Virtual Reality Therapy for Social Anxiety Disorder Treatment

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Virtual reality (VR) is a three-dimensional environment generated by the computer, in which subjects interact with the environment as if they were really inside it. The most used VR tools are the so-called HMD (head-mounted display) which make it possible to achieve what theorists define “direct mediated action”. The most common treatment for social anxiety disorder is represented by “in vivo exposure therapy” (iVET). Virtual reality therapies proved to be a valid alternative to the acquisition of social skills suitable for improving the symptoms of SAD. Although there has not been a significant difference between VRET and iVET, the low costs and flexibility of VRET open up new scenarios for achieving greater psychophysical well-being.

Keywords: virtual reality ; virtual reality exposure therapy ; social anxiety disorder ; social phobia ; VRET

1. Introduction

With the term Virtual Reality (VR) we refer to a three-dimensional environment generated by the computer, in which subjects interact with the environment as if they were really inside it [1]. Virtual reality represents a turning point in the human–computer relationship, as it is able to make the user experience the “sense of presence”, thus making the fundamental transition from the sensation of “perceiving information” to the sensation of “being in the place of information” [2].

There are several incremental levels of simulation provided by Virtual Reality. In particular, a distinction is made between: “Augmented Reality” (AR) when it is possible to superimpose computer-generated images on reality; “Non Immersive Virtual Reality” (Desktop VR) when, for example, we are faced with devices equipped with stereoscopic 3D such as modern televisions; “Immersive Virtual Reality” (IVR) when all the perceptual channels of the subject are isolated and “total” immersion is experienced.

In light of this, the IVR built and digitally manipulated represents the “best” level to carry out a direct mediated action. The subject thus becomes an active creator of his experience, thanks to an immersive technology that not only gives him the feeling of being physically present in the virtual world that surrounds him, but, above all, allows him to interact with it [3].

Today, the most used immersive virtual reality devices are represented by head-mounted displays, often accompanied by joysticks or Data Gloves—even if complete haptic suits are being developed, capable of further redefining the boundaries of “sense of presence”. The reason why we feel so present within the environment built by VR is because virtual reality employs simulation mechanisms very close to those used by our mind [4]. In essence, we can say that our mental system is itself a simulation system of reality. The confirmation of this is given by the innovative discovery of Giacomo Rizzolatti [5] and collaborators, who identified the existence of two groups of bimodal visuo-motor neurons, namely “canonical” neurons and “mirror” neurons that confirm the existence of a simulation system in our mind. In the clinical setting, VR systems have shown that they can represent a credible, realistic and effective perspective, as well as easily adaptable to different psychotherapeutic approaches [6].

The opportunities offered by VR systems to the field of experimental psychology are numerous: first of all, we can add to the X and Y coordinates, the Z coordinate, or the depth—this makes, together with the possibility of active interaction from the participant, the perception of virtual space similar to the perception of real space. Secondly, we can completely control the possible disturbance variables that intervene in a negative way during the treatment.

The goal is to use VR as a means for the clinician to build a tailor-made path for the participant in order to make him acquire “in virtual” those skills necessary for a good adaptation in the “real” world. In fact, by providing users with a highly

realistic, flexible, engaging, safe and controllable simulation, they are able to acquire the skill, confidence, mental and psychophysical preparation to face real-world activities [7].

The fields of psychological application in which this is possible are manifold, from phobic disorders and PTSD (Post Traumatic Stress Disorder) to autism, attention deficit hyperactivity disorder (ADHD), eating disorders (ADD), panic (DAP), schizophrenia, and neuropsychological rehabilitation.

The aim of our systematic review work is specifically to investigate the applications of virtual reality therapy for the treatment of social anxiety disorder, also known as social phobia. This disorder falls into the DSM-V category of “Anxiety Disorders” and is characterized by an “excessive and irrational fear of the social situations in which the individual is exposed”. Analyzing the literature, we found many systematic reviews that deal with anxiety disorders and phobias (Wechsler et al. [8]; Freitas et al. [9]; Kelson et al. [10]; Krzystanek et al. [11]). However, no one focuses exclusively or deeply enough on Social Anxiety Disorder per se.

Social phobia, in fact, is a rather widespread disorder among the world population—according to some studies, the percentage of people who suffer from it varies from 3% to 13%.

The most common treatment for social anxiety disorder is represented by “in vivo exposure therapy” (iVET). This method consists of exposing the participant, in a gradual and controlled way, to anxious stimuli, in order to change the participant’s response towards the object or situation that is causing the fear. However, the main flaw of “in vivo therapies” is represented by both the huge costs involved and the possible disturbance variables that can hinder the execution of the therapeutic treatment. Virtual reality exposure therapy could, therefore, if confirmed in its effectiveness, constitute a solution to eliminate these two defects demonstrated by “in vivo exposure therapy”.

In this regard, the cost sustainability for the VR intervention was analyzed by Robillard et al. [12], who validate the SWEAT questionnaire, which measures the costs and effort required to conduct exposure in vivo or in VR. In their research, after the evaluation of 265 exposure sessions (in vivo = 140; in virtuo = 125) it was shown that conducting VR exposure is less expensive and more easily adaptable to the needs of patients.

VR technology systems allow the infinite replicability of the anxious stimulus and the modularity of the difficulty levels of the interactions.

In fact, if in the classic “In vivo exposure therapy” for the treatment of SAD the presence and availability of a more or less varied clinical research team is necessary, in the “Virtual Reality Exposure Therapy”; instead, everything can be performed digitally and without particular time limits.

