



Virtual Reality Exposure Therapy (Vret) for Reduction of Post-Traumatic Stress Disorder (Ptd) of Terrorist Assault Survivors

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Abstract: Virtual reality exposure therapy (VRET) is a computationally simulated treatment, based on Visual, Auditory, Kinesthetic and such other sensual tools condition to immerse and redirect the patient's mind capabilities by scripted and controlled scenarios. The therapy is increasingly being used to overcome a variety of social and general anxiety disorders, specific phobias and Post-Traumatic Stress Disorder (PTSD) due to any unfortunate mishap. In recent past, by the reason of expenditures and technical limitations, VR facility has not been broadly accessible; however recent manufacturing developments gradually increase its availability to common people. The Psychological treatment requires some or more patient's intention, concentration and will power, so sometime subconscious resistance make it quite exhausting and lethargic process. VRET on the other hand immerse the client into environment rapidly and with no or less efforts. The objective of this research study is to design and develop a user-friendly cultural oriented VRET system that would be helpful to immerse PTSD patient's all mental faculties into well-defined scenarios of relevant contexts. The promising results for reducing PTSD symptoms are highly expected from this multi-disciplinary project which has validated its correct direction by initial tests. To ensure the novelty of proposed therapy a statistical comparative study is plan to conduct between the virtual reality exposure treatment group and the traditional Clinician Administered PTSD. The VRET may provide numerous advantages ranging from cost effectiveness, controlled and semi supervised environments, autonomy on feedback, learning capability and ease of availability. In current global situation such projects are unavoidable in order to attain psychological wellbeing of common man.

Keywords: Virtual Reality, Posttraumatic Stress Disorder, PTSD, Exposure Therapy

1. INTRODUCTION

Post-Traumatic Stress Order (PTSD) reflects the continuously anxious state of mind, presumed as intensive threat and trigger or simulate to survival instinct. The trauma is cause-and-effect phenomena of terrible experience of natural disaster, terrorist assault, street crime, domestic abuse, war, guiltiness and so on. Panagiotakopoulos describes the symptoms as; the psychological dimension of anxiety is usually expressed by tension, uneasiness, apprehension, and irritability. Its physical dimension is expressed among others, by the arousal of the sympathetic system, the secretion of hormones by the adrenal glands, and the production of glucose by the liver. There is also a behavioral disposition either toward fighting (avoiding) or fighting (attacking) (Panagiotakopoulos, *et al.*, 2010). The both of the reactionary avoidance patterns may provide relief from anxiety for short-time but consequently it increases in long run to left behind only limited options. Therefore, patient put all efforts to avoid the situation rather to solve it. In order to break this vicious circle of pattern, patient needs an exposure therapy where individual exposes into controlled simulated environment where he/she confront with the scenario he/she is afraid off. Such

exposure greatly helps in reduction of fear and boost confidence. The Virtual Reality Exposure Therapy (VRET) is computerized equipped environment that emotionally immerse patients and focuses over the cure activities in order to reducing the anxiety symptoms. The sense of immense presence induced is valid direction to treatment gradually. For anxieties and phobia imaginal exposure therapy (Minnen and Foa 2006) usually considered as classical treatment, Such treatment includes reparative associative imaginal retrieval and their alterations states. In this approach patient struggle to create sensual images and other affiliated sub-modalities.

The development of Virtual Reality Systems brings lots of relief, ease of access and novel research directions in Health and Education sectors. The primary advantage of the system establishes immediate rapport (alignment or harmonious relationship) between patient and system due to its culturally designed components. In addition, with small changes the system will be useful to identical class of problems such as reduction of PTSD, anxiety and various phobias. There are several target audiences of VRET including but not limited to students, engineers,

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researchers, doctors, scientists etc. Here some prominent objectives of study are elaborated.

a) Firstly, the goal is to design and develop a cultural oriented VRET system to provide effective, cutting-edge and economical treatment to PTSD patients in Pakistan. Since, in the conventional imagination based clinical therapies, it is quite harder for patient to generate sequence of cue images in their minds, which is essential for those treatments. On the other hand, such hurdle is perfectly being addressed by proposed system.

b) Secondly, the comparative study would be conducted for purpose to investigate the performance measures of VRET over traditional clinical therapies, which may open new research directions in the field. Initial study, validated the prominent research direction for removing hurdles, reduction or even elimination of PTSD symptoms, Anxiety and Stress disorders.

c) Thirdly, to make the system easily reachable to anyone. As hugely populated, developing country like Pakistan, having insufficient numbers of trained psychotherapist, professional doctors, institutions or medicines to encounter with consequential effects of natural disaster, law & order situations and Terrorist Assaults. VRET system is supposed to be available and usable even with very simple and inexpensive VR-devices.

d) In addition, Proposed VRET system, besides health care, may also be extended to identical class of objectives/issues, such as simulate academic leaning, experiencing hazard environments, and drive into complex systems like, cell structure, DNA structure, Space and solar system etc.

