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Original Paper

PET+EMDR+VR to Reduce PTSD Symptoms

Mingju Zhang[1*]

[1] Beijing 101 Highschool International Department Grade 12, Beijing, China

[*] Mingju Zhang, Beijing 101 Highschool International Department Grade 12, Beijing, China

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Abstract

As Post-Traumatic Stress Syndrome become ubiquitous in our daily life. Under overwhelming stress, people are more prone to PTSD since they live under stress and frequently come to their limits of sentimental optimal level, and the goal of this paper is to ameliorate these commonplaces in PTSD because it becomes ubiquitous. I hope to expound on this by going through various universal methods, which can guarantee therapists to cover optimal numbers of PTSD patients and benefit larger audiences. While Therapist use prolonged exposure therapy to desensitize patients and EMDR can relax patients during each treatment. Latest VR technology and Situated AI progression will resolve short-come in current PTSD treatments. Research is made and an ideal prototype will be presented with detailed procedure in this paper.

Keywords

Post-Traumatic Stress Syndrome, Virtual Reality, Prolonged Exposure Therapy, EMDR, Artificial Intelligence

1. Introduction

PTSD, which refers to “Post Traumatic Stress Disorder”, is a common mental disorder among individuals of all ages. While reading *All Quiet on the Western Front*, I felt sympathetic to veterans who had suffered from reliving painful memories of the battlefield, resulting in insomnia, social phobia, and even depressive episodes.

“Post-Traumatic Stress Disorder (PTSD) is a mental health condition that’s triggered by a terrifying event—either experiencing it or witnessing it. Symptoms may include flashbacks, nightmares, and severe anxiety, as well as uncontrollable thoughts about the event” (PTSD, 2018). PTSD does not specifically affect veterans. According to the National Center for PTSD, “About 7 or 8 out of every 100 people will experience PTSD at some point in their lives” (U.S. Department of Veteran Affairs, 2018). PTSD can manifest itself with various symptoms.

Currently, VR technology is gaining momentum. Since VR can create an ideal environment for patients, alleviate stress, and bypass direct contact with society, using VR for psychotherapy can be an excellent tool to ease patients' anxiety and help them manage their difficult memories through desensitization.

The new treatment model I propose will re-envision PTSD therapy through a combination of prolonged-exposure therapy and EMDR in VR. To consider how to refine PTSD treatment design, the initial step will include scoping both patients' and therapists' perspectives on the issue.

Users are often afraid of revisiting previous trauma and sometimes will be recluse to as a self-defense mechanism. They often become close-minded and struggle to enjoy themselves and their surroundings. Most remarkably, they live every day with overwhelming stress and insomnia. This considered a user's demands would be focused on the fundamental mechanisms that can relieve them from these physical and psychological obstacles, thereby reuniting them with general society.

Therapists are equally eager for new interventions for PTSD. The most pressing issue is to diagnose the exact portion of memory or circumstances that make patients feel dread, panic, and depression. While initiating a conversation, patients have potential intentions to hint at specific traumas to others, thereby interfering with traditional treatments. Therefore, therapists must use technology like Artificial Intelligence as NPC (the name of instructors in video games) to help patients confide their sentiments and recover from trauma from their home's comfort. Moreover, different therapists may have differing levels of competence in their diagnostic accuracy.

Altogether, these factors have inspired me to use the design thinking methodology to transform the treatment of PTSD with the introduction of VR.

