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Virtual Reality Exposure Therapy for PTSD Symptoms After a Road Accident: An Uncontrolled Case Series

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This report examined whether Virtual Reality Exposure Therapy (VRET) could be used in the treatment of posttraumatic stress disorder (PTSD) symptoms in the aftermath of a serious motor vehicle accident. Six individuals reporting either full or severe subsyndromal PTSD completed 10 sessions of VRET, which was conducted using software designed to create real-time driving scenarios. Results indicated significant reductions in posttrauma symptoms involving reexperiencing, avoidance, and emotional numbing, with effect sizes ranging from d=.79 to d=1.49. Indices of clinically significant and reliable change suggested that the magnitude of these changes was meaningful. Additionally, high levels of perceived reality ("presence") within the virtual driving situation were reported, and patients reported satisfaction with treatment. Results are discussed in light of the possibility for VRET to be useful in guiding exposure in the treatment of PTSD following road accidents.

CONSIDERABLE ATTENTION HAS FOCUSED recently on the treatment of posttraumatic stress disorder (PTSD). At present, strong empirical evidence exists to support the efficacy of cognitive behavioral treatments for PTSD, particularly those treatments that emphasize exposure to trauma-related stimuli and cues (Rothbaum, Meadows, Resick, & Foy, 2000). Exposure therapy (ET) has been used with a wide range of trauma populations (e.g., combat veterans, female survivors of sexual and physical assault), and the controlled studies that support its use meet the "gold standard" for clinical research (Foa & Meadows, 1997). Successful ET involves providing the patient with PTSD with prolonged contact with trauma-related cues in order to facilitate habituation and the development of neutral memory structures that "override" anxiety-provoking memories related to the trauma (Foa & Kozak, 1986). Although ET clearly is an efficacious approach in the treatment of PTSD, there are circumstances in which in vivo forms of ET become difficult to implement. The treatment of PTSD following a motor vehicle accident (MVA) represents one such circumstance, given the nature of the trauma-related cues and the fact that many individuals with MVA-related PTSD avoid driving completely (Blanchard & Hickling, 2004). In this article, preliminary data are presented on the use of virtual reality–assisted ET (VRET) in the treatment of acute-phase PTSD following a serious MVA in a beginning effort to examine the efficacy and acceptability of this treatment modality.

The use of VRET is relatively recent, although studies to date have shown positive results of this treatment for a panoply of anxiety disorders, including claustrophobia (e.g., Botella et al., 1998), acrophobia (e.g., Emmelkamp et al., 2002), and fear of flying (e.g., Maltby, Kirsch, Mayers, & Allen, 2002). In these studies, virtual reality techniques are used to create environments that are immersive and that provoke anxiety. The patient is encouraged to stay in the virtual environment for a prolonged time interval, until fear reduction occurs. Thus, VRET

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represents a step between imaginal exposure and in vivo exposure. As discussed by Krijn, Emmelkamp, Olafsson, and Biemond (2004), patients need to feel present in the virtual environment in order to experience it in the first person. Within this literature, "presence" is conceptualized as the subjective perception that the virtual world is somewhat real. Stated differently, "at some level and to some degree, . . . objects, events, entities, and environments are perceived as if the technology was not involved in the experience" (International Society for Presence Research, n.d., 2005). Additionally, the virtual environment needs to be able to elicit affect. Lastly, the virtual world needs to resemble the natural environment in order to ensure generalization of fear reduction. Thus, simulation sickness (which is akin to motion sickness in the virtual world) must be kept to a minimum. These qualities have been highlighted as necessary in order for VRET to be effective, following from the guidelines presented by Foa and Kozak (1986).

Preliminary data collected on Vietnam veterans suggest that VRET can be used effectively for treating PTSD. Rothbaum and colleagues have presented a clinical trial (Rothbaum, Hodges, Ready, Graap, & Alarcon, 2001) in which VRET was used as one component of a multicomponent intervention for combat-related PTSD. In this report, VRET was included along with breathing relaxation (for general stress management) and imaginal exposure. In the open clinical trial, 9 veterans completed 8 to 16 treatment sessions. Statistically significant and clinically meaningful reductions in PTSD symptomatology were noted, suggesting that VRET (when combined with other interventions) holds promise in the treatment of chronic combat-related PTSD.

Given the substantial number of individuals who are involved in an MVA each year and the estimate that 800,000 new cases of PTSD result from these crashes (Blanchard & Hickling, 2004), the need for a safe and cost-efficient treatment is clear. VRET represents a viable option for the treatment of MVA-related PTSD for a number of reasons. First, in contrast to in vivo exposure, VRET permits closer control over stimulus presentation. For example, if the patient wanted to work on exposure to driving near trucks in a highway environment, this would be easily accomplished within a VRET situation. In real life, setting up an exposure scenario to address this fear might prove challenging because it is difficult to predict when trucks would appear on a given highway. Second, VRET is especially well suited to exposure situations that involve time-limited stimuli (e.g., merging onto a freeway), as it is possible to conduct repeated exposure easily. In real-life exposure, this is considerably more difficult. Thus, VRET offers greater convenience for therapist and patient alike. Third, VRET may reduce safety risks that may be associated with in vivo exposure, particularly given that individuals with MVA-related PTSD may report overly defensive driving styles that heighten risk for another MVA (e.g., J.G. Beck & Coffey, 2005). Fourth, VRET may offer a more "tangible" exposure experience, relative to imaginal exposure, possibly facilitating fear reduction more effectively. Lastly, some individuals with PTSD report a complete inability to drive, based on intense fear and anxiety. VRET may be a less threatening (and thus, more acceptable) form of treatment compared to in-vivo exposure for individuals who are extremely avoidant.

Although there have been no published studies of VRET for MVA-related PTSD, there has been one effort to treat individuals with a specific phobia of driving using this approach (Wald, 2004). In this report, a commercially available driving simulator was used (driVR, Imago Systems, 1996). Six standardized scenes were used, in which the individual proceeded down a road in a predetermined path. Each scene was 3 to 5 minutes in duration, which is quite brief in light of the usual requirements for ET. A variety of options were available with respect to weather and time of day, although the specific driving route was repeated on subsequent exposure trials. Five women were treated in a multiple-baseline design, each receiving 8 weekly sessions. Three individuals showed reductions in phobia symptoms based on a clinician-administered interview, although the other two did not. VRET did not result in an increase in actual driving time or driving frequency for any patient in this report. Thus, even with short exposure stimuli and limited flexibility, VRET was somewhat effective for 3 of 5 (60%) of the cases of driving phobia. Clearly, this technology may hold promise for the treatment of driving-related fear.

Although driving phobia and MVA-related PTSD share the common characteristic of avoidance of driving cues, many writers believe that the psychopathology and treatment of these two disorders are somewhat different (Kuch, Swinson, & Kirby, 1985; Taylor & Koch, 1995). In particular, the range of feared cues and degree of anxiety appears greater among patients with MVA-related PTSD. Thus, the goal of this report was to examine whether VRET could be used, in conjunction with relaxation training, to facilitate the treatment of MVA-related PTSD. Individuals in the acute phase of the disorder were selected for treatment and provided with 10 sessions of treatment. This report utilized an