Viewpoint Paper

Virtual Reality Therapy in Clinical Psychology – a conceptual paper

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ABSTRACT

Virtual reality therapy came into existence in the mainstream of psychology in the last two decades. Virtual reality is a technology, a communication interface, and an artificial experience. VR has now emerged as the promising tool in many domains of clinical care and research as the capacity of this technology creates controllable, multisensory, interactive 3D stimulus offering clinical assessment, intervention and training. Virtual reality therapy is a medium of in-vivo exposure therapy that is unreal but relies on perceptual stimulation, visual cues, sounds, touch and smell to trigger emotions which is used for integrating and enhancing actual therapeutic approaches. The unique value of this technology has continued to grow and advanced the clinical areas that have long been mired in the methods of the past. The aim of the present study is to emphasize the potential offered by Virtual Reality (VR) in clinical psychology and its advances in therapeutic uses, in the treatment of numerous anxiety disorders, sexual dysfunctions and also for children with disabilities, also discussing the clinical rationale.

Keywords: Virtual reality therapy, clinical psychology, psychological disorders, interventions.

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INTRODUCTION

Clinical psychology is all about understanding and improving human functioning. As a clinical field, it focuses on improving individuals in distress, using the best available knowledge and techniques, while striving to increase the intellectual, emotional, biological, social and behavioural aspects of human functioning across lifespan in varying cultures and in all socio-economic levels, through research and sharpen the techniques needed for further interventions in the future [1]. Thus, the motto of clinical psychologist is to be a psychologist first and a clinician second.

Technology, being a far sighted tool, but a near sighted master is being widely used in today's clinical practice. According to Kemenoff, the primary use of computers in clinical practice appears to be for administrative and clerical purposes [2]. This is ever changing as with technological innovations. Psychological intervention via electronic media in clinical practice is becoming widespread. Computer-assisted intervention is designed to make psychological treatment more available to people in need of it and to outperform in in-vivo psychological treatment. Hence, the usage of computer-assisted therapy is expanding at a very rapid rate. There are two basic categories of cyber-therapy or computer-assisted therapy, namely tele-psychology and virtual reality therapy.

Tele-psychology provides psychological services using telecommunication technologies as the preparation, transmission, communication or related processing of information through electrical, electromagnetic, electromechanical, electro-optical, or electronic means [3]. The practice of telepsychology involves consideration of legal requirements, ethical standards, telecommunication technologies, intra- and

interagency policies, and other external constraints, as well as the demands of the particular professional context [4]. Whereas in virtual reality therapy, the individual is placed in a computer-designed artificial environment that is made to stimulate a real-life environment in which an individual is finds difficulty to function effectively. The applications of virtual reality are very rich and diverse. The use of virtual reality in psychotherapy is in the gradual exposure of children and adults with anxieties and phobias to the stimuli that evoke their fears and anxieties. [5].

Virtual Reality

Virtual Reality represents a core technology in the revolution of the information age. Virtual reality, a three-dimensional computer generated environment is explored and interacted with by a person and becomes part of that virtual world or is immersed within that environment and is able to manipulate objects or perform a series of actions. Virtual reality is a realistic and immersive simulation of a three-dimensional environment, created using interactive software and hardware and experienced or controlled by movement of the body" or as an "immersive, interactive experience generated by a computer [6].

Virtual reality, remote communication environments provides a virtual presence of users through telepresence and telexistence, using the standard input devices such as a keyboard and mouse, or through multimodal devices such as a wired glove or omni-directional treadmills. The immersive environment is similar to the real world in order to create a real life like experience. To enhance the strengths of an individual, virtual environments can be customized rather than allowing a disability to limit their interactive capabilities. Thus, VR is a technology which has a strong scope in Behaviour Therapy. Some of the advanced haptic systems include tactile information, it incorporate tactile sensors that measure forces exerted by the user on the interface. Some of the VR systems used in video games can transmit vibrations and other sensations to the user via the game controller.