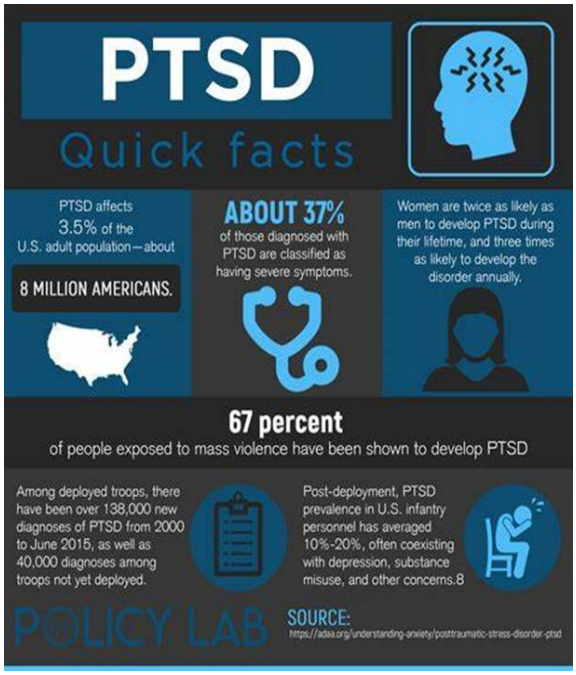

Figure 1. PTSD Global Data and Distribution in USA

2. Problem Statement

The two main issues to address in PTSD treatments are the effectiveness and universality of PTSD treatment. We found that autonomous realization should be achieved according to Maslow's hierarchy of needs. The authority gives people who are sleeping-disabled and cannot work productively during the daytime in their job positions and have trouble communicating with society. Therefore, users must embrace this pain and desensitize them in order to accommodate society. However, patients vary from different ages, races, and social backgrounds. The practical solution should first trace back to specific circumstances, which cause patients to lose sleep.

Sleep is a key desired goal for clients to achieve efficiently on the path to curing PTSD. Patients who have PTSD are encountering insomnia for years, and it is detrimental to their physiological health. VR should address this issue effectively.

Self-awareness in the mental state is necessary to cure. Patients do not want to be forced to answer questions. Instead, they want privacy and certain self-controls when they are fighting with PTSD.

To consider this model's side effect, our main questions regarding effectiveness are constant addiction, and stimulant harms to patients when they are coping with VR games. To address this side effect, researchers should limit usage and combine their treatment with EMDR, a relaxing therapy to alleviate PTSD stress. While we prompt free treatment, we must take priority to make patients cure themselves. An apparent issue with medications is that patients quickly become addicted and rely on medications for the rest of their life. Furthermore, if they are detached from these precise treatments, patients' symptoms will reoccur and worsen.

Besides sleeping, getting back into society is another crucial issue. Since standard treatments cannot supervise patients all the time, turning VR into daily clock-in games will make tracking simpler for doctors. As for simulation, researchers will need to design an evaluation system that can judge whether patients are ready to go back to live a healthy life.

For universality, VR needs to be convenient and easily accessible to cure PTSD. Since treatments are idealized but independent from each other, a sim world is suitable for patients to share similar symptoms like combating together in similar situations. At the same time, researchers can discover more connected data. The general post-simulation can be a utopian system that resembles internet-based games. To suit each patient, a big data AI is necessary to help them. Since psychotherapists cannot follow patients after the treatment, AI instructors and VR games will help patients cure post-treatment.

3. Research Insights and Documentation

3.1 Research Process

3.1.1 Existing Method and Their Outcomes

There are fundamentally four types of psychological treatments to cure PTSD. First, cognitive therapy uses conversation to lead patients to leave the places of mental entrapment and not be afraid of those

circumstances. However, the efficiency of such conversations and interviews are deficient given the complexity of preparing for such conversations, which means they cannot holistically comprehend the issue.

Regarding exposure therapy, this can help flashbacks, desensitize trauma, and help patients get back to real life. Nevertheless, it is too progressive for exposure therapy and might worsen the situation if researchers cannot accurately evaluate patients' status. The detrimental effect of merely using prolonged exposure is a hazard.

The third type of leisure treatment is EMDR, which combines exposure therapy with a series of guided eye movements that help you process traumatic memories and change your subsequent reactions. However**,** merely using EMDR cannot effectively ameliorate PTSD when patients cannot build upon relaxed states toward a cure.

The last kind of commonplace treatment is prescribing medications such as antidepressants, anti-anxiety, and Prazosin. These medications guarantee chronic therapy to alleviate symptoms and can be useful if patients strictly follow the instructions. However, the side effects of medications will cause other physiological issues in humans. Moreover, if patients ignore the prescription, the symptom will deteriorate because of reliance upon these drugs.

