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Virtual Reality Exposure Therapy: An Effective Solution for Military Personnel with Post Traumatic Stress Disorder

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ABSTRACT

Background: Post traumatic stress disorder (PTSD) is a chronic, debilitating, psychological condition that occurs in a subset of individuals who experienced or witnessed life-threatening events [1]. Higher levels of PTSD are found among veteran populations [2]. Virtual reality exposure therapy (VRET) has been identified as an effective treatment for PTSD because it facilitates emotional engagement and intervention with the patients' traumatic memory [3].

Purpose/Objectives: This review aims to examine the effects of VRET on military personnel diagnosed with PTSD. The purpose of this study is to determine whether VRET, as an emerging method of treatment, is effective at decreasing PTSD symptoms.

Methods: A structured literature review was conducted to analyze the effectiveness of VRET as treatment for PTSD in military personnel. Peer-reviewed, English-only, studies were obtained from the Academic Search Complete database and assessed for quality and relevance before inclusion. The following keywords were used: "military," "post traumatic stress disorder," and "exposure therapy."

Results: The initial literature search results produced 43 peer reviewed articles. 8 articles met the inclusion criteria as they directly related to the population, intervention and outcomes under study. All 8 studies found VRET to have a statistically significant effect on PTSD symptoms.

Conclusions: The literature shows limited evidence on the effectiveness of VRET for the treatment of PTSD. Further research is needed with larger sample sizes to demonstrate its efficacy towards treating PTSD.

BACKGROUND

Research Question: Is Virtual Reality Exposure Therapy An Effective Solution for Military Service Personnel with Post Traumatic Stress Disorder?

What is Post Traumatic Stress Disorder?

PTSD is estimated to affect about 12-18% of returning soldiers fighting in Iraq and Afghanistan [1]. Common symptoms of PTSD are avoidance of memories of the traumatic event, hyperarousal, flashbacks, nightmares, irritability, and guilt [1]. PTSD, once it becomes chronic, is said to be unlikely to resolve without active and effective treatment [2].

What constitutes Virtual Reality Exposure Therapy?

Exposure therapy is built on the idea that facing fears allows the person to overcome them. Virtual reality exposure therapy is an enhanced version of exposure therapy [3]. Virtual reality offers the client the ability to face their fears in a controlled environment [3]. The capacity of VR technology allows the therapist to present computer-generated trauma cues to the patient in a controllable, multi sensory, interactive three-dimensional stimulus environments. This therapy creates a simulated environment, where assessment and treatment of cognitive, emotional, and motor problems can take place [4].

What benefits have been found for military personnel treated with virtual reality exposure therapy?

Studies looking at the efficacy or effectiveness of exposure therapy in the treatment of military personnel diagnosed with PTSD are limited. However, the greatest amount of positive findings have been found using this therapy [3]. It has been shown that virtual reality exposure therapy decreases anxiety levels greater than treatments with imaginal exposure alone, which is the traditional method of delivering exposure therapy. Additionally, with respect to military personnel, virtual reality exposure therapy has been found to reduce avoidance and numbing symptoms [1]. Virtual reality exposure therapy provides patients with the opportunity to confront difficult memories, intrusive thoughts, and feelings, while also allowing patients to be more fully engaged in their daily activities, by encouraging engagement rather than avoidance of trauma [3].

