enjoyed working with you and wish you the best of luck."

Termination

Discuss future goals and make referrals if applicable.

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Case Vignette: Ann

A similar protocol of VRE was conducted with a patient (we'll call her Ann) who was part of the ONR study discussed earlier. Ann was a 22-year-old, female Army private who met *DSM-IV* criteria for PTSD and major depressive disorder, recurrent (MDD). Her service in Iraq typically involved direct evaluation of locations immediately following suicide and/or IED bombings, and she was exposed to significant human carnage during the course of her 1-year deployment. On returning stateside, following an evaluation, Ann was diagnosed with PTSD and agreed to participate in a standardized clinical research protocol. The protocol employed a 10-session treatment model that includes components of psychoeducation, initial imaginal exposure transitioning to prolonged VRE, and exposure-based homework exercises between sessions. Psychological assessment instruments administered were the PCL-M, PHQ-9, and BAI. Subjective Units of Distress (SUDs; 0 to 100 scale) were gathered every 5 minutes during the virtual reality exposure. The homework included listening to the audiotapes of the Ann's self-generated verbal narrative of her trauma relevant experiences while participating in VRE.

Ann showed a gradual and progressive improvement over the course of the VRE sessions. Scores on the PCL-M, PHQ-9, and BAI, prior to treatment were 42, 20, and 12, respectively. Posttreatment scores on these measures decreased to 22, 3, and 0. At follow-up, Ann did not meet *DSM-IV* diagnostic criteria for PTSD, and met remission status for MDD. She displayed signs of habituation across VRE sessions and self-reported a concomitant decline across homework sessions while listening to the audiotape of her trauma narrative recorded during treatment sessions. For example, initial SUDs ratings while doing audiotape listening of exposure at home fell in the 30 to 35 range and declined to the 10 to 15 range at the end of treatment. Following completion of treatment, Ann was able to return to her unit and, at 3-month follow-up, she continued to maintain the

therapeutic gains observed at the end of treatment with scores on the PCL-M, PHQ-9, and BAI, at 18, 1, and 1, respectively.

 Case Vignette Discussion Questions

1. Why would the use of virtual reality enhance and speed up the effectiveness of exposure therapy with this case?
2. What assessment issues should have been considered in this case to ensure that using virtual reality was safe and appropriate for Ann? For example, what if Ann's PTSD were comorbid with suicidality?

Conclusion

A recent report noted that among Iraq/Afghanistan War veterans, "those whose responses were positive for a mental disorder, only 23% to 40% sought mental health care. Those whose responses were positive for a mental disorder were twice as likely as those whose responses were negative to report concern about possible stigmatization and other barriers to seeking mental health care" (Hoge et al., 2004, p. 13). Although military training methodology has better prepared soldiers for combat in recent years, such hesitancy to seek treatment for difficulties that emerge on return from combat, especially by those who may need it most, suggests an area of military mental health care that is in need of attention. VRE may be an appealing option and promote treatment seeking by certain demographic groups in need of care. The current generation of young military personnel, having grown up with digital gaming technology, may actually be more attracted to and comfortable with participation in a VR application approach as an alternative to what is viewed as traditional "talk therapy" (even though such talk therapy would obviously occur in the course of a recommended multi-component approach for this disorder). It has been generally reported by practitioners who use VR to treat civilians with simple phobias that patients who have avoided therapy for years will sometimes choose to seek VRE, perhaps due to a reduced perception of stigma. Reger et al. (2007) has recently reported a similar attitudinal propensity in military personnel; among those who reported a disinclination to seek standard mental health treatment, 19% rated a VR approach more favorably.

Of note, VRE is not intended to be an automated treatment protocol that is administered in a "self-help" format. The presentation of such emotionally evocative VR combat-related scenarios, while providing treatment options not possible until recently, will most likely produce therapeutic benefits when administered within the context of appropriate care via a thoughtful professional appreciation of the complexity and impact of this disorder.

Chapter Discussion Questions

1. What are the signs and symptoms of PTSD?

2. Which class of psychotherapeutic techniques have received the strongest evidence to date for PTSD?

3. What is the efficacy of prolonged imaginal exposure for PTSD?

4. What is the efficacy of virtual reality exposure for PTSD?

5. How are virtual reality exposure and prolonged imaginal exposure for PTSD similar and different?

References

American Psychiatric Association. (1994). *Diagnostic and statistical manual for mental disorders* (4th ed.). Washington, DC: Author.