Virtual reality came into existence in the 360-degree murals (or panoramic paintings) of 19th century. The View-Master stereoscope [7] the popular view master stereoscope was used for "virtual tourism". The design principles of the Stereoscope are used today for the popular Google Cardboard and VR head mounted displays for mobile phones- lenticular stereoscope [7] With the advent of electronics and computer technology, virtual reality has taken off in the 20th century,

A story by Stanley G. Weinbaum's story mentioned the idea of a pair of goggles that let the wearer experience a fictional world through holo-graphics, smell, taste and touch. The Sensorama an arcade-style theatre cabinet that would stimulate all the senses, including sight and sound, came into existence [7]. The Telesphere Mask (patented 1960) was the first type of a head-mounted display (HMD) invented by Morton Heilig, which provided wide vision stereoscopic 3D with stereo sound.

The Head-sight [8] had a built-in video screen specifically for each eye with magnetic motion tracking system that was linked to a camera that allowed military personnel for immersive remote viewing of dangerous situations. Head-sight was the first step in the development of the VR head mounted display. Ivan Sutherland described it as the "Ultimate Display" – a virtual world viewed through a HMD appeared realistic and one could not tell the difference from the actual reality.

The first VR head mounted display (Sword of Damocles) [9] was connected not to a camera but to a computer which was large and heavy for users to wear comfortably and also was attached from the ceiling. Kruegere (1969) through the project "glowflow", "metaplay", and "psychic space" developed "video place" technology enabling people to communicate with each other in a responsive computer generated environment despite being miles apart.

Lanier (1987) founded the visual programming lab (VPL) and coined the term "virtual reality". He developed a range of virtual reality gear including the Data glove (along with Zimmerman) and the Eye Phone head mounted display. Being the first company, sold Virtual Reality goggles (EyePhone 1 $9400; EyePhone HRX $49,000) and gloves ($9000). The Virtuality Group launched a varying arcade games and machines. Players wore a set of VR goggles while playing on gaming machines with real time immersive stereoscopic 3D visuals.

The Lawnmower Man movie was the one to introduce the concept of virtual reality to the public. Pierce Brosnan acted as Jaron, who uses virtual reality therapy on a mentally disabled patient.

Advent of computer technology saw major development in virtual reality technology in the first fifteen years of the 21st century. The smart phones and video game industry continues to develop and has become part of daily human computing tasks. In recent times Google have released its products - the Google Cardboard, a DIY headset connected to a smart phone. Samsung too have developed products such as the Galaxy Gear. Google (2007) introduced Street View- a service that shows panoramic views of an increasing number of worldwide positions such as roads, indoor buildings and rural areas and it also features a stereoscopic 3D mode. Luckey – founder of Oculus VR, designed the first prototype of the Oculus Rift [10]. Facebook purchased Oculus VR.

Thus, virtual reality has both entertainment and serious uses. It is the virtual environment that presents to our senses in a way that we experience it as if we were really there using a host of technologies. The technology now is becoming cheaper and widespread. It is expected to develop many more innovative uses for the technology in the future and perhaps a fundamental way in which we communicate and work.

Virtual reality therapy

Virtual reality therapy (VRT), also known as virtual reality immersion therapy (VRIT), simulation for therapy (SFT), virtual reality exposure therapy (VRET) and computerized CBT (CCBT), is a method of psychotherapy that uses virtual reality technology to treat patients with anxiety disorders [11] and phobias and has proven to be very effective therapy [11-12]. The ultimate goal of VR is the presentation of virtual objects to all of the human senses in a way identical to their natural counterpart. They use VR to provide a new human-computer interaction paradigm in which users are active participants within a computer-generated three-dimensional virtual world.

Virtual Reality Exposure Based Therapy (VR-EBT) is an alternative for people finding in vivo exposure therapy aversive. VR-EBT offers more confidential setting where the exposure task takes place within the discreet confines of the therapist's office. It is flexible enough to replicate different physical or situational environments to treat various mental disorders. A study found that 76% of patients reported being more willing to be involved in VR-EBT. Though the studies are less, Press et al (2015) found VR-EBT as a very promising, and patients reported high acceptability and satisfaction with the inclusion of VR in the treatment of PTSD [12].

