

# Virtual Reality Therapy

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## GLOSSARY

**virtual reality** A technology that enables users to enter computer-generated worlds and interface with them through sight, sound, and touch.

Virtual reality therapy (VRT) is a new modality of therapy that enables clients to confront what troubles them and deal with irrational behavior using virtual reality technology. VRT is changing deeply held concepts about how human beings can overcome psychological disorders.

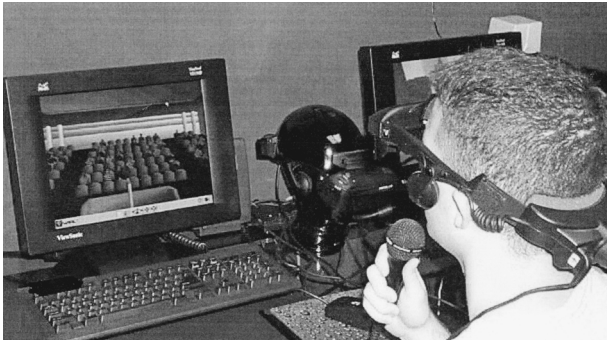
## I. DESCRIPTION OF VIRTUAL REALITY THERAPY

VRT brings clients face-to-face with their deepest fears in a nonthreatening environment. That is the key. Entering a computer-generated world, clients know the situation is harmless, yet the re-creation of fearful scenes is lifelike, enabling them to deal with their fears

in a realistic setting, confronting them through sight, sound, and touch.

VRT is similar to behavior therapy in its focus on exposing clients to fear-provoking stimuli. It differs from traditional behavior therapy modalities in that VRT computer graphics and various display and input technologies create real-life situations in the laboratory. These produce a sense of presence, so that the client feels immersed in the frightening scene. VRT can overcome some of the difficulties inherent in traditional treatment of psychological disorders. In traditional therapy, the therapist often has to imagine what is going on in the mind of the client. In VRT, the therapist can see how a phobic client reacts to fearful situations and is able to provide on-the-spot guidance. VRT generates stimuli of much greater magnitude than standard *in vivo* techniques can produce. It offers the added advantage of greater variety, efficiency, and economy in creating situations that might be either difficult or impossible with traditional techniques.

The centerpiece of VRT technology is a stereoscopic head-mounted video display with a head-tracking unit, along with a device that produces auditory and tactile stimuli (Figure 1). The effect can be startling, especially when the client is exposed to lifelike situations that have always produced fear. A set of VRT scenes is created before the therapy sessions begin. In the first laboratory session, which lasts approximately 20 minutes, the VRT client gets familiar with the virtual reality equipment. During this session, the client is asked to eliminate any virtual reality scenes that do not necessarily cause



**FIGURE 1** A typical virtual reality system with head-mounted display and head-tracking unit for use in VRT treatment.

anxiety. The client is asked to rank the remaining scenes from least to the most threatening. For the next eight weekly sessions, which last 15 to 20 minutes each, VRT is conducted in a standard format, tailored to individual needs.

The VRT session begins with the least fearful scene. Discomfort is measured every few minutes with the Subjective Units of Disturbance (SUD) scale. Clients rate their discomfort on a scale of 0 to 10. They progress systematically through each level of discomfort, and then are exposed to the next most threatening scene. Clients control their progress through the hierarchy of scenes. However, if the SUD score is 2 or less, the therapist may urge them to move up to the next level or next scene. Each new weekly session begins where the previous session ended. In addition to client-controlled subjective measurements, such as SUD, objective measurements of discomfort are also used. For instance, a heart-monitoring device, such as EEG/EMG, can be employed to monitor physical reactions.

## II. THEORETICAL BASE OF VIRTUAL REALITY THERAPY

The principal aim of VRT is to help reduce or eliminate anxiety and fear. Phobias are nearly always linked to people's reactions to specific situations. VRT focuses on re-creating those situations in a controlled environment. When people encounter these disturbing situations under nonthreatening conditions they find ways to deal with them. In VRT, they learn new responses to old disturbing situations, thus gaining more control over psychological disturbances and their symptoms.

## III. EMPIRICAL STUDIES

In testing military navigation software in a virtual reality setting in 1992, Dr. Max North and Dr. Sarah North discovered that it made some of the participants very fearful. They concluded that this technology could not only trigger phobias but could be used to combat these and other psychological disorders. Since then, they have successfully conducted numerous studies of VRT applied to specific phobias, such as fear of flying, heights, being inside a dark barn, crossing a river in an enclosed bridge, and being in the presence of various animals. Fear of public speaking; obsessive-compulsive behavior, and other psychological disorders were also found to be responsive to VRT treatment. These research activities have established a paradigm that is increasingly attracting scientists from the computer science, psychology, and medical fields.

As clients looking into the VRT head-mounted video display turn their heads, the scene changes appropriately. Visual, auditory, and tactile stimuli create a virtual world, with which the client can enter and interact. This controlled environment allows the client to reexperience events that have caused any psychological imbalance, and, most significantly, it takes place in the presence of the therapist. VRT, like current imaginal and *in vivo* modalities, generates stimuli that are unusually effective in therapy. Moreover, virtual reality generated stimuli are of greater magnitude than standard traditional techniques. VRT allows successful treatment of disorders that have often been difficult or impossible to treat with traditional techniques. A classic example is treatment of the fear of flying phobia. A virtual scene makes clients feel they are actually flying over cities. As VRT treatment progresses, these clients gradually become desensitized.

A substantial number of research activities have confirmed the success of VRT in treating psychological disorders. Table I shows a sampling of these innovative applications.