3.1.2 Research Documents and Data

After analyzing each treatment's pros and cons, several renowned companies and studies have shown how VR can be implemented in PTSD treatment.

In a research study made by David P. G. van den Berg and his colleagues, they examine the efficacy of treating PTSD by using Prolonged Exposure Therapy (PET) and Eye Movement Desensitization and Reprocessing (EMDR) under the waitlist condition of PTSD with psychosis, a condition not investigated thoroughly before, and which can incur severe symptoms. Since psychosis is considered the extreme situation of PTSD, it belongs to PTSD treatment exceptions.

They set the experiment and used CAPS, stating that "The primary outcome measure was the CAPS, which provides a symptom severity score and assesses the presence of a PTSD diagnosis" (David & van den Berg, 2015).

Besides the significant evaluation, they also evaluate "the Posttraumatic Stress Symptom Scale Self-Report (PSS-SR), which assesses the self-reported frequency of PTSD symptoms, and the Posttraumatic Cognitions Inventory (PTCI), which measures trauma-related cognitive distortions" (David & van den Berg, 2015).

After eight 90-minute treatment sessions of PET and EMDR, comparing with the controlled waitlist group, researchers concluded that "that standard PE and EMDR protocols are effective, safe, and feasible in patients with psychosis and comorbid PTSD without using stabilizing psychotherapeutic interventions" (David P. G. van den Berg, 2015). This further strengthens the plausible effectiveness of PET and EMDR.

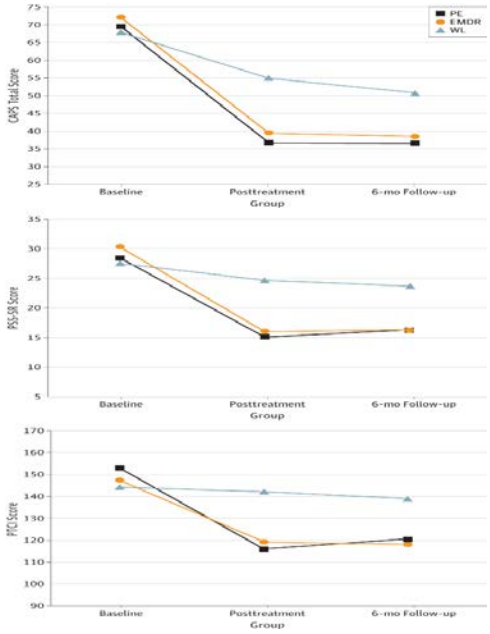

Figure 2. The CAPS, PSS-SR, and PTCI Scores of Patients Who Receive PET, EMDR and the Controlled Group

Their data is collected at the baseline, after the treatment, and after 6month of each treatment.

3.1.3 Research about Current XR Companies that Serve as the Base of MyProject (Psious)

Psious is a company that uses PET and EMDR together in VR to cure PTSD and other mental disorders. For PTSD, Psious applies EMDR as an auxiliary, and therapists can manipulate the virtual circumstances which patients experience. Everyone can have designated situations to experience.

Psious' devices are app-based VR games, which can be portable and easily accessible.

Figure 3. VR Headset Goggle in Psious Company

Figure 4. Biofeedback Sensor in Psious

Psious has a sophisticated system that contains many parameters to assess whether patients have become standard.

However, if this device can become universal and effective by amalgamating PET and EMDR in the same treatment, the effectiveness and universality can be guaranteed.

3.2 Research Insights

For PTSD treatment in Exposure therapy, adequately applied with VR, Several Physiological data should be measured to assess if patients typically react to their encountered circumstances. I think EEG, heartbeat, and certain neurotransmitters such as serotonin and melatonin are necessary. Secondly, current PTSD treatments take longer to use communication, which is subjective, so the novel VR should take less time preparing for patients to achieve the effect. To achieve that autonomous curing process, we induce PET to desensitize patients when they can positively face their traumas and consider them an ordinary clip of memories. In memory stimulation, researchers should use variable-interval treatments in VR in order to enhance the outcome. Patients should avoid accompanying with chemical treatment in the procedure of VR treatment in PTSD since taking consider as passive treatments and will cultivate addictions.

