Virtual Reality as an Advanced Imaginal System: A New Experiential Approach for Counseling and Therapy

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ABSTRACT. Virtual reality (VR), an exciting new technology, can be used as an advanced imaginal system: an experience that is able to reduce the gap existing between imagination and reality. In that sense, VR can improve the efficacy of a psychotherapy by reducing the distinction between the computer's reality and the conventional reality. That experience can induce in the patient an awareness of being more skilled in the difficult operations of recovery of past experiences through the memory and in foreseeing of future experiences through the imagination. Starting from the existing research in this area, the authors discuss the possible use of virtual reality in counseling and therapy, its underlying possible advantages, and its existing constraints.

Key words: cognitive therapy, using virtual reality in therapy

VIRTUAL REALITY (VR) IS USUALLY DESCRIBED as an exciting new technology. Since 1986, when Jaron Lamier coined the term, VR has been usually described as a collection of technological devices: a computer capable of 3D real-time animation, a head-mounted display, and data gloves equipped with one or more position trackers (Durlach & Mavor, 1995). That vision is also well reflected in the growing research work concerned with virtual environments (VEs). Most research has focused more on the development of new rendering technologies than on the highly interactive and dynamic nature of a user-system interaction that VR supports.

The focus on technology, however, is somewhat disappointing (Riva, 1996b). As noted by Steuer (1992), that approach "fails to provide any insight into the processes or effects of using these systems, fails to provide a conceptual framework from which to make regulatory decisions and fails to provide an

aesthetic from which to create media products" (p. 73). VR constitutes a three-dimensional interface that puts the interacting subject in a condition of active exchange with a world re-created via the computer. The possibility of not limiting the paradigm of interaction in a unidirectional sense represents the strong point of the new technology: Man is not simply an external observer of pictures or one who passively experiences the reality created by the computer but may actively modify the three-dimensional world in which he is acting, in a condition of complete sensorial immersion (Riva, 1997; Vincelli & Molinari, 1998).

In this context, VR takes its place as an advanced imaginal system: an experience that is able to reduce the gap existing between imagination and reality (North, North, & Coble, 1997; Vincelli, 1999; Vincelli, Molinari, & Riva, 2001). From the birth of clinical psychology to the present day, the majority of psychotherapeutic techniques that have been developed and consolidated over time have been based on the analysis and modification of mental images. From the interpretation of dreams to the most up-to-date procedures of cognitive restructuring, the common goal has been to intervene on the internal representations of reality that prove to be nonfunctional with respect to the required adaptation to the environment.

The images of the mind constitute the result of the operation of psychological processes and describe to us three aspects of extreme importance for the assessment of, and intervention on, the individual—the representations of self, the representations of the world, and the representations of the future; these aspects are characteristic of every subject and, in certain cases, may be associated with precise psychopathological types. Therefore the assessment of possible dysfunctions and subsequent treatment cannot disregard the examination of processes of perception, thought, and attribution of meaning through the involvement of the verbalized images.

Within that process, VR can play an important role development because it can reduce the distinction between the computer's reality and conventional reality. We (Vincelli and Riva) determined that this situation changes the traditional relationship between client and therapist (Vincelli, Molinari, & Riva, 2001). The new configuration of this relationship is based on the awareness of being more skilled in the difficult operations of recovery of past experiences through memory and of foreseeing of future experiences through imagination. At the same time, the subject undergoing treatment perceives the advantage of being able to re-create and use a real experiential world within the walls of the clinical office of his own therapist (Castelnuovo, Gaggioli, & Riva, 2001; Vincelli, 1999).

We contend that VR can be a sheltered setting where patients can start to explore and act without feeling threatened. In that sense, the virtual experience is an empowering environment that therapy provides for patients. As noted by Botella and his team (Botella, Banos, Villa, Perpina, & Garcia-Palacios, 2000),

nothing patients fear can "really" happen to them in VR. With such assurance, they can freely explore, experiment, feel, live, and experience feelings or thoughts. VR thus becomes a useful intermediate step between the therapist and the real world. With VR, it is unnecessary to wait for situations to happen in the real world because any situation can be modeled in a virtual environment, thus greatly increasing self-training possibilities. In addition, VR allows the situation to be graded so that the patient can start at the easiest level and progress to the most difficult. Gradually, because of the knowledge and control afforded by interaction in the virtual world, the patient will be able to face the real world.

