BRIGHTER BRAINS

Your IQ is higher than your parents’—which is higher than your grandparents’. Here’s why.

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J
onah is inching upward in the glass-walled exterior elevator of a 70-story skyscraper. For each story he ascends, he rates his fear on a 100-point scale. At the top, he peers out over a microcosm of office towers, streets and gas stations—that are not really there. While donning a headset that produces three-dimensional images, Jonah is receiving an experimental therapy for a debilitating fear of heights.

The goal of the treatment is habituation, a form of learning in which a response to a stimulus diminishes with repeated exposure. Traditionally this exposure is done in real-world settings—in an actual skyscraper, on an airplane (for fear of flying) or with a spider (for spider phobia). But in a new twist, clinicians are increasingly replacing reality with 3-D computer simulations.

Simulated experiences require no actual travel or complicated arrangements. They also are less likely to trigger so much fear that the patient backs out of the treatment. And although subjects can hit the panic button and stop their fantasy trip in the elevator, this rarely happens. “Amazingly, not a single patient has ever hit that button,” claims psychiatrist Marcus F. Kuntze, now at the Cura Bern clinic in Switzerland, who tested the program on Jonah (not his real name).

Such virtual-reality (VR) technologies can also help combat anorexia, post-traumatic stress disorder and pain, among other psychological ailments. Moreover, studies of virtual therapies are accumulating apace. In August, references to “virtual reality” appeared in 1,923 papers in the clinical database PubMed, an increase of more than 80 percent from December 2002.

Other computer-based technologies, from electronic games to cell phone text messaging, are also gaining guarded acceptance in clinical circles [see “The Promise of E-Therapy,” by Beryl Lief; Benderly; Scientific American Mind, December 2005]. Recent applications of such technologies include therapy for obsessive-compulsive disorder and outpatient treatment of bulimia. The American Psychological Association (APA) estimates that some 2 percent of U.S. therapists are using virtual real-
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In Europe, pioneers of a venture called VEPSY Updated are developing digital media for psychotherapy tailored to disorders as diverse as social phobia, male sexual dysfunction and obesity.

“Virtual realities are beginning to play an important role in clinical psychology,” says psychologist Giuseppe Riva of the Catholic University of the Sacred Heart in Milan. Although controversy still surrounds the efficacy of such treatments, some researchers now predict that media-based methods will ultimately supplant many more established psychotherapy techniques.

Facing Fear
Decades ago psychotherapy was mostly talk. Relaxing in an armchair, a therapist would listen to the proverbial couch-bound patient free-associate in hopes of revealing the roots of the patient’s disorder. The process was open-ended and could stretch on for years.

Today, however, many clinical psychologists have scrapped such Freudian psychoanalysis for a more finite and pragmatic technique known as cognitive-behavior therapy (CBT). In CBT, counselors teach patients how to detect and combat distorted negative thought patterns (the cognitive part) and to use behavior-modification techniques to help them get on with their lives.

The new computer-based technologies are designed to work with CBT; most of them facilitate the therapy’s behavior component. In addition to reducing the demand on a therapist’s time and the cost and inconvenience of exposure therapy, the technology adds an element of control: a therapist can adjust the elevator’s speed, the aerial view of the ground and the amount of time the elevator lingers on the top floor based on a patient’s fear ratings. Such tuning can help ensure that a patient gets enough exposure for habituation to occur but does not get so scared that he or she panics.

In various studies, virtual-reality therapy has proved as effective as real-world, or in vitro, exposure therapy for some phobias. In Kuntze’s experiments, for example, some patients’ fear ratings dropped from 80 or 90 (out of 100) in the first minutes of exposure to below 30 after several hours, a sign that the fear had been overcome.

And last year psychologist Barbara O. Rothbaum of the Emory University School of Medicine and her colleagues reported successfully using the technique to treat the fear of flying. After four trips in either a virtual airplane or an actual airplane, 76 percent of 50 patients with this phobia were willing to go on a post-treatment flight, compared with just 20 percent of 25 people in the study’s control group. Both real-world and virtual therapies were also equally effective in reducing patients’ anxiety during a flight. What is more, the VR treatment had a lasting impact: more than 70 percent of the patients from both treatment groups reported flying in airplanes a year later.

Spider phobia has also succumbed to virtual-exposure therapy. In a VR program called SpiderWorld developed by psychologist Hunter G.
Hoffman of the University of Washington and his colleagues, patients confront virtual spiders that descend on webs from a kitchen ceiling to the floor and crawl out of cupboards. One patient treated with SpiderWorld had been so afraid of the eight-legged critters that she had regularly fumigated her car with pesticides and sealed her clean laundry in plastic bags. At first, she hesitated to approach the virtual spiders, too. Gradually, though, she moved closer to them and eventually picked them up with her cyberhand. Her fear of real spiders also eased. The program has helped another 20 similarly haunted patients.

In the same vein, VR may ease the symptoms of post-traumatic stress disorder (PTSD), in which patients experience serious psychological disturbances as a result of traumatic experiences, such as war. In this case, VR enables participants to relive the situation that triggered their PTSD so that they can access emotion-laden memories they have been avoiding—the recall serves to desensitize them to these memories.

In a 2001 pilot study, Rothbaum’s team showed 10 Vietnam veterans with PTSD a computer-rendered Hue helicopter soaring over a clearing encircled by a jungle in a simulated Vietnam environment. Eight to 16 sessions with the VR program improved the patients’ symptoms by 15 to 67 percent. In a later study, published in 2006, Hoffman and his colleagues treated male disaster workers traumatized by the World Trade Center attacks of September 11 by exposing them to realistic renditions of planes flying over virtual twin towers, pictorial explosions with sound effects and animated humans leaping to their death from the buildings. After 14 weekly sessions, the VR therapy basically eliminated PTSD symptoms in five of the eight patients treated, compared with none of the patients on a waiting list for treatment.