Beck, A. T., Epstein, N., Brown, G., & Steer, R. A. (1988). An inventory for measuring clinical anxiety psychometric properties. *Journal of Consulting and Clinical Psychology, 56*, 893–897.

Blanchard, E. B., Jones-Alexander, J., Buckley, T. C., & Forneris, C. A. (1996). Psychometric properties of the PTSD Checklist (PCL). *Behaviour Research and Therapy, 34*(8), 669–673.

Blimes, L. (2007). *Soldiers returning from Iraq and Afghanistan: The long-term costs of providing veterans medical care and disability benefits*. John F. Kennedy School of Government Faculty Research Working Paper Series, No. RWP07–001.

Cahill, S., Rothbaum, B., Resick, P., & Follette, V. (2009). Cognitive-behavioral therapy for adults. In E. Foa, T. Keane, M. Friedman, & J. Cohen (Eds.), *Effective treatments for PTSD* (pp. 139–223). New York, NY: Guilford Press.

Difede, J., Cukor, J., Jayasinghe, N., Patt, I., Jedel, S., Spielman, L., . . . Hoffman, H. (2007). Virtual reality exposure therapy for the treatment of posttraumatic stress disorder following September 11, 2001. *Journal of Clinical Psychiatry, 68*, 1639–1647.

Difede, J., & Hoffman, H. G. (2002). Virtual reality exposure therapy for World Trade Center post-traumatic stress disorder: A case report. *Cyberpsychology and Behavior, 5*, 529–535.

Difede, J., Rothbaum, B. O., & Rizzo, A. A. (2011). *Enhancing exposure therapy for PTSD: Virtual reality and imaginal exposure with a cognitive enhancer*. USAMRAA: W81XWH-10–1-1045. Retrieved from PR: http://weill.cornell.edu/news/releases/wcmc/wcmc_2011/12_12_11.shtml

Department of Defense. (2010a, December 4). Retrieved from http://www.defense.gov/news/

Leaman, S., Rothbaum, B.O., Difede, J., Cukor, J., Gerardi, M. & **Rizzo, A.** (2013). Virtual Reality   113
Exposure Therapy: A Treatment Manual for Combat Related PTSD. In Coll, J., Rubin, A. & Weiss, E.
(eds.) *Handbook of Military Social Work*. John Wiley & Sons, Inc., Hoboken, NJ. *113-140.*

Department of Defense. (2010b, December 4). Retrieved from http://www.defenselink.mil/news/casuality.pdf

Fischer, H. (2010, December 4). *United States military casualty statistics: Operation New Dawn, Operation Iraqi Freedom, and Operation Enduring Freedom, Congressional Research Service 7–5700:RS22452*. Retrieved from http://opencrs.com/document/RS22452/

Foa, E. B., Davidson, R. T., & Frances, A. (1999). Expert consensus guideline series: Treatment of posttraumatic stress disorder. *American Journal of Clinical Psychiatry, 60*, 5–76.

Foa, E. B., Hembree, E. A., & Rothbaum, B. O. (2007). *Prolonged exposure therapy for PTSD: Emotional processing of traumatic experiences, therapist guide*. New York, NY: Oxford University Press.

Foa, E. B., & Kozak, M. J. (1986). Emotional processing of fear: Exposure to corrective information. *Psychological Bulletin, 99*, 20–35.

Gamito, P., Ribeiro, C., Gamito, L., Pacheco, J., Pablo, C., & Saraiva, T. (2007, June). *Virtual war PTSD: A methodological thread*. Paper presented at the 10th Annual Cybertherapy Conference, Basel, Switzerland.

Gerardi, M., Rothbaum, B. O., Ressler, K., Heekin, M., & Rizzo, A. A. (2008). Virtual reality exposure therapy using a virtual Iraq: Case report. *Journal of Traumatic Stress, 21*(2), 209–213.

Glantz, K., Rizzo, A. A., & Graap, K. (2003). Virtual reality for psychotherapy: Current reality and future possibilities. *Psychotherapy: Theory, Research, Practice, Training, 40*(1), 55–67.