An individual enters a Virtual Environment, wearing special gloves, earphones, and goggles, which send their responses (output) to the computer systems. He/she faces the three-dimensional life-sized images supported with audio devices and the perspective is modified in accordance with the user's need. VR can boost the effect of the VE on the user. In contrast to virtual reality, augmented reality enhances experiences by adding virtual components such as digital images, graphics, or sensations as a new layer of interaction with the real world [13].

An individual using virtual reality equipment is typically able to "look around" the artificial world as customized, move around in it and interact with features or items that are depicted on a screen or in goggles. Virtual environments artificially create sensory experiences, including sight, touch, hearing, and, less commonly smell. VR are usually displayed either on a computer monitor, a projector screen, or with a virtual reality headset that is the head mounted display (HMD), which is a head-mounted goggle with a screen in front of the eyes.

Virtual environment has been used in the general population for educational and job training purposes. VE are known for treating different phobias, PTSD [12], fear of flying [14] or public speaking, eating disorder. It has tremendous effectiveness in the treatment of addictions [15] and other conditions such as caused by lesions.

Virtual reality therapy uses experiential cognitive therapy (ECT) -an integrated approaches involving cognitive behaviour therapy to modify body image perceptions [16]. Diemer, Muhlberger, Pauli, and Zwanzger (2014) found VR exposure provokes psycho-physiological arousal which is considered as a prerequisite for effective exposure treatment [17]. De Carvalho, Freire, and Nardi (2010) found clinical experiences in virtual environments should be related to real experiences in a flexible context that combines relevant cultural, physical and cognitive aspects [18].

The main components of a virtual environment are:

1. The visual displays which submerge the user in the virtual world and block out contradictory sensory impressions from the real world.
2. The graphics rendering system generates the ever changing images at 20 to 30 frames per second.
3. A tracking system continuously measures the position and orientation of the user's movements.
4. The database construction and maintenance system builds and maintain detailed and realistic model of the virtual world.
5. A sound system produces high quality directional sounds and simulated sound fields.
6. Devices like tracked gloves with push-buttons enable users to specify their interactions with the virtual objects.

Virtual reality exposure therapy (VRET) findings suggest that in the case of both anxiety disorders and the post-treatment results show similar efficacy between the behavioural and the cognitive behavioural interventions incorporating a virtual reality exposure component and the classical evidence-based interventions, it has a powerful real-life impact [19]. VRET has a good stability of results over time, similar to that of the classical evidence-based treatments. Also found, there is no difference in the dropout rate between the virtual reality exposure and the in vivo exposure. Presently under investigation are agoraphobia, claustrophobia, panic disorder with agoraphobia, public speaking disorder.

Advancements in virtual reality technology have not only led to improved experiences for people who enjoy video games but also treatment of serious psychological and physical disabilities. For years, therapists are using exposure therapy where patients are exposed to real, or guided imagery in which the patient imagined his or her fear. In the early 1990s, a few psychologists began to imagine a middle ground using the newly available virtual reality technology to give patients an experience that is more realistic than imagery, and more convenient than in vivo exposure. A VE aims to "extract" the user from the "physical" world and "insert" him into a synthetic world; this is accomplished by exposing him to synthetic sensory information that emulates real life stimuli.

Albert "skip" Rizzo is known for researches on the design, development and evaluation of virtual reality systems, focusing on clinical assessment, treatment rehabilitation and resilience addressing the use of virtual reality applications to help treat post-traumatic stress disorder [12], help patients recover after a stroke, celebral Palsy [20] as well as help treat children with autism spectrum disorder.

Virtual environments advocate to help teach and prompt empathy among children with autism spectrum disorder [21]. Wuang and others demonstrated the successful use of Wii gaming technology to promote the visuo-spatial skills of children with Down syndrome. Other eminent workers such as Vasquez used virtual environments as a means to teach critical social skills to students with Autism spectrum disorder.