METHODS

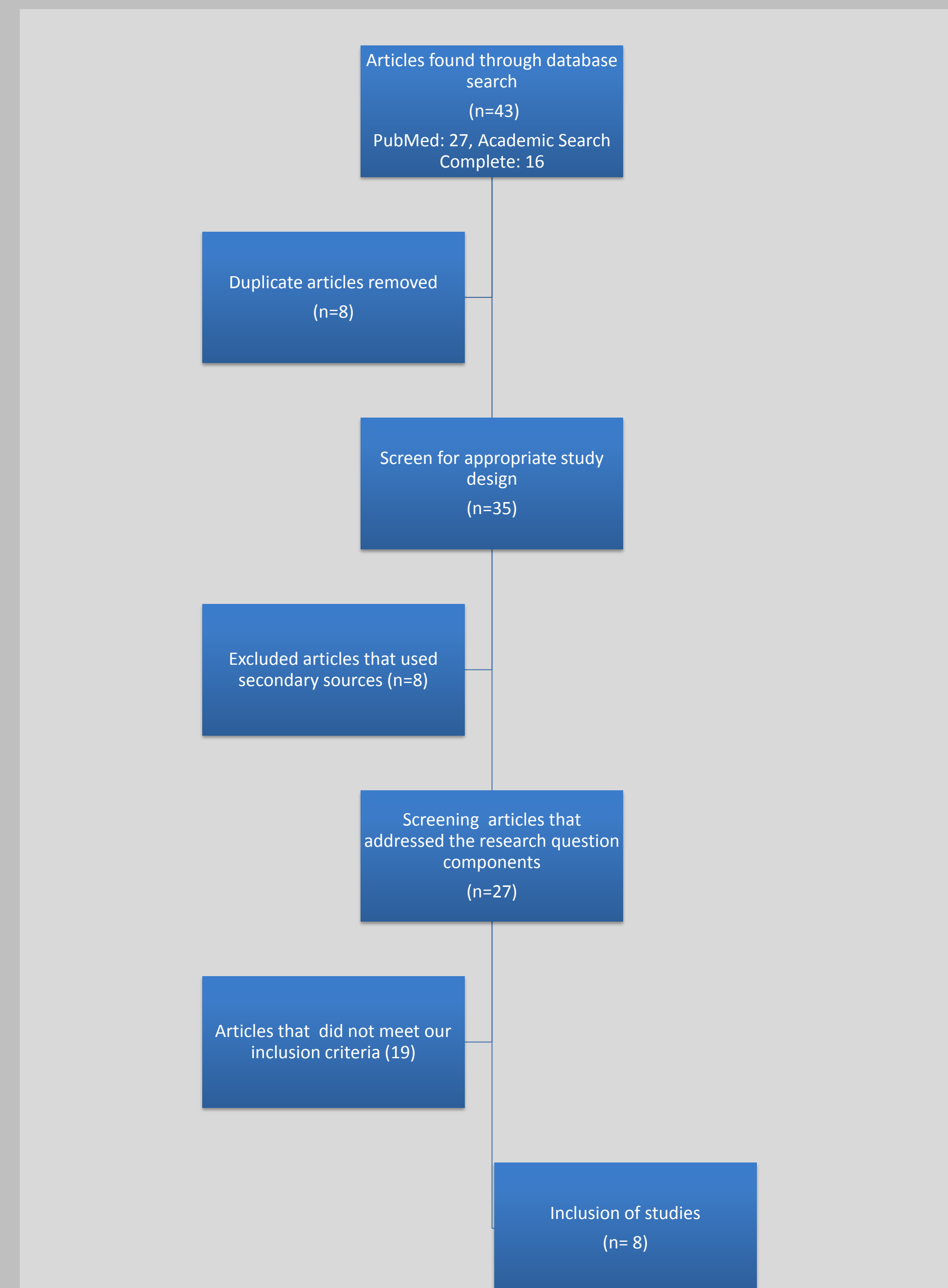


Figure 1. Flow chart demonstrating the process of identifying studies for inclusion in the structural literature review. Databases were chosen based on availability through the University of Ottawa.

Inclusion Criteria: Peer-reviewed, Military populations, Publication date: 1980-2015, using Virtual reality exposure therapy to treat PTSD

Exclusion Criteria: Combining Virtual Reality exposure therapy with another treatment, Discussions and opinions on VRET

DISCUSSION

Virtual reality exposure therapy encompasses a range of behavioural and cognitive approaches that help military service personnel to confront stimuli associated with their traumatic experience [5]. This approach allows the therapist to identify and neutralize behavioural cues associated with PTSD. The studies analyzed demonstrated the efficacy of VRET in military personnel. The results of the VRET studies show promising outcomes in terms of decreasing PTSD symptoms in Iraq (OIF) and Afghanistan (OEF) military service personnel. 80% of the treatment showed both statistically and clinically meaningful reductions in PTSD, anxiety, and depression symptoms. Patient reports suggested that they experienced improvements in their activities of daily living [4]. VRET facilitates as a cognitive reconstruction of maladaptive interpretations of visual, auditory, and kinesthetic stimuli [1]. With repeated exposures through use of VRET and the guidance of a trained therapist, military service personnel will be able to discuss their combat memories in a safe and therapeutic setting. The studies outcomes provided a great deal of evidence for the use of VRE to treat PTSD. The major barriers in this area of research that need to be addressed include small sample size, high attrition, and uncontrolled cases. Further research is needed to substantiate the efficacy of VRET in PTSD military service personnel. Additionally, there is a need for formal randomized control trials to determine if VRET is superior to any other type of exposure therapy [6].

