

**THE USE OF VIRTUAL REALITY IN THE TREATMENT OF PSYCHIATRIC  
DISORDER**Shaik Rafijani<sup>1\*</sup>, Mehnaaz Alam<sup>2</sup> and Likitha Ch.<sup>3</sup><sup>1</sup> Pharm.D, PGDCR; Scientific Writer at Indegene Pvt. Ltd. Bangalore, India.<sup>2</sup> Pharm.D; CRC at K.G.H, Visakhapatnam, India.<sup>3</sup> Pharm.D, Clinical Pharmacy Intern at Q'NRI Hospital, Visakhapatnam, India.**\*Corresponding Author: Dr. Shaik Rafijani**

Pharm.D, PGDCR; Scientific Writer at Indegene Pvt. Ltd. Bangalore, India.

Article Received on 26/11/2021

Article Revised on 16/12/2021

Article Accepted on 06/01/2022

**ABSTRACT**

Virtual reality (VR) is a computer-generated simulation of the three-dimensional environment with which one can interact in a real way. VR is a phenomenon in which users are “immersed” in a computer-generated environment via a human-computer interface, wherein the user can naturally “interact” with the virtual features or items. VR provides rich visual and auditory stimuli, as well as peripheral tactile and olfactory stimuli. These sensations help the users to feel and remember VR in a realistic manner. The subjective feeling that a user experiences as “being there” is called “presence”. Although the users are aware that VR is not real, they can be mistaken that the simulations are real instances and feel that they have experienced in reality, the events that have occurred in the VR. Within the controlled and safe environment of VR, experimenters can manipulate the VR environment as required to test different hypotheses on human behaviour. Simultaneously users can repeatedly experience a situation and control the environment themselves. In addition, with the development of bio-signal recognition technology and big data technology, bio-signal data of VR users, such as head movement, body movement, and heart rate can be collected and analyzed using artificial intelligence algorithms to provide objective data on the behaviour and symptoms of the patients in their specific VR states. VR is also being used in the medical field, particularly in radiology, preoperative planning, and image-guided surgery, as well as in rehabilitation remedies such as physiotherapy and occupational therapy. Nevertheless, the use of VR in these fields is still in its infancy.<sup>[1,2]</sup>

**KEYWORDS:** Virtual Reality, Technology, Algorithm, Physiotherapy.**INTRODUCTION**

Mental health is a representative field that could utilize VR for the diagnosis and treatment of various mental illnesses. There are many psychological barriers to medication-assisted treatment due to the social stigma associated with mental disorders and the burden of medications. Furthermore, psychotherapy has its limitations, owing to the shortage of counselling professionals and the high cost. Therefore, in these situations, logistics and economics of VR therapy would encourage patients to adopt a VR-based treatment regimen. VR therapy provides a realistic and immersive environment tailored to the individual's needs, and allows for repetitive, consistent, and systematic training. It facilitates objective data measurements, their retrieval, and evaluation. In addition, psychotherapy or training using VR can reduce anxiety in the patients when compared with the traditional treatment methods. These features make VR useful for patients with mental health concerns, who have difficulty interacting with the world.<sup>[3]</sup>

**Treatment of Posttraumatic Stress Disorders (PTSD)**

Posttraumatic Stress Disorder (PTSD) is a psychological reaction that occurs after experiencing stress that has caused life-threatening extreme mental trauma. An individual's quality of life is greatly reduced by re-experiencing the situation with awakening, anxiety, agitation, and insomnia symptoms. Among PTSD, many VR studies have been focused on veterans who have been exposed to battles in Iraq and Afghanistan, to alleviate their trauma, reduce suicidal ideation, decrease depression and anger, and to improve their PTSD. Discharged soldiers can have destructive behaviours to both themselves and others as a result of rage and depression caused by PTSD. However, they can learn to solve these situations in a safe and well-controlled environment called VR. Since the key in the emotion-processing theory (EPT) is to expose and modify their unique fear structure, the virtual environment is ideal in the sense of its flexibility and customization. As they are exposed to sources of their disorder, they decrease the feelings of fear and anxiety in the form of VR-based habituation therapy.<sup>[4,5,6]</sup>

### **Anxiety Disorders and Specific phobia**

More specifically, phobia is a type of anxiety disorder characterized by marked and persistent fears that are cued by the presence or anticipation of specific objects or situations with a desire to avoid that condition due to high levels of fear and discomfort. Phobia includes acrophobia, flight phobia, phobias for insects or animals, and so on. Exposure therapy in VR is helpful because we can deal with such specific phobias in a virtual world, and it can be cost-effectively performed. In VR, patients with phobia can reproduce the situation they actually feel fearful of and face it themselves. Repeated use of VR increases the threshold of anxiety and makes it less insensitive, resulting in the reduced incidence of actual situations. Initially, VR graded exposure therapy was found to be successful in reducing fear of spiders (social phobias, and flight phobia after applying it to a small number of subjects. A self-training program with mobile VR individuals with acrophobia has been safely and successfully applied to reduce fear of heights. It can be safely applied at home and at the hospital. It can be easily interrupted or repeated depending on the situation. VR can reduce the degree of anxiety by exposing the patient to a virtual dental care scenario in an incremental manner. Recently, VR with repetitive transcranial magnetic stimulation (rTMS) over the prefrontal cortex has been applied in participants with spider phobias.<sup>[7]</sup>