Studies have found that students with ASD prefer simulated environments over traditional role-playing models because of the predictable, structured nature of the setting. However, the benefits of VEs for students with ASD are increasingly noted with each subsequent study [19-20]. Cognitive therapy using virtual reality has proven to be highly efficient in the treatment of persecutory delusions [22] and even paranoia [22] resulting, after the virtual reality therapy session, over 50% of these patients no longer had severe paranoia or delusion at the end of the testing day.

Research studies found that perceptual cues, regardless of the type of specific phobia or social phobia, alone induces more self-reported fear than information alone. It is found that fear enhances perceptual, but not mental processing implying that there is a closer link between perceptual input and the experience of fear, than between fear and the mental processing of (conceptual) information [23]. Gorini, Griez, Petrova and Riva found higher the sense of presence, the stronger the level of anxiety [24].

Shiban and others and Peperkorn with his team revealed the sample of patients suffering from claustrophobia, the perceptual condition (seeing the inside of a virtual box with a closed door) activates stronger self-reported and physiological fear responses compared to the information condition where patients knew they sat in an actual, closed claustrophobic box (the fear-specific information), but saw an open door in the corresponding VR environment. Peperkom, Diemer, Alpers and Muhlberger found in case of spider phobia patient, when the fear was triggered by information about a real spider, the virtual

hand had no effect on fear throwing the light on the significance of different fear triggers (visual, conceptual) in interaction with body representations [23-24].

Recent researches into advancement in virtual reality therapy techniques have proved to be effective for physical and psychological disabled people [25]. Virtual scenarios are customized where patients suffering from motor disturbances like pareisis or apraxia performs motor task for diagnosis and rehabilitation purposes. Therapy of ataxia and strabismus also benefits from special VR facilities. Using VR data gloves people with speech disabilities can communicate through hand gestures which are translated into spoken words. Furthermore, VR technology is able to serve the physician as an advanced visualization and animation tool for the diagnosis of physical disabilities.

VR is helping people to face their fears and learn overcoming them. This technology helps in mentally transporting users to another time, another place, another state of mind, making it easier for patients suffering, to get the help provided by. He or she could experience the traumatic situation that triggers their unbearable anxiety, while guided by a professional to help the person get over that fear. In VR, he or she can prevent the occurrence of unpredictable events or repeat a specific exposure task as many times as necessary. In VR, the patient is intentionally confronted with the feared stimuli while allowing the anxiety to attenuate. Because avoiding a dreaded situation reinforces all phobias, each exposure to it actually lessens the anxiety through the processes of habituation and extinction.

VR makes it is possible to target patient's specific cognitive or emotional state without any significant change in the therapeutic approach. For instance, behavior therapists may use a VE for activating the fear structure in a phobic patient through confrontation with the feared stimuli; a cognitive therapist may use to assess situational memories or disrupt habitual patterns of selective attention; experiential therapists may use VR to isolate the patient from the external world and help him or her in practicing the right actions; psychodynamic therapists may use as a complex symbolic systems for evoking and releasing affect. Thus, it is a powerful therapeutic tool that helps people change their behaviors and protects them while the change occurs. It is helpful in modifying behaviors, thoughts, and emotions through virtual experiences designed in order to facilitate and enhance the process of change. However, the experience is convincing but is cartoon-like. But for most people with phobias it is real enough to elicit their fears.

A meta-analysis study supports that in vivo exposure therapy and VR-EBT is equally effective in treatment of anxiety disorder [26]. There is increase in use of VR as a research tool across many psychological domains such as psychotherapy, sports psychology, and social interaction. It can be administered in traditional therapeutic setting and in more controlled manner and is cost effective.

However, VR research studies now include varying levels and combinations of multimodal sensory input, allowing audio, haptic, olfactory, and motion to be experienced simultaneously to the graphically rendered environment or objects. For example, exposure therapy is a common method employed in the treatment of anxiety disorders which, in the case of PTSD, may be difficult to implement for logistical or safety reasons. To overcome these issues, multimodal VR has been employed to create a virtual replica of a warzone, complete with audio and haptic feedback, to treat PTSD in war veterans.

