Treatment of earthquake-related posttraumatic symptoms with virtual reality

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Abstract. After major earthquakes, many people suffer from posttraumatic symptoms (PTS) as well as anxiety and distress about ongoing aftershocks. Traditional treatments such as in vivo or imaginal exposure may be of limited applicability for earthquake-related symptoms while others such as cognitive behavioural therapy may not be short enough to deal with the many people needing rapid help after mass disasters. This project aims to examine how virtual reality exposure therapy (VRET) can help people to reduce PTS and strengthen resilience against traumatic stressors. VRET systems are cost-effective, relatively easy to deploy and enable short, focused interventions.

Keywords. Earthquake, PTSD, Resilience, Virtual Reality, Haptic feedback

Introduction

The proposed study seeks to assess the effectiveness of virtual reality exposure therapy (VRET) to assist people to reduce posttraumatic symptoms (PTS) directly related to experiencing an earthquake, and ameliorate anxiety about impeding aftershocks. Previous research has shown the high psychological cost of experiencing earthquakes [1] and the anxiety about future aftershocks [2]. Although regular exposure therapy or Cognitive Behaviour Therapy (CBT) are generally good choices for PTS treatment there are problems with many traditional approaches for events such as earthquakes. While effective, these therapies may not be sufficiently short and deployable enough for use after a mass-trauma event, may require specialist therapist skills, are not easy to control (e.g. stimulus exposure intensity), or might not be able to prepare people psychologically for future trauma.

A simulator, consisting of a small furnished house on a shake table, was very efficient in reducing earthquake-related PTSD and fear of future earthquakes [3]. Other research has demonstrated the value of VRET for a variety of psychological problems. However, there are no studies that specifically explore this approach for treating PTS post-earthquake and for strengthening resilience against ongoing traumatic stressors. VRET systems are cost-effective, relatively easy to deploy and enable short and focused interventions. After earthquakes a considerable amount of people suffer from PTS, as well as anxiety and distress about the ongoing aftershocks. In such an environment VRET could offer a treatment option to work alongside other treatments for earthquake survivors, such as Control Focused Behavioural Treatment [4].

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1. Methods

The main goal is to develop and test a fully immersive, low-cost virtual reality earthquake exposure treatment tool integrating convincing visual, audio and haptic feedback for earthquake-related posttraumatic symptoms and to promote resilience to ongoing aftershocks. To provide a low-cost setup the participants will use a Head Mounted Display to experience the virtual environment. Visual shaking and destruction of buildings will be accompanied by a low, rumbling sound that is typical for earthquakes, infra-sonic frequencies (below 20 Hz) that are perceived through the body but normally cannot be heard by humans and have a role in producing feelings of panic [5], and haptic feedback (physical shaking) produced by off-the-shelf bass shakers used for example in home cinema set-ups. The combination of visual, auditory and haptic stimuli will create a very immersive experience. Stimulus presentation and intensity will be fully controllable and adaptable during exposure sessions.

The planned intervention study will use a waitlist design with random assignment to immediate treatment or waitlist with 30 participants per group. The treatment will consist of up to 4 sessions over 5 weeks. Waitlisted individuals will immediately cross over to treatment after 5 weeks. A pretest/posttest experimental design will be used to evaluate the immediate and short-term effects of VRET. Longer-term effects will be examined six months after treatment. Our treatment procedure will allow for basic cognitive restructuring and therapeutic habituation. This is consistent with contemporary approaches to PTS [6]. We will recruit adults who, as a direct result of the earthquakes in Canterbury, New Zealand, experienced PTS that significantly impact on daily functioning.

2. Conclusion

The main anticipated outcome will be a cost-effective, relatively easy deployable system that enables short and focused interventions. We expect that a highly immersive VRET that includes haptic feedback through shaking, will be a valuable tool for treating earthquake related PTS. We anticipate that the proposed VRET will produce a significant decrease in PTS and associated distress (earthquake-related anxiety and mood problems), that it will produce improved overall social and occupational functioning, and that it will increase psychological resilience to ongoing aftershocks.

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