Starting from these premises, we outline in this article a theoretical framework for supporting the development and tuning of clinically oriented VR systems and note the advantages and existing constraints. We also note the leading researchers in this area and discuss their outcomes.

Virtual Reality in Clinical Psychology

According to Banos and colleagues (1999), VR can affect cognitive development because of "its capability of reducing the distinction between the computer's reality and the conventional reality." Moreover, "VR can be used for experiencing different identities and . . . even other forms of self, as well" (p. 289). As Vincelli (1999) noted, the experience can induce in the patient the awareness of being more skilled in the difficult operations of recovery of past experiences through memory and of foreseeing of future experiences, through imagination.

The diffusion of VR in clinical psychology is constantly increasing (Rizzo, Wiederhold, Rica, & Van Der Zaag, 1998). Hodges et al. (1995) used virtual environments to provide 10 college students with acrophobia with fear-producing experiences of heights in a safe situation. The researchers found significant differences on all measures between the students who completed the virtual reality treatment and those on the waiting list ($N = 7$).

Rothbaum and colleagues (Rothbaum, Hodges, Watson, Kessler, & Opdyke, 1996) verified the possibility of using a virtual reality airplane for exposure therapy in the treatment of fear of flying for a 42-year-old woman with a debilitating fear and avoidance of flying. The virtual reality exposure involved six sessions of graded exposure to flying in a virtual airplane. On a planned posttreatment flight, the woman completed the trip with anxiety measures indicating that she had had a comfortable flight.

North and his team (1997) also presented a case study of a 42-year-old man with a fear of flying who was recruited for virtual reality therapy. Using a helicopter simulation, the therapists exposed the patient to anxiety-producing stimuli in progressively challenging situations. The use of VE desensitization produced a significant reduction in anxiety symptoms and an increased ability for the patient to face phobic situations in the real world.

In a more recent controlled study, Rothbaum's team (Rothbaum, Hodges, Smith, Lee, & Price, 2000) compared the results from clients' exposure to VR therapy, standard therapy, and being part of a wait-listed control. Treatment consisted of eight sessions over 6 weeks, with four sessions of anxiety-management training followed by either exposure to a virtual airplane or exposure to an actual airplane at an airport. A posttreatment flight on a commercial airline measured the participants' willingness to fly and their anxiety during the flight immediately after treatment. The researchers found that the results from the VR treatment and the standard exposure therapy were equally superior to the results from the wait-listed control experience. The participants maintained the gains observed in treatment at a 6-month follow up.

North and colleagues (North, North, & Coble, 1996) also verified the possibility of using VEs in the treatment of agoraphobia. In a controlled study, the experimental group exposed to VR therapy reported significant improvement. The Botella group (1998) used a similar approach in the treatment of claustrophobia. The North team (North, North, & Coble, 1998) also used the technique in the treatment of public-speaking disorder. Expanding these approaches, Vincelli and colleagues (Vincelli, Choi, Molinari, Wiederhold, & Riva, 2000) outlined a multicomponent protocol using virtual technology for the treatment of panic disorder with agoraphobia. The Virtual Environments for Panic Disorder virtual reality system, which was developed for this therapy, includes a display system, motion input system, and four-zone virtual environment. The clinical protocol, outlined for seven sessions, proceeds from the assessment through the completion of graded exposure and booster sessions.

VR exposure is also used as an alternative to typical imaginal exposure treatment for Vietnam combat veterans with posttraumatic stress disorder (PTSD). Rothbaum and colleagues (1999) exposed a Vietnam combat veteran with PTSD to two virtual environments, a virtual Huey helicopter flying over a virtual Vietnam and a clearing surrounded by jungle. The patient experienced a 34% decrease on clinician-rated PTSD and a 45% decrease on self-rated PTSD and maintained the treatment gains at 6-month follow-up.

