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### RESEARCH ARTICLE

#### EFFICACY OF VIRTUAL REALITY EXPOSURE THERAPY FOR THE TREATMENT OF POST TRAUMATIC STRESS DISORDER IN ADULTS

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#### Abstract

The emergence of new technologies like enhanced immersion and realism providing realistic stimulations, biometric sensor integration having physiological monitoring like heart rate monitors and conductance sensors which allow the observation and monitoring of patient's behaviour and their responses and combining the reality with VR technology have altogether made the Virtual Reality Exposure Therapy more effective for the treatment of phobias and Post Traumatic Stress Disorder [1]. The efficacy of VRET in treatment of PTSD can be observed through various studies conducted on war veterans, general population and people suffering from stressful traumatic memories of the past. A study was conducted to assess the treatment of PTSD through VRET in the survivors of 9/11 attacks revealed significant reductions in symptoms with large effect size ( $d=1.50$ ).

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#### Introduction:-

Posttraumatic stress disorder (PTSD) involves a constant feeling of fear [2] due to an event perceived as threat to physical integrity and safety. Dr. Bessel Van Der Kolk defined PTSD as a disorder that develops in people who have experienced a shocking event [22] leading to drastic changes in the brain and body. Patient experiences recurrent, unwanted distressing memories of the traumatic event along with its flashbacks and upsetting nightmares, severe emotional distress [17] or physical reactions of the traumatic event. The prevalence of people in the US that experience PTSD at some point is approximately 7-8% whereas estimates suggest that 1-7% of adults may suffer from PTSD at some point in their life in India.

Exposure therapy emphasizes repeated, intentional confrontation of feared stimuli with the goal tolerance of fear and decreasing the intensity [13] of anxiety. Virtual Reality Exposure Therapy (VRET) involves retelling traumatic memories in detail while getting immersed in a three-dimensional virtual environment that is customized to resemble aspects of the patient's traumatic event [10]. It exposes patients in a graded and control manner facilitating the process of desensitization and emotional processing (Dr. JoAnn Difede 2007). Virtual Reality Exposure Therapy (VRET) permits individualized, gradual, controlled, immersive exposure that is easy for therapists to implement and often more acceptable to patients than *in vivo* or imaginal exposure. VR is presented as a scalable tool that can augment access to and effectiveness of exposure therapy thus improving treatment of anxiety disorders [6] and mental problems.

Virtual reality exposure therapy (VRET) facilitates the emotional engagement of patients with PTSD during exposures to the multiple sensory stimuli made possible by the virtual environment, bypassing symptoms of

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avoidance and facilitating control on the part of the therapist. The sense of presence provided by a virtual environment that is rich in sensory stimuli facilitates the emotional processing of memories related to the trauma [2]. The controlled exposure in VRET help patients to desensitize traumatic memories and reduce fear response as the therapist can adjust the time, duration and nature of the virtual scenarios (Dr. Barbara Rothbaum 1997). The immersive and interactive nature of VRET encourages active engagement and cognitive restructuring by allowing patients to revisit and re-evaluate their traumatic experiences (Dr. Francine Shapiro 1990s). VRET's immersive environments can evoke strong emotional responses, which are essential for therapeutic change. By eliciting the emotional responses, it helps patients confront and process their emotions, leading to a reduction in avoidance behaviours and emotional numbing (Dr. Stéphane Bouchard 2010). The technological advancements in VR technology such as improved graphics and interactive elements lead to creating real-world like scenarios which results in better approach and outcomes (Dr. Albert "Skip" Rizzo 2010).

### **Methods:-**

The data from various sources like reports, questionnaires, articles, researches which focused on the effectiveness of VRET to reduce PTSD symptoms and results from validated PTSD assessment tools were observed for the inclusion criteria to assess whether VRET helps to reduce the symptoms [29] and traumatic experiences of PTSD or not. Articles found in the references related to this review were also considered for analysis [2]. Detailed information was taken from sources like Google Scholar to collect clinical assessment articles, behavioural measures, follow-up studies in English and the data focusing on the inclusion criteria was used. Papers focusing on related approaches to VR technology besides VRET were used.

### **Results:-**

Studies show openness to treatment technology gives better results from the state of therapy used (Kothgassner et al 2019) [1]. Various studies have been conducted to assess the efficacy of Virtual Reality Exposure Therapy for Post Traumatic Stress Disorder [19] in adults.