Hoffman, H. G., Chambers, G. T., Meyer, W. J., Araceneaux, L. L., Russell, W. J., Seibel, E. J., Sharar, S. R. (2011). Virtual reality as an adjunctive non-pharmacologic analgesic for acute burn pain during medical procedures. *Annals of Behavioral Medicine, 41*(2), 183–191.

Hoge, C. W., Castro, C. A., Messer, S. C., McGurk, D., Cotting, D. I., & Koffman, R. L. (2004) Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care. *New England Journal of Medicine, 351*(1), 13–22.

Holden, M. K. (2005). Virtual environments for motor rehabilitation: Review. *CyberPsych and Behavior, 8*(3), 187–211.

Institute of Medicine Committee on Treatment of Posttraumatic Stress Disorder. (2008). *Treatment of posttraumatic stress disorder: An assessment of the evidence*. ISBN: 0–309–10925–6. Retrieved from http://www.nap.edu/catalog/ 11955.html

Jaycox, L. H., Foa, E. B., & Morral, A. R. (1998). Influence of emotional engagement and habituation on exposure therapy for PTSD. *Journal of Consulting and Clinical Psychology, 66*, 186–192.

Josman, N., Somer, E., Reisberg, A., Weiss, P., Garcia-Palacios, A., & Hoffman. H. (2006). BusWorld: Designing a virtual environment for post-traumatic stress disorder in Israel: A protocol. *CyberPsychology & Behavior, 9*(2), 241–244.

Kroenke, K., & Spitzer, R. L. (2002). The PHQ-9: A new depression and diagnostic severity measure. *Psychiatric Annals, 32*, 509–521.

Merians, A. S., Fluet, G. G., Qiu, Q., Saleh, S., Lafond, I., & Adamovich, S. V. (2010). *Integrated arm and hand training using adaptive robotics and virtual reality simulations*. Proceedings of the 2010 International Conference on Disability, Virtual Reality and Associated Technology, Chile.

Parsons, T. D., & Rizzo, A. A. (2008). Affective outcomes of virtual reality exposure therapy for anxiety and specific phobias: A meta-analysis. *Journal of Behavior Therapy and Experimental Psychiatry, 39*, 250–261.

Powers, M., & Emmelkamp, P. M. G. (2008). Virtual reality exposure therapy for anxiety disorders: A meta-analysis. *Journal of Anxiety Disorders, 22*, 561–569.

Reger, G., & Gahm, G. (2008). Virtual reality exposure therapy for active duty soldiers. *Journal of Clinical Psychology, 64*, 940–946.

Reger, G., Gahm, G., Rizzo, A., Swanson, R., Etherage, J., & Reger, M. (2007, June). *Virtual reality in operational and garrison psychology: A review of the applications of the VR Iraq at Fort Lewis*. Presented at the Cybertherapy 2007 Conference, Washington, DC.

Reger, G. M., Gahm, G. A., Rizzo, A. A., Swanson, R. A., & Duma, S. (2009). Soldier evaluation of the virtual reality Iraq. *Telemedicine and e-Health Journal, 15*, 100–103.

Reger, G. M., Holloway, K. M., Rothbaum, B. O., Difede, J., Rizzo, A. A., & Gahm, G. A. (2011). Effectiveness of virtual reality exposure therapy for active duty soldiers in a military mental health clinic. *Journal of Traumatic Stress, 24*(1), 93–96.

Ressler, K. J., Rothbaum, B. O., Tannenbaum, L., Anderson, P., Zimand, E., Hodges, L., & Davis, M. (2004). Facilitation of psychotherapy with d-cycloserine, a putative cognitive enhancer. *Archives of General Psychiatry, 61*, 1136–1144.

Riva, G. (2011). The key to unlocking the virtual body: Virtual reality in the treatment of obesity and eating disorders. *Journal of Diabetes Science and Technology, 5*(2), 283–292.

Rizzo, A. (2010). *Virtual Iraq/Afghanistan and how it is helping some troops and vets with PTSD*. Retrieved from:

http://www.veteranstoday.com/2010/07/29/virtualiraqafghanistan-and-how-it-is-helping-some-troops-and-vets-with-ptsd/

Rizzo, A. A., Bowerly, T., Buckwater, J. G., Klimchuk, D., Mitura, R., & Parsons, R. D. (2006). A virtual reality scenario for all seasons: The virtual classroom. *CNS Spectrums, 11*(1), 35–44.