2. RELATED WORK

Only in Pakistan, between 2003 to 2016, approximately 32971 insurgencies/Terrorist attack were reported (South Asia Terrorism Portal. 2016), which severally causes the huge loss of life and property, more than 60558 casualties, among them 21106 were civilians and 6481 were Security Force Personnel. Although such human death toll is irreparable however directly or indirectly psychologically victims of these incidents are uncountable and mostly unidentifiable, probably the multiple of given facts and figures. Besides it the natural disasters in last couple of decade affected millions of people mentally, physically and economically, due to increasing density in population every such incident brings more severe damages in all the means. The impacts are more deep over children and women, (Khan, *et al.*, 2012), showed in the study that females are more concerned about the threat of

terrorism and they think more about terrorism than men. The study conducted by (Ahmad, *et al.*, 2013), for the province Khyber Pakhtunkhwa reflects the results that out of 51.2% people affected, 23.6% people had Post Traumatic Stress Disorder and 6.9% were suffering from depression. 20.7% people were suffering from both Anxiety and Depression. 48.2% people were unaffected. A research study conducted in a University in Karachi (Ahmad, *et al.*, 2011), reflecting the students' perspective in a way that, A total of 65.8% of the students had mild stress levels, 91.5% of university students were exposed to terrorism through television, while only 26.5% students reported personal exposure to terrorism. 67.4% students were forbidden by their parents to go out ($p=0.002$). Most of those who had self-exposure to an attack were the ones whose parents forbade them from going out ($p=0.00$). Most commonly used coping strategy was increased faith in religion. Irritability was the most common stress symptom. Results of the research in two districts of province KPK (Ahmad, *et al.*, 2014) explored ($p<0.05$) that people who are the direct victim and those who are eyewitness of the traumatic event suffered from serious psychological problem i.e. depression. All these facts and figures reflect desperate need of shifting all focus to these victims to provide them mental relief in order to involve them into main stream. The promising results for reducing PTSD symptoms are highly expected from this multi-disciplinary project which has validated its correct direction by initial tests. To ensure the novelty of proposed therapy a statistical comparative study is plan to conduct between the virtual reality exposure treatment group and the traditional Clinician Administered PTSD. The VRET may provide numerous advantages ranging from cost effectiveness, controlled and semi supervised environments, autonomy on feedback, learning capability and ease of availability. In current global situation such projects are unavoidable need for the treatment of pathological grief and psychological wellbeing of common man.

3. PROBLEM DESCRIPTION

In last few decades, increasing terrorism has been considered the global threat and a very serious issue due to ease and availability of technology and mas-destructive weapons to extremist and terrorist groups. The destructive phenomenon is specifically become more intense in Pakistan after 9-11, causes huge loss in terms of properties and lives and left behind a lifelong physical and psychological impact over affected. Due to lack of resources and awareness such people are helpless to lead panic lives and unintentionally develop the several traumas in their personalities including Posttraumatic Stress Disorder (PTSD), Anxiety Disorder and Depression etc. Posttraumatic stress disorder

(PTSD) is an imaginatively frightening altered state of mind that may continuously and compulsively be triggered, which usually caused as being a part of any panic incident in past including (but not limited to) Terrorist attack, violent personal assault such as robbery or outrage, any type of child abuse, intense humiliation publically, natural disaster, fatal road accident and sudden death of a loved one. Such condition severely affects personal, interpersonal and professional activities of patient. In turn, their behavior can damage the basic personal and social endowments of self-esteem, will-power, confidence, motivation and problem solving. Other reactive behavior in response makes the trauma more survivors. So a sequence of reciprocal cause and effect pattern develops which may lead to worst consequences even to suicidal attempts.