Several studies have examined the treatment of PTSD with VRET, and the results show that the symptoms of PTSD decreased after completed treatment (McLay et al 2017; Reger et al 2016) [1]. In the study conducted by Reger (2016) the results were followed up 3 and 6 months after the end of treatment with consistent positive results for the patients in both follow-ups. Beidel (2019) investigated differences in PTSD symptoms during treatment with VRET and VRET together with TMT (trauma management treatment) [1]. The participants underwent group therapy to manage the experiences they had been traumatized by. The results showed that both groups significantly reduced existing PTSD symptoms, which were permanent at follow-up after 3 and 6 months [1].

Results from a large national survey show that major depressive disorder (MDD) is nearly three to five times more likely to emerge in those with PTSD than those without PTSD. A large meta-analysis composed of 57 studies, across both military and civilian samples, found an MDD and PTSD comorbidity rate of 52% [5]. In one study of recent veterans, 63% of those who met the diagnostic criteria for alcohol use disorders (AUDs) or drug use disorders had co-occurring PTSD, while the PTSD prevalence among those who met criteria for both AUDs and drug use disorders was 76% [8].

Results of a case report which assessed the improvement in PTSD followed by the attack at World Trade Centre which also included the women population as survivors revealed significant improvement in 85-90% of women (Difede and Hoffman 2002). Soldiers actively involved in the infantry unit which included both men and women population showed that the symptoms decreased by 50% after their treatment with Virtual Reality Exposure Therapy (Reger et al 2013). A study conducted on survivors of motor vehicle accident who were given VRET treatment showed more positive approach towards life, decreased anger (Goncalves et al 2012). Study titled "Virtual Reality Exposure Therapy for treatment of PTSD: A Review of Its Efficacy, the Adequacy of its Treatment Protocol, and its Acceptability" [12] on people who suffered from trauma like natural disasters, accidents showed better adaptability towards life proving the therapy's effectiveness (Botella et al 2015) [24].

### **Treatment of PTSD through VRET and medication**

Several combinations have been made in treating PTSD together with different types of medication (D-cycloserine, alprazolam, dexamethasone or other benzodiazepines) were described as being effective for treating PTSD symptoms compared to VRET treatment alone (Rothbaum et al 2014) [1]. The combination of VRET and D-

cycloserine(antibiotic which enhances the effect of exposure therapy) resulted in reduction of symptoms in Afghanistan and Iraq war veterans(Rothbaum et al 2014).Another study which included combining VRET with Sertraline (an SSRI) resulted in 50-70% reduction of symptoms in combat veterans with Post Traumatic Stress Disorder (Tuerk et al 2013) [23].A study also described those patients in the VRET drug group showed earlier and more significant improvement in PTSD symptoms compared to the VRET placebo group [1](Difede et al 2014).

### Discussion:-

PTSD is one of the more investigated disorders during treatment with VRET, and several studies showing that symptoms of PTSD decrease during treatment with VRET (Beidel et al2019; McLay et al2017; Reger et al 2016) [1].Studies showed reduction in Post Traumatic Stress Disorder with 85-90% reduction in [27]women survivors of World Trade Centre attack (Difede and Hoffman 2002), 50% reduction of symptoms in soldiers of infantry unit(Reger et al 2013), reduction of symptoms in people who suffered from trauma like natural disasters proved therapy's effectiveness (Botella et al 2015) along with decreased anger and positive approach(Goncalves et al 2012) [1]. Combination therapies with VRET and medications such as D-cycloserine, alprazolam, or other types of benzodiazepines, and dexamethasone have, in most cases, reduced PTSD symptoms and VRET in combination with D-cycloserine or alprazolam reduced PTSD symptoms and this reduction is permanent at follow-up after 3 and 6 months (Difede et al2014; Norrholm et al 2016) [1]. Maples-Keller (2019) described those patients experienced symptoms of PTSD to a greater extent during the combination treatment with the medication dexamethasone for therapeutic indications [1].

The reasons for reduction in symptoms of PTSD through VRET treatment are that it allows the controlled exposure memories of trauma in a systematic manner and the repeated discord. It also helps in reducing the stigmatised emotions and thoughts through the in vivo exposures resulting in better treatment outcomes. The sessions conducted under the guidance of therapist allows patient to connect exquisitely which helps in better coping of their abrasive circumstances. VRET is customizable as it can be tailored to every patient needs, their beliefs which further enhances its efficacy. It also allows patient to face their trauma again, they can lever its intensity first in a less disturbing circumstance then increasing or decreasing it as per their need depending on the current state of their emotional strife.

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