U.S. Navy scientists are applying the technology to the Iraq War. They have built a virtual mini Fallujah with a base compound, marketplace, village, hospital and eight battle spaces and are now testing this fantasy battlefield on five Iraq War veterans who are suffering from PTSD.

Escaping Pain

In contrast to phobias, for which the cure comes from confronting the fear, virtual-reality therapy for pain works by distracting patients from what ails them. A few years ago Hoffman sat burn victims in front of a computer and surrounded them with a frigid virtual landscape called SnowWorld. While their painful wounds were being debrided, the patients made their way through an icy canyon with a chilly river and waterfall, tossing snowballs at virtual robots and snowmen loitering along their route.

The winter trip dulled the patients’ pain by providing an escape. “Virtual reality redirects people’s attention away from the wound and to an artificial world,” Hoffman says. He and his colleagues have also had similar success with other VR programs, such as SpiderWorld, in burn patients and in patients experiencing pain from other sources.

In a follow-up study, Hoffman, along with University of Washington radiologist Todd L. Richards and their colleagues, monitored the ef-
Virtual reality can help anorexics and the overweight form more accurate mental images of their bodies.

In one small study, Reichbaum and her colleagues showed that virtual-reality entertainment reduced pain and anxiety in young cancer patients during an invasive procedure—as assessed by nurses' reports and the children's decreased pulse rates—compared with either no diversion or a diversion that did not involve VR.

**Digital Feedback**

In some VR programs, a patient's profile can be incorporated into a simulated scene, a technique that Riva has applied to the treatment of anorexia. In Riva's programs, a computer uses a person's physical dimensions to generate an animated version of that person. The patient then guides her virtual image through a house with many doors in which she meets figures of various shapes and sizes, including some she had previously judged as ideal.

Eventually the patient encounters her own figure behind a door. The encounter, according to Riva, causes many patients to realize that they are slimmer than the people they had considered perfect. "The sight of her own body often triggers strong emotions," Riva says. In this way, the computer-generated image can help anorexics start to form more accurate mental pictures of themselves.

Riva and his colleagues have tested a similar approach in obese individuals, for whom dieting alone is often ineffective in diminishing their body dissatisfaction. In addition to receiving body-image therapy like that used in anorexia...
relapse in bulimia patients. In a study at the University Hospital of Heidelberg in Germany, headed by psychiatrist Stephanie Bauer, patients send a text message to a computer once a week in which they rate their body perception and indicate the frequency of behaviors such as binge eating and self-induced vomiting. After a computer calculates the patient’s progress, or regression, from the previous week, a therapist offers support and advice. For instance, if a patient has a low body-image rating but a positive eating report, a therapist might reply: “Don’t let negative body perception get you down. You’ve got your eating disorder under control. That’s something to be proud of!”

Other innovations have developed computer software to assist in the treatment of obsessive-compulsive disorder (OCD). Behavior therapy for OCD often involves repeated exposure to everyday scenarios, such as getting dirty or locking a door, in which OCD patients have strong emotional reactions. As with phobia treatment, such training dampens these reactions through habituation.

To lessen the monotony of such training for the clinician, psychotherapist Christoph Woelk of the University of Osnabrück in Germany has developed an animated, talking computer assistant called Brainy that monitors OCD patients during their training sessions. First the patient selects an exercise—say, taking a shower—and enters a time limit into the computer. Then he starts the task, and if it takes too long, Brainy warns: “Your time for this activity is up.” Brainy stops nagging only after the patient has stopped the repetitive activity and returned to the computer.

Brainy also helps patients prolong the time between a trigger for a repetitive ritual and the ritual itself. This delay helps disconnect the trigger from the disruptive behavior and thus reduces a patient’s need to engage in the behavior. Brainy is used in conjunction with traditional therapy: it keeps a log of the patient’s successes and failures that is sent to the therapist, who monitors his or her progress.

The Personal Touch

Many researchers remain skeptical of the effectiveness of virtual reality and other computer technologies, citing a lack of hard data showing that they make patients better. “There are still too few rigorous controlled therapeutic studies,” cautions psychologist Helmut P. Huber of the University of Graz in Austria. In some cases, for example, researchers gauge treatment success with patient evaluations rather than with objective evidence that shows patients have been cured—that people afraid of public speaking, for instance, are actually giving speeches after virtual therapy rather than just saying they are less afraid.

For now, many researchers emphasize that the relationship between a therapist and a patient is the most important element of psychotherapy. “Personal conversations cannot be replaced by electronic media,” opines psychologist Rainer Richter of the University Medical Center Hamburg-Eppendorf in Germany.

Nevertheless, a 2002 survey of 60 well-known psychotherapists suggests that the various so-called cybertherapies will become more popular over the next few years, in many cases displacing traditional techniques. “Whether by video feedback, e-mail or simulation software, cybertherapy will increasingly be supplemented by new media-supported forms,” Kuntze forecasts. In this way, today’s therapists may propel the talking cure into the digital age.

(Further Reading)

- Download Giuseppe Riva’s VR environment and learn about the uses of VR in clinical psychology at www.neurov.org.
- Learn about the virtual-reality technologies in Hunter G. Hoffman’s laboratory at www.hfhlwashington.edu/projects/vrpain/