Riva and colleagues (Riva, Bacchetta, Baruffi, Rinaldi, & Molinari, 1998; Riva, Bacchetta, Cesa, Conti, & Molinari, 2001) are using experiential cognitive therapy (ECT), an integrated approach ranging from cognitive-behavioral therapy to virtual reality sessions in the treatment of eating disorders and obesity. The treatment lasts about 28 weeks, with 4-week inpatient/outpatient treatment and 24-week telemedicine (Internet-based) treatment. It is administered by therapists having a cognitive-behavioral orientation who work in conjunction with a psychiatrist on the management of the pharmacological component. In a case study, a 22-year-old female university student diagnosed with anorexia nervosa received ECT treatment (Riva, Bacchetta, Baruffi, Rinaldi, & Molinari, 1999). At the end of the inpatient treatment, the woman

had increased her body awareness, had reduced her level of body dissatisfaction, and presented a high degree of motivation to change.

Expanding those results, Riva and colleagues carried out two preliminary clinical trials on female patients: 25 patients suffering from binge-eating disorders were included in the first study and 18 obese patients in the second (Riva, Bacchetta, Baruffi, Cirillo, & Molinari, 2000; Riva, Baruffi, Rinaldi, et al., 2000). At the end of the inpatient treatments, the patients in both samples had modified their bodily awareness significantly. The modification was associated with a reduction in problematic eating and social behaviors.

Optale and his team (Optale et al., 1999; Optale et al., 1997) used virtual reality as a new means of treating male erectile disorders. The obtained results show that VR seems to hasten the healing process and reduce dropouts, suggesting that the method opens or consolidates new or rarely used brain pathways, facilitating the flow of new mnemonic associations that promote the satisfaction of natural drives.

In a recent case report, Hoffman and colleagues (Hoffman, Doctor, Patterson, Carrougher, & Furness, 2000) provided the first evidence that entering an immersive virtual environment can serve as a powerful adjunctive, nonpharmacologic analgesic: 2 patients received VR to distract them from high levels of pain during wound care. The preliminary results suggest that immersive VR merits more attention as a potentially viable form of treatment for acute pain. The results were confirmed in a second study (Hoffman, Patterson, & Cattougher, 2000) on 12 burn patients who performed motion exercises of their injured extremity under an occupational therapist's direction: All patients reported less pain when distracted with VR, and the magnitude of pain reduction by VR was statistically significant.

In general, with the use of VR software, it is possible to re-create with the subject undergoing treatment a hierarchy of situations corresponding to reality, which he or she may experience in an authentic way because of the involvement of all his or her sensorimotor channels (North et al., 1996; Riva, Wiederhold, & Molinari, 1998). The experience of virtual environments enables the interacting individual to immerse himself or herself in a dimension of real presence that can play an important role in therapy.

As Glantz (Glantz, Durlach, Barnett, & Aviles, 1997) noted,

> One reason it is so difficult to get people to update their assumptions is that change often requires a prior step—recognizing the distinction between an assumption and a perception. Until revealed to be fallacious, assumptions constitute the world; they seem like perceptions, and as long as they do, they are resistant to change. (p. 96)

Using the sense of presence, the therapist can actually demonstrate to the patient that what he or she perceives does not really exist. Once the patient has

understood that, the therapist and the patient can challenge individual maladaptive assumptions more easily.

Using the New Technology

Even if the number of reported applications is constantly increasing, understanding how to use immersive VR to support clinical practice presents a substantial challenge for the designers and users of this emerging technology. As Banos and colleagues (1999) noted, VR has two opposite faces. On one side, it can be used by clinicians as a "setting lab where to study anomalous behaviors, emotions and beliefs" (p. 284). On the other side, "VR can be also seen as a creator of psychopathology" (p. 288) for its potential for inducing reality judgment and identity problems. Moreover, it is well known that the tool can induce potent side effects, such as cybersickness, and aftereffects (Rizzi, Wiederhold, & Buckwalter, 1998), forcing the clinician to have a clear plan of approach to lessen the probability of inducing harmful consequences for the patients.

The opposite faces result from the peculiar characteristics of VR. The tool is not simply a particular collection of technological hardware but can be considered as a new medium, defined in terms of its effect on both basic and major psychological processes (Durlach & Mavor, 1995; Riva, 1999a, 1999b). According to Bricken (1990), the essence of VR is the inclusive relationship between the participant and the virtual environment, in which direct experience of the immersive environment constitutes communication. In that sense, VR can be considered as the leading edge of a general evolution of present communication interfaces such as television, computers, and telephones (Kay, 1984). The main characteristic of this evolution is the full immersion of the human sensorimotor channels into a vivid and global communication experience (Biocca & Delaney, 1995).