In the simulation process, several insights can enhance the verisimilitude and the effectiveness of PTSD treatment. In the first place, specific AI programs are necessary for the program: not only can Artificial Intelligence be an NPC to instruct users with different conditions, but also it can be a data collector to extrapolate the next level of situated treatment. During simulations manipulated by therapists or AI therapists, CG motion pictures or high clarity pictures can build up the utopia. I am thinking about adding sensory motors on humans, like dressing up specialized outfits and simulating them in VR for touching in the module situations. For users who want to fully experience those specific situations, VR goggles should be implemented with eye-caring screens or lenses and visualize 360 degrees of landscapes for PTSD patients to use.

While operating VR simulations, Different levels of symptoms should employ different VR simulation levels, and VR machines should monitor 24/7 data of metabolism. A biofeedback sensor is necessary to

monitor patients' daily life and during their simulations. Moreover, an extrapolation system should be made to determine whether patients are cured to embrace the real world. This system can solve the inaccuracy problems that will worsen the PET treatment with VR simulation.

To add EMDR in VR, therapists can add this relaxing meditation procedure to happen during the relaxing stages when patients are resting between two treatments or about to sleep. EMDR should implement sleeping detection or blow off the steam while patients have just taken prolonged exposure therapy in VR simulation. EMDR should last for 15 minutes and create serene places for patients to meditate.

Finally, post-health monitoring can become games in patients' daily life in order to sustain that optimal state. User experience: users' response to the amount of demanding VR treatments is different. They pursue moderate levels of stress while curing PTSD and eager to cure PTSD effectively. Therefore, determining what level of stress patients can be consent with is crucial. After a group of treatments, VR utopia can facilitate post-PTSD treatments and increase AI variables so that they can enhance further PTSD treatments.

3.3 Research in AI Instructor and DataCollector

Since the number of therapists is limited as PTSD becomes omnipresent. Medications can be universal but detrimental. The discussion treatment of interaction with each patient can be but ineffective; therefore, if VR companies can mobilize the same AI to calculate the general algorithm, they can come up with infinite possibilities to accommodate each patient.

Situated AI is the learning machine that can facilitate their functions as they are placed in different environments. A renowned scholar, Phoebe Sengers, proposes that "At the same time, I propose that the problems socially situated AI addresses are particularly pressing for applications in AI and entertainment, where the utility of an agent depends not so much on the internal correctness of the agent's actions as on the effect of the agent on the user" (2002). Therefore, while AI therapists encounter all walks of patients, their analytic function can be enhanced while interacting with humans. Hence, AI can not only unify the system of assessing VR treatment in PTSD but also enhances themselves as they encounter myriads of cases and present therapeutic responses, which are VR simulations.

3.4 Research in General Extrapolation System during the Therapy and Post-treatments

Since the PET has a hazard when therapists cannot measure each patient's exact stimulus or status, there is a chance that patients will be overwhelmed under that circumstance. Adding EMDR can partly alleviate stress, but a bumping system can be achieved to grasp the actual states of minds that users are attaining.

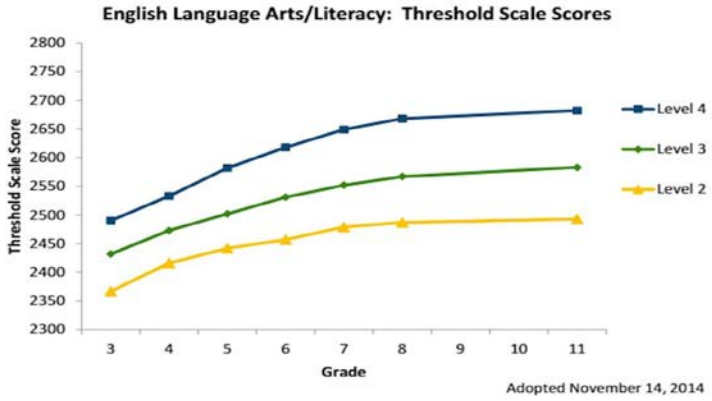

Figure 5. An Assessing System to Detect the Optimal Level of English Proficiency Level, and It Can Be Implemented in PETSimulation

After the treatment, patients should pass an evaluation test to get back to a healthy life with physiological statements' supervision. It can be like this evaluation system made by AI to create a utopia to produce "society" in VR.