It has been suggested that VR environments help bridge the gap by allowing participants to respond in a manner that is more natural. Studies on altruism or prosocial behavior are often carried out using hypothetical scenarios and self-report. As participants attempted to navigate out of a virtual maze, under time pressure, virtual avatars approached the participant for help in a variety of situations. This enabled the experimenters to measure actual helping behaviors, as opposed to participants reporting what they would hypothetically do in such a situation.

The researchers argued that high-level behaviors are successfully examined using VR. VR environments have also been used recently to examine the avoidance behavior, a central component of fear that contributes to the maintenance of anxiety disorders. Glotzbach and others were able to directly examine avoidance behavior by conditioning participants to be afraid of particular virtual environments and recording the extent to which they avoided returning to those environments. VR has proved to be very useful in measuring responses in circumstances where it might be impractical or ethically questionable to do so in real life [27].

VR offers a blend of attractive attributes for the psychologists and rehabilitators. In VR, one has the ability to expose the patient to stimuli and places that would otherwise be difficult to access, for instance, a plane, or its usefulness in maximizing the benefits of in vivo exposure therapy. Being in VR participants some time complain of dizziness and nausea when in virtual reality.

Due to relative newness of virtual reality therapy, there may not be many clinicians who have experience with the technology thereby limiting the accessibility to systems based on VR-EBT and lack of training in the use of this technology. Thus it should be used by trained clinicians rather than as a mere attraction for patients. Another concern when applying VRET is the idea of overexposure that can take place in the name of science. It is possible for therapist to choose to take advantage of patients in order to gain more insight regarding the efficacy of the therapy. Also he may choose to over expose in order to determine exactly how many aversive stimuli an individual can withstand and still see progress. In addition, there is a need for more cross-cultural studies to facilitate the generalization of the VR-EBT effects, and studies with long-term follow-ups would help to assess the maintenance of the results.

The therapy does not work for everyone; it works better for some people than for others. Some studies have found that people who are more hypnotizable or more easily able to block out distraction and be absorbed in an activity like reading are also more likely to benefit from virtual reality exposure therapy. The scope of VR applications in medicine has widened including neuropsychological assessment and rehabilitation. Social stimulations, if, would permit the therapist to accompany the patient into current and past situations, interacting with simulated people significant in the patient's life to assist the patients in solving problems or mastering the skills but the technology necessary for such applications is still in its infancy.

Rationale

According to recent researches on the future of psychotherapy, the use of VR and computerized therapies are ranked respectively 3rd and 5th. Even though various therapists have been using VR in their clinical practice since the early 1990s, more work is still required. Thus, the goal of "Telemedicine and Portable Virtual Environment in Clinical Psychology"—VEPSY UPDATED is to exploit and understand this potential- where specific goal is the development of different PC-based virtual reality modules to be used in clinical assessment and treatment of social phobia, panic disorders, male sexual disorders, obesity, and eating disorders and many others.

VR is considered to be a special, sheltered setting which is an "empowering environment" that therapy provides for patients where they can explore and act without feeling threatened. There is also the possibility of carrying out exposure to bodily sensations (interoceptive) and situational exposure simultaneously. Virtual reality is finding its extensive acceptance in the medical community as researchers and clinicians are becoming more aware of its potential clinical benefits. Several pioneer research groups have already demonstrated improved clinical performance using V.R imaging, planning and control techniques. The data set is manipulated accordingly and the data-glove and data-suit use dramatic new methods to measure human motion dynamically in real time. The clothing is instrumented with sensors that track the full range of motion of specific activities of the person wearing the glove or suit. The very exciting aspect of VR technology is its inherent ability to enable individuals with physical disabilities to accomplish tasks otherwise denied by them.

Over the last few years, VR technology has been successfully applied to a number of behavioural treatments. Iamson [28] and Iamson & Meisner [29] have contributed in investigating the diagnostic and treatment possibilities in the area of anxiety, panic and phobia of heights. VR is used to modify body image perceptions. Other approaches require a strong involvement of the patient and many months of treatment unfortunately, even if it is effective in the long run. It allows users to create or import 3D objects, apply behavioural attributes to it such as weight and gravity, and can set up program to the objects to respond to the user via visual and/or audio events. In most of the circumstances, the clinical skills of the therapist are the key factors in the use of VR systems successfully.