Post-Traumatic Stress Disorder (PTSD) is observed a series of troublesome states of mind as outcome of unintended or natural painful incidents, including military invasion, personal violent assault, being victim of terroristic attacks etc. Virtual reality exposure therapy (VRET) is multidisciplinary, cutting edge technology, increasingly being used to treat a variety of psychological disorders including social anxiety (fear of public speaking), Acrophobia (fear of height), spider phobias and PTSD etc. A VRET system actually immerses an individual into a computer-generated virtual environment, either pitting on simply a head-mounted display (HMD) or more sophisticatedly equipped virtual room, where interactive images are reflected all around. This environment may be programmed to help the person directly confront the feared situations or locations that might not be safer to encounter in real situations.

4. **PROBLEM FORMULATION**

A series of deterministic environments/scenarios are initiated and planned to design, reflecting the local or urban street, dress code and communicating in local language. It may also include specifically, some regions with public places and residential areas, a roadway having traffic etc. The system features include the choice of moving objects such as mirroring technique, weather change, control over time-point, a variety of background natural sounds and virtual mentor. All the designed frames will be updated and improved with subject to professionals' and patients' feedback. The latest version of Unreal engine, Maya's integration with python language would provide a realistic graphic, art and animation which believably stimulate/immerse the user into content. Each session would be 20-30 minutes along with incremental degree of details and complexity level. The Head-mounted Display (HMD) is a main source of immersion. Sometimes wearing the HMD causes unease for the patient so the shorter

session in consort with break-state is supposed to be more productive. (Poeschl and Doering 2012) stated the limitations of their VR environment of audience for designed gloss phobia, "an undergraduate student audience at a university lecture session in Germany was observed. Results cannot be transferred to other audiences without caution".

As discussed, Post-traumatic stress disorder (PTSD) is a fearful mental situation, it afflicts a person when he or she is severely influenced by a frightening incident/accident, either experiencing it or witnessing it. The event might be a natural disaster such as earthquake, floods, lightning and thunderstorms, tsunamis or the event caused by humans interventions for instance wars, explosions, target killing, suicide attacks, automobile accident, being kidnapped etc. In both the cases indeed, such (Yeh, *et al.*, 2009) (Rizzo, *et al.*, 2009) incidents would be distressing to almost anyone and leaving behind the intensive feelings of fear, terror, and helplessness. The vital feature of PTSD is the development of characteristic symptoms that may include: intrusive thoughts, nightmares and flashbacks, avoidance of reminders of the traumatic event, emotional numbing, and hyper-alertness. Eventually, uncontrolled cue exposure may lead the person to react with a survival mentality and mode of response that could put the patient and others at considerable risk.

The primary beneficiary of this VRET system would be terrorist victim or common man, who has lack of awareness, inadequate financial resources and inaccessibility to professional practitioner. The system Virtual Reality Exposure Therapy (VRET) would provide alternative treatment of different types of phobias, anxieties, PTSD and other mental and stress disorders. The system largely can assist the professional for lessen their tedious efforts over patient for reducing one to one sessions.

Furthermore, the research direction would help the faculty and students to contribute in research and achieve milestone as their thesis and publications. Virtual Reality Simulation Based Learning and Training System may contribute a very important role in the field of education.

1. The entire system is focusing mainly over the economy/social sector, one of the performance measures is to determine the effectiveness of VRET is interaction and involvement of patient's contribution as individual, family and at work, for one had to struggle during PTSD state.
2. A rapid and cost-effective solution to cure identical social or psychological problems of big group of population, in order to pull them into main stream.

3. Small investment based VR simulation provides graphical interaction of very expensive environments (for example flight simulator for acrophobia) which are also iteratively usable.

In Pakistan, more than sixty thousands casualties are on account of Terrorism (aside from death toll caused by natural disaster and poor law & order situations) within a decade (South Asia Terrorism Portal. 2016), the range of affected mentally might be in multiple of death toll. So that, such issues must be handled on priority basis. Frequent terrorist assaults usually raise uncertainty and fear of insecurity to survival which somehow influence everyone to take psychological precautions in order to regulate their daily life routine. So we believe VRET system of such essential need of such situation which would be beneficial for economic and social perspective of country. With typical time of 20-30 minutes long session, over average five workstation, and under supervision of a pair of domain-engineer and knowledge-engineer, approximately 40-50 patients may be attended and went through by the system on daily basis.

5. CONCLUSION

Virtual Reality may be extended into a number of sub-domains which includes Learning Systems, Entertainment Industry, the Arts & Design and Medical, Life, and Mind Sciences. In some cases, the VR system may easily be extended to address identical issues of same class of the problems. Establishment of VRET system will certainly raise the possibilities for enhancing its benefits to identical issues such as in life sciences, to simulate DNA, RNA sequences/traits, and Nature-Inspired computational models and many of other engineering and business applications.

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