

A virtual reality system for the treatment of stress-related disorders: A preliminary analysis of efficacy compared to a standard cognitive behavioral program

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Received 12 September 2010; received in revised form 22 May 2011; accepted 2 June 2011

Communicated by A. Steed

Available online 13 June 2011

Abstract

This paper presents preliminary efficacy data in a controlled study of the use of a virtual reality (VR) system for treating stress-related disorders (Post-Traumatic Stress Disorder, or PTSD; Pathological Grief, or PG; and Adjustment Disorders, or AD). “EMMA’s World” is a VR application in which patients can explore negative experiences to the degree required for their specific therapeutic needs. To accomplish therapeutic goals, a series of virtual elements is customized to be meaningful to the user; the elements contain the fundamental emotional components that the person must confront. Thirty-nine participants diagnosed with PTSD ($N=10$), PG ($N=16$), and AD ($N=13$) were randomly assigned to a standard cognitive-behavioral program (CBT) ($N=20$) or a CBT program driven by EMMA’s World ($N=19$). Participants were assessed before and after treatment. Measurements related to anxiety, depression and other emotions, maladjustment and interference were applied. Results indicate that CBT with EMMA’s World was as effective as the standard CBT program for the treatment of these disorders, and the statistically significant differences (depression, relaxation intensity and social area interference) were in favor of EMMA’s World. We expect VR to provide a positive alternative that will draw in clients who do not seek traditional forms of treatment.

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Keywords: Virtual reality; Psychological treatments; Stress-related disorders; Post-Traumatic Stress Disorder; Pathological Grief; Adjustment Disorder

1. Introduction

Stress-related disorders (SRD) are connected with a ubiquitous human behavior: reaction to adversity. Human

beings have long tried to cope with adversity using many strategies. SRD occur when a person cannot cope with a stressful or traumatic event (e.g., the loss of a loved one, loss of a job, divorce, rape, etc.) and consequently develops emotional or behavioral issues. SRDs include several disorders like Post-Traumatic Stress Disorder (PTSD), Pathological Grief (PG), or Adjustment Disorders (AD). PTSD is characterized by intense feelings of fear, helplessness, or horror in response to being exposed to a traumatic event that is perceived as life-threatening (APA, 2000). Regarding PG, this syndrome comprises symptoms of separation distress (e.g., yearning, searching and pre-occupation with the deceased to the point of functional

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impairment) and traumatic distress (e.g., numbness, lack of trust in others, bitterness, etc.), which can put the individual at risk for social, psychological and medical impairment (Prigerson et al., 1997, 1999). Lastly, ADs comprise debilitating reactions to an identifiable psychosocial stressor or stressors and are characterized by the development of clinically significant emotional or behavioral symptoms (APA, 2000). Fortunately, there is strong empirical support for the efficacy of certain psychological interventions for the treatment of these conditions.

In recent decades, efficacious psychological treatments have been developed for a variety of disorders; these interventions have been called “empirically supported treatments” or “evidence-based psychological practices”. Cognitive-behavioral treatments (CBT) are empirically supported for many psychological disorders. In the case of SRD, the aim of CBT interventions is to evoke stressful events so that patients can learn to process them adaptively. In this approach, the “exposure technique” is a common treatment component; it involves confronting stimuli that provoke fear. In the case of anxiety disorders, the use of the exposure technique is one of the great success stories in the field of mental health treatment (Frueh et al., 1995; Olatunji et al., 2009; Tyron, 2005). Numerous studies and meta-analyses have consistently provided supportive evidence and demonstrated large effects on primary and secondary measures of psychopathology (Deacon and Abramowitz, 2004).

Despite the proven effectiveness of exposure therapy, it is surprisingly not used extensively in clinical settings. One possible reason is that it suffers from a “public relations problem”, including concerns that it is cruel and at odds with some ethical considerations because it purposefully evokes distress in patients (Olatunji et al., 2009). Some practitioners hold a negative view of this treatment for this reason (Feeney et al., 2003; Prochaska and Norcross, 1999). As Olatunji et al. (2009) have pointed out, ethical concerns about the safety, tolerability, and indeed humanness of exposure therapy are central objections against this form of treatment. A study by Becker et al. (2004) confirmed the presence of such beliefs, particularly among practitioners treating patients with PTSD. Richard and Gloster (2007) conducted a survey of professional members of the Anxiety Disorders Association of America, and found that exposure-based therapies were considered fairly aversive. Patients themselves have objected to such treatment; approximately 20–25% of people reject *in vivo* exposure because they consider it too aversive to confront feared situations (Marks and O’Sullivan, 1992; García-Palacios et al., 2001). This highlights the need to follow the American Psychological Association recommendations (Chambless et al., 1996, 1998; Chambless and Hollon, 1998; Nathan and Gorman, 1998, 2002), which stresses on the importance of carrying out two kinds of studies, one focused on internal validity or efficacy, and another one on clinical utility, external validity or effectiveness. New technologies, especially virtual reality (VR) could help to

overcome these issues. In fact, in Richard and Gloster’s (2007) survey, VR exposure therapy was viewed as more acceptable, helpful, and ethical than traditional exposure-based therapies).

VR is a new technology that comprises computer-generated simulations of reality. The essence of VR programs is that they create the illusion that users are “inside” the computer-generated environment, as if they were “there” in the virtual world. In the field of clinical psychology, VR has proven to be an effective tool for delivering exposure therapy in the treatment of phobias; recently, VR programs have been developed for the treatment of more severe problems such as panic disorder, PTSD, eating disorders and others (see, for a review, Anderson et al., 2004; Emmelkamp, 2005; Krijn et al., 2004; García-Palacios et al., 2006; Marks et al., 2007; Powers and Emmelkamp, 2008). VR therapy involves creating safe virtual worlds where the patient can explore and experience new realities; this feeling of safety is essential in therapy, so that the patient can act without feeling threatened. The virtual context allows patients to approach situations that they perceive as threatening in a gradual way, at their own pace, with complete safety and protection.

Most of the VR systems currently available in the field of psychological treatments are designed to solve specific problems. A paradigmatic example is VR systems for the treatment of PTSD. The approach has been to use VR to simulate traumatic events with high realism with the aim of exposing individuals to the feared aspects of their trauma. This perspective has resulted in the development of very targeted VR environments for individuals who have suffered specific traumas, including September 11th victims (Difede and Hoffman, 2002), Vietnam veterans (Rothbaum et al., 2001), Iraq war soldiers (Rizzo et al., 2004), and victims of motor vehicle accidents (Walshe et al., 2003). The main limitation of this approach is that such specific programs cannot be used with sufferers of other types of PTSDs (e.g., rape victims). It is costly to employ these treatments in daily clinical practice since many separate virtual environments are required to treat diverse problems (Baños et al., 2009).

In order to treat different trauma populations, it may be more efficacious to develop flexible virtual scenarios that can evoke a variety of stressful events. We propose a different approach that broadens the scope of traditional VR systems (Baños et al., 2008, 2009): instead of requiring patients to work within discrete virtual worlds, we support designing displays which are adapted to the users’ needs, regardless of the type of trauma they have suffered. To this end, our group has developed a VR system called “EMMA’s World” wherein patients can explore a stressful environment to the degree required for specific therapeutic needs. The system shows customized, clinically significant environments for each individual, emphasizing the meaning of the trauma or stressful event over the realism of the VR environment. Personalized components in the environments, rather than

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