But it is important to note that many of these electronically facilitated interventions are stills in their infancy. It has been found that clinicians support electronically delivered psychotherapies to a limited extent, recognizing their appeal to young people and the ease of their dissemination. The new technology

helps to engage some members of the population of ambivalent young people who need therapy by reducing the demands placed on them to present themselves at a given day and time in a clinic or therapist's office.

Virtual Reality makes going beyond reality possible. In therapy, one can witness the importance of certain situations considered extreme in order to overcome a problem. There are different thresholds of difficulty or threat; once a very high threshold is overcome, it is much easier to cope with the remaining once. Virtual worlds allow creating situations or elements so difficult or threatening that they would not be expected to happen in the real world. For instance, a person with phobia of spiders unexpectedly has to cope with thousands of spiders or spiders whose size increase so much that they turn into monsters.

VR is an important source of personal efficacy. According to Bandura [30], from all possible source of personal efficacy, performance achievement is useful. It allows the construction of virtual adventures in which the person experiences himself or herself as competent and efficacious. VR is flexible enough to permit the design of different scenarios in which the patient can develop efficacy expectations of the highest magnitude generalizations and strength. The goal is for the person to discover that the obstacles and feared situations can be overcome through confrontation and effort. Though, patients can control the context with the therapist as they wish and with no risk involved which is an important intermediate step between the therapist's office and the real world. The treatment can be custom made for each patient and each problem.

VR offers privacy and confidentiality. It provides platform for confronting many fears inside the consulting room. With the development of commercial VR, headsets will be widely available, which will open up access to these already-developed therapies for new patients all over. Rizzo states that "it doesn't mean that people should start thinking they can just treat themselves for any sort of psychiatric condition The VR headset might become a therapist's office that can transport you to a new setting, but it won't replace therapists themselves".

For the researcher, VR is compelling due to the limitless possibilities for the creation of stimuli and has led to spread of VR into domains such as clinical and developmental psychology, which one might not have initially anticipated. However, in addition to the many advantages associated with the use of VR, there remain some drawbacks and ongoing questions. The possibility of activating fear separately by perceptual cue or information in VR opens up new research opportunities to investigate pathological processes specific to each route.

Virtual reality in therapy now

Since 2016 is the year that headsets like the Oculus Rift and HTC Vive had gone on sale, thus, accessibility issue changed totally. Currently, VR is largely used for exposure therapy, gradually exposing people to the situation that triggers their anxiety or PTSD [31-32]. Thus, Virtual reality exposure therapy holds promise for treating PTSD [33]. Along with this, clinicians frequently use cognitive behavioural therapy to teach patients techniques for dealing with those situations.

Researchers are treating people with arachnophobia [34-36] by exposing them to virtual spiders and even more effectively, having them touch fake spiders during that process. Studies have shown that VR exposure therapy can help people with other conditions, as fear of flying, social anxiety. A review puts it as: "You know that the events you see, hear and feel are not real events in the physical meaning of the word, yet you find yourself thinking, feeling and behaving as if the place were real, and as if the events were happening. From a cognitive point of view, you know that there is nothing there, but, both consciously and unconsciously, you respond as if there is".

The areas where clinical VR has been usefully applied includes fear reduction in persons with simple phobias [37-38], treatment for PTSD [39-45], stress management in career patients, acute pain reduction during would care and physical therapy with burn patients and in other painful procedures [46-51], body images [52-54], disturbances in-patients with eating disorders [55-64] acrophobia [65-66], aerophobia [67-75], erectile dysfunction [76-77], navigation and spatial training in children and skills adults with motor impairments, functional skill training and motor rehabilitation with patients having central nervous

systems dysfunction [78] and for the assessment and rehabilitation of attention, memory, spatial skills and other cognitive functions in both clinical and unimpaired population [79]. Thus, VR scientists have constructed virtual airplanes, skyscrapers, spiders, battlefields, social settings, beaches, fantasy worlds and the mundane functional environments of schoolrooms, office, home, street and supermarket.