Following this approach, it is also possible to define VR in terms of human experience (Steuer, 1992): "a real or simulated environment in which a perceiver experiences telepresence," in which telepresence can be described as the "experience of presence in an environment by means of a communication medium" (pp. 78–80). Starting from those definitions, we outline a theoretical framework for supporting the development and tuning of clinical oriented VR systems.

Virtual Reality as Imaginal System

The Disappearance of Mediation

The possible use of a virtual environment as an advanced imaginal system is based on a key idea: the perceptual illusion of nonmediation. According to Lom-

bard and Ditton (1997), the term *perceptual* shows that the illusion "involves continuous (real time) responses of the human sensory, cognitive, and affective processing systems to objects and entities in a person's environment." Furthermore, a person experiences an *illusion of no mediation* when he or she "fails to perceive or acknowledge the existence of a medium in his/her communication environment and responds as he/she would if the medium were not there."

We concluded that a key issue for developing satisfying virtual environments for the clinical use is the disappearance of mediation, a level of experience in which the VR system and the external physical environment disappear from the user's phenomenal awareness. When that happens, the difference between "in imagination" and "in vivo" treatments also disappears.

How can therapists obtain that result? In most of the work in this area, VR designers try to achieve the disappearance of mediation by providing to the user a more realistic experience, such as adding physical qualities to virtual objects. For instance, Hoffman and colleagues (Hoffman, Hollander, Schroeder, Rousseau, & Furness III, 1998) published an article in *Virtual Reality* about the results of two experiments in which they tried to verify whether adding olfactory cues and tactile feedback to a virtual environment improved its sense of presence.

Is this focus on the physical characteristics of a VE necessary? As suggested in another article (Sastry & Boyd, 1998), more than the richness of available images, the sensation of presence depends on the level of interaction/interactivity that actors have in both the real and simulated environments. According to Sastry and Boyd, a VE, particularly when it is used for real world applications, is effective when "the user is able to navigate, select, pick, move, and manipulate an object much more naturally" (p. 235). In that sense, the emphasis shifts from the quality of image to the freedom of movement, from the graphic perfection of the system to the actions of actors in the environment.

> Experience of space will depend more on the mode of locomotion than on the visual and acoustic images. The reality of a surface will be in its implications for action (e.g., does it impede locomotion) rather than in its appearance (e.g., does it look like a wall). In this approach, the reality of experience is defined relative to functionality, rather than to appearances. (Flach & Holden, 1998, p. 93)

Creating a Relationship

It is well known that a core feature of any form of psychological therapy is the relationship between client and therapist. However, understanding how to use VR to support that relationship presents a substantial challenge for the designers and users of clinically oriented VEs. The challenge is even more demanding when we consider the design of multiuser VEs.

Because VEs are designed to serve a purpose, that design must expicitly consider the intended users' tasks and goals (Rodden, Mariani, & Clair, 1992).

Moreover, during the VR experience, the knowledge relevant to the goal should be distributed, and actions should be coordinated. In particular, to support collaborative activities, VEs should provide task-appropriate information representation and communication tools that are embedded in the environment in which activities happen (Churchill & Snowden, 1998).

The possibility of negotiation, both of actions and of their meaning, has a key role in providing a satisfactory sense of presence. This is even truer for clinically oriented VEs for which empathy and communication are the key features. However, individuals vary tremendously in their negotiation strategies as well as in their task accomplishment process (Churchill & Snowden, 1998). The difficulty of managing negotiation has the following two consequences for the design of clinical oriented VEs:

1. The only way to understand negotiation is by analyzing the participants involved in the environment in which they operate. This means that the social context in which the VR experience occurs plays a crucial role.
2. New processes and activities will develop during interactions that can challenge and change the initial relationship between subject and context. Clinically oriented VEs have to be flexible enough to handle these changes without imposing constraints to the interaction (Riva, 1999a, pp. 95-96).

Churchill and Snowdon (1998, pp. 5–7) recently identified a series of key issues that a VE developer has to face for supporting the negotiation process:

The transition between shared and individual activities: Actors should know what is currently being done and what has been done in the context of the task goals.

Flexible and multiple viewpoints and representations: Tasks often need use of multiple representations each tailored to a different point of view and different subtasks.

A shared context: The shared context is composed of symbolic references, which allow actors to orient and coordinate themselves. It includes the shared knowledge of each other's current and past activities, shared artifacts, and shared environment.