Rizzo, A. A., Buckwalter, J. G., & Neumann, U. (1997). Virtual reality and cognitive rehabilitation: A brief review of the future. *Journal of Head Trauma Rehabilitation, 12*(6), 1–15.

Rizzo, A., Difede, J., Rothbaum, B. O., & Reger, G. (2010). Virtual Iraq/Afghanistan: Development and early evaluation of a virtual reality exposure therapy system for combat-related PTSD. *Annals of the New York Academy of Sciences (NYAS), 1208*, 114–125.

Rizzo, A., Parsons, T. D., Lange, B., Kenny, P., Buckwalter, J. G., Rothbaum, B. O., & Reger, G. (2011b). Virtual reality goes to war: A brief review of the future of military behavioral healthcare. *Journal of Clinical Psychology in Medical Settings, 18*, 176–187.

Rizzo, A. A., Reger, G., Gahm G., Difede, J., & Rothbaum, B. O. (2009). Virtual reality exposure therapy for combat related PTSD. In P. Shiromani, T. Keane, & J. LeDoux (Eds.), *Post-traumatic stress disorder: Basic science and clinical practice* (pp. 375–399). New York, NY: Humana Press.

Rizzo, A. A., Schultheis, M. T., Kerns, K., & Mateer, C. (2004). Analysis of assets for virtual reality applications in neuropsychology. *Neuropsychological Rehabilitation, 14*(1/2), 207–239.

Rizzo, A. A., Lange, B., Suma, E. A., Bolas, M. (2011). Virtual reality and interactive digital game technology: new tools to address obesity and diabetes. *Journal of Diabetes Science and Technology,* 5(2):256-264.

Rose, F. D., Brooks, B. M., & Rizzo, A. A. (2005). Virtual reality in brain damage rehabilitation: Review. *CyberPsychology and Behavior, 8*(3), 241–262.

Rothbaum, B., Difede, J., & Rizzo, A. (2008). *Therapist treatment manual for virtual reality exposure therapy: Posttraumatic stress disorder in Iraq combat veterans*. Atlanta, GA: Virtually Better.

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

Rothbaum, B. O., Hodges, L. F., & Smith, S. (1999). Virtual reality exposure therapy abbreviated treatment manual: Fear of flying application. *Cognitive and Behavioral Practice, 6*, 234–244.

Schneider, S. M., Kisby, C. K., & Flint, E. P. (2010, December 10). *Effect of virtual reality on time perception in patients receiving chemotherapy*. Supportive Care in Cancer. Retrieved from http://www.springerlink.com/content/?k=(au%3a(Susan+Schneider)+OR +ed%3a(Susan+Schneider))+pub%3a(Supportive+Cancer+Care)

Seal, K. H., Bertenthal, D., Nuber, C. R., Sen, S., & Marmar, C. (2007). Bringing the war back home: Mental health disorders among 103,788 US veterans returning from Iraq and Afghanistan seen at Department of Veterans Affairs facilities. *Archives of Internal Medicine, 167*, 476–482.

Stanton, D., Foreman, N., & Wilson, P. (1998). Uses of virtual reality in clinical training: Developing the spatial skills of children with mobility impairments. In G. Riva, B.

Weiderhold, & E. Molinari (Eds.), *Virtual reality in clinical psychology and neuroscience* (pp. 219–232). Amsterdam, the Netherlands: IOS Press.

Tanielian, T., Jaycox, L. H., Schell, T. L., Marshall, G. N., Burnam, M. A., Eibner, C., . . . the Invisible Wounds Study Team. (2008*). Invisible wounds of war: Summary and recommendations for addressing psychological and cognitive injuries*. Rand Report. Retrieved from http://veterans.rand.org/

Walker, D. L., Ressler, K. J., Lu, K. T., & Davis, M. (2002). Facilitation of conditioned fear extinction by systemic administration or intra-amygdala infusions of d-cycloserine as assessed with fear-potentiated startle in rats. *Journal of Neuroscience, 22*, 2343–2351.

Wilson, J., Onorati, K., Mishkind, M., Reger, M., & Gahm, G.A. (2008). Soldier attitudes about technology-based approaches to mental healthcare. *Cyberpsychology and Behavior, 11*, 767–769.