Emerging research and development is also producing artificial intelligent virtual human patients that are being used to train clinical skills to health professionals. VR offers the potential to create systematic human testing, training and treatment environments that allow for the precise control of complex, immersive, dynamic 3D stimulus presentations, within which sophisticated interaction, behavioral tracking and performance recording is possible. Findings suggest environment was effective and realistic at overcoming acrophobia [81] and even subject's comments that the VE seemed to evoke more fearful feelings than the real situation [82].

Studies shows that when the virtual environments used in treatment were exactly copied from the real environments used in the exposure in vivo program. VR exposure was found to be as effective as exposure in vivo on anxiety and avoidance as measured with the Acrophobia Questionnaire (AQ), the Attitude towards Heights Questionnaire (ATHQ) and the Behavioral Avoidance Test (BAT) with 33 samples of patients suffering acrophobia. It is seen that VR exposure can be effective with relatively cheap hardware and software available in the market [65]. It also suggests that merely receiving visual balance information contradictory to somato-sensory balance information is sufficient to induce anxiety, dizziness, and body sway in individuals with fear of heights [82].

Clinicians and researchers in the 21st century can now create and deliver compelling virtual worlds through HDM or stereo television. Now, the technology has caught up with the vision and such exponential advances are expected to continue to advance the science and practice in the discipline of clinical VR. In the case of VR exposure therapy, neither general presence nor immersion seem to be related to treatment outcome; rather, a certain degree of both appears a necessary requirement for VR exposure therapy, but increasing either does not per se enhance therapy effects [83].

Rizzo has worked with clinical VR since the mid-1990s and developed treatments for PTSD. He also developed VR therapies to teach people to use prosthetics and to recover physical capabilities after stroke or trauma, and is currently working on VR scenarios to help train people with autism spectrum disorder in vocational and social settings, among other things.

CONCLUSION

Virtual reality (VR) has been used for decades as a tool for therapists to administer virtual reality exposure therapy (VRET) in a safe and controlled manner. Due to cost, lack of standardization in VR devices and software; lack of flexibility and capabilities necessary to individualize environments for each patient, it has not been widely available, to date. There is also the lack of standardized protocols that can be shared by the community of researchers. There are the two clinical databases, only five published clinical protocols: for the treatment of eating disorders, fear of flying, fear of public speaking, and panic disorders. Significant efforts are still required to move VR into commercial success and therefore routine clinical use. With the advent of affordable mobile VR headsets, such as the Gear VR, there is a new opportunity to apply telemedicine to decentralize mental health treatment, reaching more patients and improving lives around the world. However, it is frustrating knowing that we currently possess the technology to make some really far out Virtual Reality applications but not seeing VR widely distributed. A key challenge today is the lack of clinical evidence and data to support if and how VR can be used to administer effective treatment both in the clinic (expanded use) and remotely. Companies are wishing to penetrate this market will need to conduct well-designed, randomized, controlled, properly powered clinical studies in order to change or influence treatment paradigms. There will undoubtedly be a flood of VR apps in the coming months and years attempting to solve these mental health issues.

For many disorders, there are highly effective treatments that do not require drugs. Some examples might include remote teletherapy by qualified practitioners who use VR as a supplementary tool, in-clinic VR therapy, virtual therapists created using artificial intelligence or patient-directed VR therapy in the absence of a professional therapist. It remains to be seen which options can deliver real, effective and sustaining

treatment to mental health patients across the world, or even people with no diagnosable disorder who want to reduce generalized stress and anxiety in their lives.

It is clear that building new and additional virtual environments is important so that therapists will continue to investigate applying these tools in their day-to-day clinical practice. In most of the circumstances, the clinical skills of the therapist remain the key factor in the successful use of VR systems. Here, VR can have a role both as supportive technique and for targeting a specific cognitive system without any significant change in the therapeutic approach. Finally, communication networks have the potential to transform virtual environments into shared worlds in which individuals, objects, and processes interact without regard to their location. In the future, such networks will probably merge VR and telemedicine applications, allowing us to use VR for such purposes as distance learning and e-therapy, active learning, encouraging the participant ensuring motivation.

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