Mental and physical health risks associated with VRT can be greatly minimized by taking precautionary measures, as pointed out by Stanney in 1995. Clients at risk for psychological harm are primarily those who suffer from panic attacks, those with serious medical problems such as heart disease or epilepsy, and those who are (or have recently been) taking drugs with major physiological or psychological effects. A professional screening process will help identify these risks. Questions regarding physical and mental disabilities must be a standard part of the admissions process, and persons with these

**TABLE 1**  
**A Brief Report of Prior VRT Applications**

<i>Disorder to combat</i>	<i>Experiment conducted</i>	<i>Researchers</i>
Fear of flying	Several case studies involving fear of flying were successfully conducted. After clients were exposed to virtual aerial views, they were given real world tests. A virtual helicopter and virtual commercial airplanes were used to fly the clients over realistic terrain. Afterwards, when clients flew long distances in real airplanes, they reported significant reduction in anxiety levels.	North et al., 1994 North et al., 1995 North et al., 1996 North et al., 1997a Hodges et al., 1996 Wiederhold et al., 1998
Fear of heights	Virtual scenes that were created for two major controlled studies and several case studies included balconies of various heights, an elevator, a canyon, bridges, and a series of balloons. The result: Clients comfortably accomplished real-life situations involving heights.	Rothbaum et al., 1995 North et al., 1996
Agoraphobia (fear of being in certain places or situations)	A major controlled study centered on helping clients who suffer from being in places from which escape might have been either embarrassing to them or impossible. Several virtual scenes were created for this study. The scenes included a dark barn, a cat in the dark barn, a covered bridge over a river, empty room, and a few more related virtual scenes based on the request of the clients. In general, a subjective measurement showed that a majority of the clients' subjective measurements indicated their anxiety level was reduced and they became more comfortable in comparable real-life situations.	North et al., 1995, 1996
Autism	The challenge here was to create scenes of altered reality, of the kind clients were experiencing. Traditional treatments had often been ineffective for these clients. The virtual scenes closely tracked the distortion of environment that clients had personally perceived. This enabled them to gain new insight and to better understand the real situation.	Strickland, 1996
Body experience (eating disorders)	In this study, clients were exposed to a virtual environment that let them experience a modified body image. A partial reduction in negative feelings of body dissatisfaction was reported.	Riva, 1997a, 1997b
Fear of public speaking	Several case studies were conducted using a virtual auditorium with no audience initially. As treatment progressed, more audience and varieties of sound effects were introduced. Clients' symptoms reduced significantly, and they gained greater confidence in real-world speaking experiences after the therapy.	North et al., 1997b
Fear of closed spaces (claustrophobia)	Clients in several case studies were confronted with closed spaces in a virtual house. The spaces could be resized to suit the clients' progress, allowing them to gradually cope with their fear of closed spaces and significantly reduce their anxiety level.	Botella et al., 1998 Booth et al., 1992
Fear of driving	Volunteers tested the effectiveness of virtual reality technology in automobile driving situations. They were exposed to scenes that ordinary drivers might find themselves in, such as a series of stops, turns, heavy traffic, nearby buildings, and various hazards. Phobic participants significantly and consistently reported more anxiety than the nonphobic clients.	Schare et al., 1999
Posttraumatic stress disorder	In a case study, a Vietnam veteran was immersed in virtual jungle scenes, encountering thick foliage and armed combat, including machine guns and other weapons. The client reported significant decrease in symptoms as treatment progressed.	Hodges et al., 1999

(continues)

TABLE 1  
(Continued)

Disorder to combat	Experiment conducted	Researchers
Obsessive-compulsive disorder	Another case study involved a young client who had trouble remembering to take supplies she needed for school each day. She was encouraged to prepare a virtual schoolbag with all the articles she would need on a particular day. After treatment she reported more confidence in remembering what to take to school each day.	North et al., 2000
Attention deficit disorder	A virtual classroom scene was created to help a client stay focused on studying. She was exposed to an increasing number of classroom distractions, as well as activities that could be seen outside the window. VRT was shown to be more effective than previous traditional treatments had been.	Rizzo, 2000

characteristics must be excluded from VRT experiences. Additionally, some otherwise healthy people experience symptoms ranging from headaches to epileptic seizures when exposed to certain visual stimuli. Clients must be closely observed by therapists at all times. Both the client and the therapist must agree beforehand to terminate quickly the virtual reality session if there is any evidence of significant physical or psychological distress. As a routine precaution, the therapist should ask clients to sit in a chair rather than stand during the VRT procedure. It is also recommended that the therapist use a modified head-mounted display so clients can partially see their physical body, choose the head-mounted display with a narrower field of view, and, most important, keep the sessions brief (between 15 and 20 minutes). This configuration reduces the degree of immersion while increasing the physical and psychological safety of the clients. There is a need for more research in this area. In the meantime, it is strongly recommended that researchers take appropriate steps to minimize client risks.

Therapists must keep in mind that symptoms of anxiety while under VRT are distinctly different from simulation sickness. Anxiety symptoms evoked under VRT are the same as real world experiences, including shortness of breath, heart palpitations (irregular or rapid heartbeat), trembling or shaking, choking, numbness, sweating, dizziness or loss of balance, feeling of detachment, being out of touch with self, hot flashes or chills, loss of control, abdominal distress, and nausea.

### See Also the Following Articles

Cinema and Psychotherapy ■ Emotive Imagery ■ Online or E-Therapy ■ Post-Traumatic Stress Disorder

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