RESULTS

Table 1. Summary of results and limitations of articles

Study	Statistical Analysis	Primary Findings	Limitations
Geradi et al., 2008.	Pre-test and Post-test analysis	CAPS score decreased by 56% from extreme range PTSD to moderate/threshold range PSS-SR score decreased from 35 to 10 Results are both clinically and statistically significant (CAPS p<0.5, PSS-SR p<0.1)	Small sample size Not randomized
Mclay et al., 2010.	Repeated measures ANOVA Paired t-tests	Significant effect between pre-treatment and post-treatment (p<0.001) and Depression and anxiety symptom scores for the patients improved throughout treatment, changes in PCL-M and BAI scores in those who received VR therapy and was a statistically significant change for BAI (p<0.05) and PHQ-9 (p<0.005)	Small sample size Not randomized Therapist effect
Mclay et al., 2012.	Pre-treatment to Post-treatment and Pre-treatment to 3-month follow up analysis using t-tests Bonferroni correction to control multiple t-tests	75% of the 20 participants who completed treatment, no longer met diagnostic criteria for PTSD on the PCL-M at post assessment. 13 of the 17 (76%) participants who were available for the 3-month assessment had improved at least 50% on the PCL-M and no longer met PTSD criteria when compared to their pre-treatment results.	No control group Open label- treatment protocol was developed and then modified as the study progressed Not randomized High attrition
Mclay et al., 2011.	Chi-square with Yates correlation Katz (Relative risk and 95 % confidence interval) Repeated measures analysis of variance (ANOVA)	Chi-square for the treatment response comparison between VR-GET and TAU was 6.74, p< 0.01. With Yates correction $\chi^2 = 4.54$, p< 0.05, relative risk was 3.21, with 95 % confidence interval 1.18 to 8.72. Two-way analysis of variance showed a significant effect of time (pre- vs. post-treatment, p< 0.001), but not group (p> 0.05). There was no significant difference between VR-GET and TAU mean CAPS score before or after treatment Significant difference in the mean CAPS change score over the course of treatment (35.4 vs. 9.4, p< 0.05)	Small sample size No blinding Single therapist Did not include protocol-adherence measures Used a control group that allowed for a wide variety of possible treatments Did not include long-term follow up
Miyahira et al., 2012.	Clinician Administered PTSD Scale (CAPS) PTSD Diagnostic Scale (PDS) Beck Depression Inventory II (BDI-II) Quality of Life Inventory (QOLI) Trauma Rel/Ted Guilt Inventory (TRGI) Pre-test and Post-test analysis Analysis of Variance (ANOVA)	No significant difference was found between groups on pre-post CAPS total score: F(1, 20) = 1.214, p = 0.284 Significant decrease over time on the CAPS Criterion C in the VRE group: F(1, 20) = 6.03, p = 0.02 The VRE group scored significantly lower on the CAPS Criterion C compared to the MA group at post-procedures: F(1, 20) = 8.705, p = 0.008 Significant interaction effect of VRE treatment on TRGI total score over time: F(1, 20) = 4.858, p = 0.04	High attrition
Reger et al., 2011.	T—tests	PCL-M (M = 60.92; SD = 11.03), patients receiving VRE reported a statistically significant drop in PTSD symptoms (M = 47.08; SD = 12.70), t(23) = 6.53, p< .001, d = 1.17	No controls No clinician-administered measure or blind assessment was included No dose-response relationship since number of sessions varied across patients
Rizzo et al., 2010.	Paired Pre-test and Post-test analysis	Mean pre-/post-PCL-M scores decreased; mean (SD) values went from 54.4 (9.7) to 35.6 (17.4); t= 5.99, df = 19, P< 0.001 Mean BAI scores significantly decreased 33% from 18.6 (10.7) to 11.9 (13.3), (t= 3.67, df = 19, P< 0.003) Mean PHQ-9 (Depression) scores decreased 49% from 13.3 (5.4) to 7.1 (6.7) (t= 3.68, df = 19, P< 0.002)	High attrition
Roy et al., 2014.	PCL-M Paired t-tests General linear model Analysis of Covariance (ANCOVA) ANOVA	VRET significantly reduced mean CAPS scores from baseline 80.44 (SD 13.31) to post treatment 64.5 (23.07), p<0.05 No significant change in PE therapy: 72.7 (13.01) before and 75.9 (11.79) after, p= 0.27 Both treatments associated with significant (p<0.05) reductions in PCL scores: from 60.44 (13.65) at baseline to 47.67 (13.73) at post treatment for VRET, and 64.9 (10.39) to 49.9 (11.51) for PE	Small sample size

* PSS-SR= post-traumatic scale stress symptom scale-self report, PCL-M= PTSD checklist-military version, BAI= Beck anxiety inventory, PHQ-9= patient health questionnaire, TAU= treatment as usual

CONCLUSION

The results from uncontrolled trials and case reports are difficult to generalize and make claims on the effectiveness of VRET [4]. In general under the supervision of a trained therapist, the simulated trauma is found to be an effective method to decrease PTSD and anxiety symptoms [3]. However, large scale longitudinal studies are needed to explore the effectiveness of VRET in the long-term. The findings can be used to develop, explore, and test hypotheses as to how to improve current treatment. Additionally, to determine patient characteristics that may predict who will complete and benefit from VRET and who may be best served by traditional therapeutic means [4]. The need to reduce the stigma of seeking mental health treatment in military personnel is important for treatment attrition rates [4]. VRET may offer additional attraction and promote treatment seeking by certain demographic groups in need of care, such as, the current generation of young military personnel [4].