### **Schizophrenia**

Patients with schizophrenia show anhedonia, social withdrawal, and a blunted affect, which can lead to rumination and isolation. While exposure therapy in anxiety-related disorders uses VR as a simulation tool, the so-called avatar therapy for negative symptoms of schizophrenia focuses on interactive VR. In a computer-generated virtual world, VR users are no longer simply external observers, but active participants. It is one of the key variables in understanding social environments that need to be controlled, and thus provides exciting applications to research and treatment.<sup>[8]</sup>

### **Autism**

Autism is characterized by a state of being trapped in one's own world. It is a childhood developmental disability. Children with autism do not interact with others. They do not have emotional ties. VR approaches for rehabilitation in autism tend to create virtual environments integrated with other equipment, facilitating cognitive processes of training such as concentration and other functional skills in everyday life. The University of Texas has developed a training program to assist in the social skills training of autistic children. It uses brain imaging and Electroencephalography (EEG) monitoring. It also uses avatars to put children in situations such as job interviews and meetings. They practice reading social signals and expressing socially appropriate behaviours. After completion of the program, the activity of the brain area associated with social understanding was found to be increased in participants' brain image.<sup>[9]</sup>

### **Dementia and Mild Cognitive Impairment (MCI)**

Dementia is a broad term describing such disorders of the brain that progress over time. Basically, in evaluating cognitive dysfunction and detecting MCI, VR has been applied and has exhibited very high accuracy. VR technology can be feasible amongst individuals living within the earlier stages of dementia outside of a hospital environment. While much of the VR studies appear to focus on the treatment of anxiety or phobias, the population of VR applications is underdeveloped. However, it is perhaps not surprising that recent advances in VR rehabilitation applications keep pointing to the feasibility of VR training in healthy elderly persons as well as in pathological populations.<sup>[10]</sup>

### **Stress and Pain alleviation**

Stress and pain have deleterious effects on the mind and body. In order to decrease one's attention available for conscious pain processing, VR usage for stress and pain alleviation typically provides simple forms of distraction (e.g., watching videos or playing video games). Although the physical mechanisms are not well understood, the patients focus moves away from the conscious attention on the stressful and painful condition during the occupational activity. While patients can learn pain-management techniques as mindfulness, several experimental results suggest that VR techniques have actual benefits for subjective pain reduction. This could reduce a patient's stress and shorten hospital stays. Relaxation and meditation in various VR applications have become increasingly widespread for treating patients at home or in hospitals.<sup>[11,12,13]</sup>

### **Limitation**

Clearly, exposure to VR applications may result in significant discomfort for the majority of people, with symptoms of motion sickness including eye fatigue, headaches, nausea, and sweating. VR Sickness is different from common motion sickness because motion sickness is caused by visual perception of self-motion while VR sickness does not require actual movement. A conflict between accommodation and vergence depth cues on stereoscopic displays is a significant cause of visual discomfort from VR. Dry eyes due to an overheated display in an enclosed space and retinal damage due to blue light are also concerns. As shown in this review, only a few large-sized and well-designed studies have been conducted in psychiatry with VR.

VR is developing to improve real-life adaptation of patients with psychiatric problems. However, patients may become preoccupied or addicted to the VR environment, similar to internet game addiction. If patients with schizophrenia have impairment on reality testing, they may have delusional thinking in the VR environment. Doctor-patient relationships and careful education before using VR are mandatory before applying VR treatments in psychiatric patients. In the near future, a guideline to apply VR treatments to patients with psychiatric illnesses should be established.

VR will play a role as an alternative option for psychiatrists to use in supporting psychiatric assessments and treatments in patients.<sup>[14]</sup>

## CONCLUSION

Many studies and clinical trials have used VR as a simulation, interaction, and distraction tool for patients with psychiatric illnesses such as PTSD, anxiety, specific phobia, schizophrenia, autism, dementia, and heavy stress. VR environments show the possibility of changing their anxiety, depression, cognition, and social functions by effectively exposing them sources of fear, presenting interactive virtual environments of cognitive-behavioural approaches, and contributing to other rehabilitation applications.

In practice, patients with a psychiatric diagnosis such as depression, bipolar disorder, anxiety disorder, schizophrenia, and even alcohol use disorder share common characteristics such as anxiety, avoidance, and poor insight to their illnesses. Modern VR systems can deliver an ideal place where one can confront the problem which needs to be overcome, not only through talking with doctors, but also through virtual environments with well-controlled sensory stimuli. This may produce cognitive and behavioural changes in patients with psychiatric disorders including autism and dementia. They also have benefits in reducing chronic pain and intensive stress. However, VR needs to overcome technical hurdles such as motion sickness and dry eyes, as well as user hurdles such as preoccupation and addiction.<sup>[15]</sup>

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