Awareness of others: This awareness includes both knowledge of shared tasks related activities and the sense of co-presence.

Support of communication activities: Negotiation through face-to-face talks is important for collaboration. In fact, conversation analysis studies of negotiation at work have detailed how subtle verbal and nonverbal contribute to such negotiation.

Accomplishing this is more difficult in VR than in other computer-based activities. As noted by Oravec (1996), VR forces individuals "to deal with such issues of image manipulation and distortion on an immediate and per-

sonal basis, as participants immersed in fast-moving interaction" (p. 51). That adds layers of complexity to an already overwhelming set of social constructs.

To overcome that problem, VR designers usually use some tricks. For instance, more of the effort of the design of multiuser VR is focused toward developing tools for the creation of faces. That choice reflects the considerable societal attention on the face as a medium for expression and information display. Facial expressions exceed verbal reports to enhance context comprehension. Generally, the development of multiuser VR systems calls for conceptual mechanisms with which groups can be constructed and vehicles through which groups can express themselves (Oravec, 1996).

Many developers of multiuser VR systems are aware of that and are conscious of the need to "create community" in the context of their efforts (Oravec, 1996). Even if many traditional means for creating community are not available, great effort is given to the creation of virtual town squares or meeting rooms. According to Coate (1992), the work of maintaining virtual communities is similar to the work of an innkeeper who must facilitate interaction and keep order among the patrons. If multiuser VR has to serve as community for its users, it has to embody or replace with adequate substitutes some functions of community life that parallel those commonly provided by "traditional" communities. This is even truer for the development of clinically oriented multiuser VR systems, in which the sense of community could be an important boost of therapy.

Conclusions

The great potential offered by VR derives primarily from the central role that imagination and memory occupy in psychotherapy. Those two elements, which are fundamental in the life of every one of us, present absolute and relative limits to the individual potential. By using VR as an advanced imaginal system—an experience that can reduce the gap existing between imagination and reality, one can transcend those limits. In that sense, VR can improve the efficacy of a psychological therapy because of its capability of reducing the distinction between the computer's reality and conventional reality. The experience can induce in the patient the awareness of being more skilled in the difficult operations of recovery of past experiences through memory and of foreseeing of future experiences through the imagination.

Although there is much potential for the use of immersive virtual reality environments in clinical psychology, some problems have limited its application. Some users have experienced side effects during and after exposure to virtual reality environments (Lackner, 1992), reporting symptoms similar to those experienced by users during and after exposures to simulators with wide field-of-view displays (Kennedy, Hettinger, Harm, Orfy, & Dunlap, 1996). Such side effects, collectively referred to as "simulator sickness" (Kennedy &

Stanney, 1996), are characterized by three classes of symptoms: ocular problems, such as eyestrain, blurred vision, and fatigue; disorientation and balance disturbances; and nausea. Exposure duration of less than 10 min to immersive virtual reality environments has been shown to result in significant incidences of nausea, disorientation, and ocular problems (Regan & Ramsey, 1996).

With the improvements in the VR hardware, however, the latest VR experiences are characterized by the lack of side effects and simulation sickness. Those data are confirmed in all the studies presented published after 1998 (Griffin, 1990).

We can identify two core characteristics of VR-based imaginal experience: the perceptual illusion of nonmediation and the possibility of building and sharing a common ground. The first characteristic of a satisfying virtual environment is the disappearance of mediation, a level of experience in which both the VR system and the physical environment disappear from the user's phenomenal awareness. When that happens, the user is not simply an external observer of pictures or one who passively experiences the reality created by the computer but may actively change the three-dimensional world in which he or she is acting, in a condition of complete sensorial immersion. In that way, the subject undergoing treatment perceives the advantage of being able to re-create and use a real experiential world within the walls of the clinical office of his or her own therapist.

The second characteristic is the possibility of building and sharing a common ground through the interaction process. Through interaction, individuals share empathy and, in multiuser VR, form groups that share interests. Therefore, information exchange becomes the carrier for expressing self-concept and eliciting emotional support.

Experiencing presence in a clinical VE such as a shared virtual clinic requires more than reproduction of the physical features of external reality; it requires the creation and sharing of the cultural web that makes meaningful—and therefore visible—both people and objects populating the environment.

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