The cost of maintaining such a large team in in Vivo therapy, as well as the cost of time to perform the procedures, is consequently halved as the team itself can be reduced to a few doctors responsible for managing the therapy and technology, with return on the price to pay for the patient.

With this in mind, VRET (Virtual Reality Exposure Therapy) can be used as a support tool for psychotherapy to improve the quality of life of this population. There are many socio-cultural implications that an innovative therapy such as VRET, if confirmed in its effectiveness, can offer to those suffering from social anxiety disorder. We will, therefore, provide an updated review of VR therapeutic techniques and their effectiveness in clinical practice in order to reduce or defeat this disabling disorder, and finally we will try to understand if VRET produces better results than iVET.

2. Virtual Reality Therapy for Social Anxiety Disorder Treatment

VRET has proved to be a valid alternative to “In Vivo” therapies for the treatment of Social Anxiety Disorder and its various forms. From the various analyzed research, it emerges that this therapy produces significantly positive results in a range that goes from 6 to 14 sessions. The research analyzed is positively correlated with a better diagnosis of the main measure of SAD. Moreover, the studies that contemplate a follow-up show that the curve of improvement is maintained over time. By critically evaluating the research by Anderson et al. [13], PRCS and BAT measures show a significant effect of active therapies compared with the waiting list control group. There are no significant differences between EGT and VRET except for FNE-B, which only improves for EGT. In the research by Bouchard et al. [14], the results were found to be consistent with other research. At post-treatment, VR was more effective than traditional exposure on the primary outcome measure (LSAS-SR) and on one of the five secondary outcome measures (SPS), whereas it was slightly less effective on the FNE measure. The result on SWEAT also gives us empirical confirmation of our hypothesis that VRET would be a simpler and cheaper intervention than iVET at SAD, thereby allowing the possibility to offer more exposure

experiences. Bouchard et al. [14] highlighted the importance of the therapeutic alliance in predicting the outcome of SAD symptoms. In the study by Kampmann et al. [15], for example, where iVET was in some cases (FNE-B; EUROHIS-QOL) superior to VRET, the participant and the therapist were in two separate rooms during exposure to virtual reality. The absence of therapist support may have negatively impacted the therapeutic alliance, and thus may have reduced the effectiveness of VRET. Still in the research of Kampmann et al. [15], the regression analysis demonstrated the efficacy of VRET and IVET at post-treatment for LSAS-SR, BAT, PDBQ, DASS-21 measures. However, there are still many limitations: in the research of Kim et al. [16], although nearly all measures improved with VRET treatment (LSAS-SR; BAI; STAI; SPS; SIAS; PERS; ISS; FNE-B) the latter was unable to carry participants with SAD at the level of “healthy” participants. Another limitation of the studies is the frequent use of self-assessment measures which may not reflect the real levels reached. Most of the research (Anderson et al. [13]; Kampmann et al. [15]; Wallach et al. [17]) shows that the FNE-B measurement achieves positive results only through “In Vivo” therapy. This result can be interpreted in the perspective of a “realism” not yet achieved by available technologies, which does not allow participants to completely reduce their social anxiety. Much remains to be done to improve the technology behind VR exposure and thereby, the efficacy of VRET. However, by analyzing the research chronologically, in the various measures in common, we can still confirm a gradual improvement, in line with technological development, of the exposure in virtuo. The hope is, therefore, the achievement of an even more “mature” technology that can make a difference in the treatment of this debilitating disorder.

Put another way, the superiority of VRET over iVET should not be seen as much in the perspective of the reduction in symptoms, since they seem to be equally effective, but in the drastic reduction in the costs to carry out the therapy and in the flexibility that allows the clinician to control all the variables at stake. The low cost of VRET, in fact, may today represent the turning point for a broader access to psychological care to socioeconomic classes that are currently excluded.

In addition, Virtual Reality’s flexibility opens up new psychotherapist scenarios in which the risks that a “disturbance variable” could compromise the therapeutic work are eliminated. Worth nothing, the analyzed research was exclusively based on Cognitive Behavioral Therapy, thus it would be interesting to hypothesize the support of Virtual Reality with other psychotherapeutic approaches.

Virtual Reality is not free from limits, among which the main one is represented by so-called “cybersickness”. The hope in this regard is the development in the following years of hardware and software technologies that can reduce this feeling of nausea and allow for an even longer “exposures”. Of course, VR therapy is a tool that does not replace the founding elements of the therapeutic relationship: dialogue and listening between therapist and patient. Rather it has to be seen as an integrated approaches to the clinical practice in which the therapist keeps nurturing the human contact with the patient by creating a dialogue between classic psychotherapy and new technology. Of particular interest is exploring the therapeutic process insofar it is related to the outcome, and it is paramount to understanding mechanisms of change during therapy.

However, future research in this area should evaluate the effects of virtual reality exposure in an even longer term. It should also always include a measure of the “sense of presence” as this is what makes virtual reality a “transformative reality for the subject” [18]. In conclusion, standard data collection protocols should be improved in order to overcome self-assessment measures and generate more accurate measures.

In sum, virtual reality treatments seem to be an applicable option for decreasing the symptoms of SAD through the social skills learning. Somewhat surprisingly, as highlighted by our results, the efficacy of VRET is tantamount to iVET.

The future of Virtual Reality treatments is currently promising and will face new challenges in the coming years. There is a general need to understand how new technologies, given their transformative potential, can find a place within the therapeutic practice [19].

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