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ScienceDirect

Behavior Therapy 48 (2017) 147–155

Behavior Therapy

www.elsevier.com/locate/bt

Investigating Relationships Between PTSD Symptom Clusters Within Virtual Reality Exposure Therapy for OEF/OIF Veterans

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Several cognitive behavioral therapeutic approaches have been demonstrated to be effective in reducing post-traumatic stress disorder (PTSD) symptoms (Foa, Keane, Friedman, & Cohen, 2008). The bulk of PTSD treatment research has relied on pre-post designs, which are limited in their ability to investigate the therapeutic process over time. The present study investigated the relations between PTSD symptom clusters using symptom assessment at pretreatment, midtreatment, and posttreatment using cross-lagged panel design over the course of Virtual Reality Exposure (VRE) treatment. Participants were 156 Iraq and/or Afghanistan veterans who met DSM-IV criteria for PTSD due to military trauma. Using structural equation modeling, the final reexperiencing model demonstrated good fit, $\chi^2(34) = 39.95$, $p = .22$; RMSEA = .034, 90% CI: [0.00, 0.07], CFI = .993, and results suggested that reexperiencing at pretreatment demonstrated a significant effect on numbing, avoidance, hyperarousal at midtreatment, and reexperiencing symptoms at midtreatment demonstrate a significant effect on each of the three symptom clusters at posttreatment. These findings suggest that reexperiencing symptoms are indeed a key aspect of the therapeutic process within exposure therapy for PTSD. Additional research examining the impact of reexperiencing-focused intervention strategies on treatment outcomes is warranted.

Keywords: PTSD; prolonged exposure; treatment response; symptom clusters; virtual reality

While the essential criterion of PTSD is exposure to a traumatic stressor, it is a heterogeneous disorder comprised of 20 symptoms across four clusters (DSM-5: APA, 2013; DSM-IV: 17 symptoms and three clusters, APA, 2000), which are correlated but distinct (King et al., 1998). The lifetime prevalence estimate for PTSD is 8.3% (Kilpatrick et al., 2013), suggesting that this disorder has a substantial psychological, physical, and societal impact. Fortunately, several cognitive behavioral therapeutic approaches have been demonstrated to be effective in reducing PTSD symptoms, including cognitive-focused interventions such as Cognitive Processing

This study was supported by National Institute of Mental Health, Grant No. 1R01MH70880–01-A2, "A Cognitive Enhancer may Facilitate Behavioral Exposure Therapy" awarded to Dr. Rothbaum.

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Therapy and exposure-focused interventions such as Prolonged Exposure Therapy (PE; Foa, Keane, Friedman, & Cohen, 2008). While a strong empirical basis for exposure-based treatments for PTSD exists (Jonas et al., 2013; Powers, Halpern, Ferenschak, Gillihan, & Foa, 2010), there is a lack of research regarding the therapeutic process across the clusters of symptoms. Examining how PTSD symptoms influence one another over the course of PE may facilitate understanding of the therapeutic process with exposure-based interventions and may guide treatment decisions.

Exposure-based interventions for PTSD are informed by Emotional Processing Theory (Foa & Kozak, 1986), which integrates learning, cognitive, and information-processing theories and proposes that specific pathological fear structures underlie PTSD. Specifically, PTSD is related to excessive fear-based stimulus and response patterns, as well as pathological meaning within the fear structure (Foa & Rothbaum, 1998). As such, exposure-based interventions aim to modify pathological elements of this fear structure by activating the fear structure and presenting incompatible information, which is subsequently integrated to develop a more realistic and less pathological fear network. Exposure-based interventions are consistent with translational models of fear extinction, which suggest that conditioned fear responses decrease following therapeutic exposure to the feared stimuli (e.g., Vervliet, Craske, & Hermans, 2013). While exposure-based treatment for PTSD has been demonstrated to be effective (Jonas et al., 2013; Powers et al., 2010), there is a limited empirical literature on how treatment reduces PTSD symptoms. This is particularly important as nonresponse, attrition, and dropout rates are problematic in randomized controlled trials (RCTs) for PTSD interventions (Imel, Laska, Jacupcak, & Simpson, 2013; Schottenbauer, Glass, Arnkoff, Tendick, & Gray, 2008). Understanding how PTSD treatment works may help to identify strategies that maximize effective components and identify nonresponders early in order to enhance therapeutic outcomes.

The preponderance of PTSD treatment research has used total PTSD symptom scores as the primary outcome. PTSD symptom clusters have been empirically demonstrated to be correlated but distinct (King et al., 1998), suggesting PTSD is a heterogeneous disorder. As such, examination of how PTSD symptom clusters impact one another over the course of exposure-based treatment may provide direction regarding how treatment works. Within the PTSD symptom clusters, reexperiencing and avoidance symptoms could be conceptualized as the symptom clusters most theoretically relevant to Emotional Processing Theory. Within this framework, reexperiencing symptoms can be conceptualized as representing the excessive fear stimulus and response elements that comprise the pathological fear structure, and avoidance is conceptualized as the behavior that maintains and increases PTSD symptoms, which is combated via the exposure techniques. When a patient has experienced multiple traumatic events, as is often the case in veterans, clinicians who use exposure start treatment for PTSD with the trauma that is referenced by the reexperiencing symptoms (i.e., the index trauma). A decrease in reexperiencing symptoms may represent that exposure has promoted discrimination between the past and present, which could subsequently lead to decreased excessive fear responses (i.e., hypervigilance) and an improved ability to engage emotionally (i.e., decreased numbing) in the present. Alternatively, given that avoidance is hypothesized within the PE rationale to be the factor that impairs recovery from PTSD, the emotional processing that occurs within exposure therapy as avoidance is targeted could lead to improved emotional engagement (i.e., decreased numbing), and more realistic perceptions of self and the world and fewer stimulus and response elements associated with fear and threat (i.e., decreased hypervigilance). There is evidence that PTSD symptom clusters may respond at different phases for pharmacological treatment. In a pooled analysis of two randomized trials of venlafaxine, an SSRI, compared to placebo, the earliest onset of separation between medication and placebo occurred for reexperiencing symptoms, with symptoms of numbing and arousal taking longer for differences to emerge (Stein et al., 2009).

We hypothesize that reexperiencing and avoidance symptom clusters may demonstrate significant effects on the other PTSD symptom clusters over the course of exposure therapy. When clusters have been examined previously, designs have relied on simple pre-post measures without recognition of what may be occurring during the treatment period. For instance, one investigation compared PE, Eye Movement Desensitization and Reprocessing, and relaxation training, and found that PE was more effective in reducing reexperiencing and avoidance symptoms than both of the other treatment approaches (Taylor et al., 2003). Another study compared imaginal exposure with and without cognitive restructuring and supportive counseling and found that both exposure therapy conditions demonstrated unique effects on reexperiencing and avoidance symptoms compared to supportive counseling (Bryant, Moulds, Guthrie, Dang, & Nixon, 2003). Notably, neither investigation identified significant differences on hyperarousal or on numbing for PE compared to the other treatment approaches. In a recent investigation comparing PE