It can be an interconnected game that connects each patient and certain ordinary people created by AI and have club discussion, and researchers or AI can collect more variables to make more precise models in future simulation.

4. Ideation and Post-ideation Discussion

Imagine a patient named Richard who has PTSD of trauma, such as being abused in childhood or experiencing overwhelming pressure. Firstly, the diagnosing stage: Richard will be given a questionnaire to demonstrate symptoms with a designated online questionnaire, mainly asking about the specific flashbacks' patients have and then recording details down as precisely as possible. Then, according to the survey, they will build specific databases and build up circumstances to direct the real causes of PTSD. After the team uses AI therapists and researchers' previous data to accommodate the VR simulation's basic version, Richard is ready to start his treatment.

During the therapeutic period, Richard will be given a VR goggle set and biofeedback model, with AI able to link into the system to instruct Richard. AI instructors and recorders are implanted to give patients a feel like they interact with a human "Turing test of thinking AI" to replace therapists as the primary cure potentially. Richard will be exposed in certain situations that he previously depicted in the survey about the specific circumstance that stimulates him to reminisce that trauma. Richard's metabolism and levels of oxygen in hemoglobin (breathe), melatonin secretion(sleeping), dopamine and adrenal secretion (arousal), and heartbeat with blood pressure.

By learning from a Duolingo English Aptitude test where AI uses special bumping assessments to impose a mild situation and then a harsher situation for patients to help researchers evaluate their PTSD status, AI can manipulate the standard of patients' simulations as therapists do. There is an ideal linear increment of treatment in each patient but in zig-zag levels of difficulties. Researchers can learn from this data and proceed with further treatment in simulations of VR. Once the symptom level is stabilized, the treatment can be continued to 12-16 weeks of PET+VR periods as a group. Richard will be presented in a verisimilitude scene that he resists. For instance, it can be the battlefield or at his residence where he acquired that traumatic memory. Their physiological data are being collected while experiencing simulations, including heartbeats, blood pressure, and certain neurotransmitters like melatonin and dopamine. During each of these, treatment should be at a moderate level of 2-3 hours to control addiction/eyesight damage. During each interval or before sleep, EMDR games can be implemented to relax their minds from stressfully prolonged exposure. Each EMDR resting stage can happen before sleeping or after enhancing PET treatments have been implemented. Richard can unwind himself at this period so that he will not be overwhelmed by PET therapy.

After collecting data from a group of therapy, Richard should be tracked with a designated VR game in which different patients who have similar symptoms of PTSD can be brought together, and enhance relationships in interactions with society. Like a rehab utopia online, they can discuss their similarities and live in a safe-space every day to communicate with each other and other symptom-less people. Richard can know and connect with patients who have PTSD, form community, alleviate pain by sharing experiences, and implement a new understanding of the therapy games. AI instructors can facilitate these special occasions and utilize them to perfect their algorithms to build improved PET therapy simulations for the future.

Final simulation (Live in Sims for an extended time) (voluntarily) Evaluate safety to communicate with society. CAT based evaluation accessories can be used to finalize the treatment. When they reach specific scores, Richard can be announced as the end of his standard treatment; his simulation data will be recorded holistically by AI data collectors and compare future physiological data with these current features to secure Richard's future. After PET and EMDR therapy, researchers can employ biofeedback bands to each patient and keep on tracking them with physiological data to see if Richard's CAT and other evaluation data are as moderate as ordinary people.

Post-treatment therapy can be achieved by downloading apps like Psious can play VR games in the future safe-space, and AI can be around each patient to offer the practical situations in which Richard's like to live at first, then Richard can accommodate circumstances better in the future.

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