

INVITING OTHERS TO LEAVE THEIR EVERYDAY experience and enter the realm of another seems fantastical and implausible. What if it were possible to welcome others into a specifically developed world? A world designed for the sole purpose of creating an alternate experience—one which transports someone from their own unpleasant reality to one of mythical fancy? This alternate reality occupies and engages the psyche, thereby distracting it from what is happening to the physical body. Some researchers and pain specialists are using complex computer programs to develop detailed worlds as alternate realities, virtual havens for those suffering from pain.

Hunter Hoffman, PhD, a virtual reality researcher from the University of Washington Human Interface Technology Laboratory, in Seattle, Washington, and David Patterson, PhD, Head of the Division of Psychology at the University of Washington Department of Rehabilitation Medicine, also in Seattle, co-originated a new technique of using Virtual Reality (VR) for pain control. A 3-dimensional, computer-generated world, VR is an interactive simulation of images and scenes. In the late 1990s, Hoffman and Patterson's research focused on burn pain in the acute setting. Joined by a multidisciplinary team from the University of Washington School of Medicine and the Harborview Burn Center, the group opened an imaginary world to patients suffering from uncontrolled pain.

To prevent infection and aid in healing, these patients must have their wounds cleaned daily. Although necessary, wound care is incredibly painful—often more painful than sustaining the original injury.

Even with aggressive opioid treatment that is the standard-of-care in this setting, almost 90% of patients report severe to excruciating pain during these procedures.

The group started exploring immersion VR in conjunction with drug therapy to enhance analgesia. The working theory behind immersion VR is to engage patients



SnowWorld, the 3-dimensional virtual world used to distract burn patients from their pain during wound care bandage changes and physical therapy stretching of their newly healing skin. Image by firsthand.com; Copyright Hunter Hoffman, PhD, University of Washington, vrpain.com.

Welcome to My World

By Stefani Kronk

in a virtual world, pulling their attention away from the debridement and cleaning process. In SnowWorld, a computer-generated visit to a frigid realm, patients fly around in an icy canyon, shoot snow balls at penguins, and pelt snowmen. Developers purposely chose the arctic landscape, as most patients associate wound cleaning with the injury-sustaining fire. SnowWorld was the first immersive virtual world

designed for reducing pain. The premise behind this computer-generated world is simple, but effective, as it is understood and accepted that introducing a distraction can reduce pain. There is a limit to how many sources of information people can process; VR distraction ties up many of those processes, leaving fewer pathways open to interpret incoming pain signals.

“We showed that if you put people in this 3-dimensional world during wound care, it would pull their attention away from the external stimuli. The data were good that it had an impact on their pain, but they also confirmed that when you bring them out of the virtual world the pain would return, because they would no longer be distracted, so it was a good thing for acute procedural pain,” says Patterson.

In healthy volunteers receiving thermal pain stimuli but engaged in SnowWorld, functional magnetic resonance imaging (fMRI) scans confirmed decreased regionalized pain activity in the brain. In addition, several case reports have indicated that VR use was associated with substantially decreased opioid use. By decreasing the use of opioids, unwanted side effects, such as nausea, constipation, sedation, cognitive impairment,

and respiratory depression, are also reduced. VR has shown to be a safe adjunctive therapy, with very few, if any, safety issues or side effects.

Making the Leap

Conducting research in both hypnosis and VR, the team quickly recognized the correlation between the two, noting that the

state a person is in when they have entered the virtual world is much like a state of hypnosis—one of absorbed and focused awareness. Approximately 3 years ago, Patterson experienced these similarities after a VR session and decided to investigate them further, “It was a logical step to take the same technology and apply it to hypnosis,” he concludes.

Many people categorize their pain as inadequately controlled, giving rise to the need for improved and alternate therapies to treat chronic pain. With the impressive results seen in the acute pain sector, Patterson adapted the immersion VR program into a hypnosis tool for chronic pain. “We wanted to know if we could use VR to assist someone entering this state of hypnosis, and then make hypnotic suggestions to help make permanent changes in how their brain processes stimuli.”

Although it seemed reasonable to modify the immersion VR program for acute pain to one for hypnosis, it was not as simple as rebooting the program. Rather, the team had to critically analyze the type of pain and the goal of the VR mechanism, and adapt the program accordingly. Team member and chronic pain specialist, Mark Jensen, PhD, notes that the goal when transitioning from acute to chronic pain is very different. “For acute pain, our working hypothesis is that VR pulls people’s attention from painful situations.” However, the premise of a VR program had to be adapted for chronic pain, as “you don’t want people distracted day in and day out,” Jensen concludes.

Because programming virtual worlds is incredibly expensive, Patterson took the same platform as in SnowWorld and modified it for VR hypnosis. While in the virtual world, patients follow tracks in the

snow, descending deeper and deeper into a frozen canyon. As they descend, VR visitors see numbers, and an audiotope of Patterson’s voice instructs that as they see each number, they are going to become more and more relaxed. After the tape counts down to 10, patients float over a tranquil lake. At this point, the hypnotic suggestions are delivered. Virtual worlds are a portal to help patients enter a more relaxed state. Jensen describes, “The



A child with severe burns using virtual reality distraction during physical therapy. Photo and Copyright Hunter Hoffman, PhD, University of Washington, vrpain.com.

primary focus of what we are doing is using VR technology to help people enter a hypnotic state. While in this state, the brain is much more flexible and open to suggestions.”

Two differences exist in the application of these virtual worlds for the different pain types: timing and level of activity. VR distraction is designed to work as the patient is engaged in the virtual world, while clinicians are simultaneously performing wound care. However, in the hypnotic setting, VR is designed to deliver suggestions that last well after patients depart the virtual world. In fact, as Jensen notes, “the suggestions don’t fully apply until after a

person comes out of VR hypnosis.” Unlike SnowWorld where patients are active in the VR—shooting snowballs or balancing on ice shelves—in order to pull their attention away from the real-world procedure taking place, people undergoing hypnosis are just as engaged in the VR, but in a more subdued fashion. As Jensen explains, “Part of the essence of hypnosis is that it’s effortless. If people need to think, move, and toss things

around, then it’s losing part of its purpose. When people are hypnotized, you want them to sit quietly and not have to do anything. At this point, they become very receptive to suggestions. You don’t want them to have to engage their attention on an activity in the virtual world because they’re supposed to be responding to those beneficial suggestions.”

The team hopes VR hypnosis fulfills 2 goals—creating a mechanism that assists people to enter that focused state of awareness, especially for those who have difficulty or find it easier to enter that state with the aid of VR. Secondly, they would like to develop

an automated intervention that doesn’t require a trained clinician, so people can access the benefits at any time. By creating an adjunctive treatment that can be used in one’s own home, VR hypnosis programs can potentially alleviate the anxiety of contemplating treatment and the pain-provoking stimuli of traveling to a clinic for the sessions.

Although immersion VR is gaining a foothold in the acute pain setting and becoming more mainstream, the use of VR hypnosis in the chronic pain setting is still in the initial, experimental stages. As Jensen describes, “We are just starting to explore it. It is too early in the study and

clinical application process to make such a determination regarding the utility... The jury's still out," he concludes.

A question that Jensen and his team are exploring is whether VR hypnosis provides an enduring improvement in quality of life outcomes when used in conjunction with other pain-reducing mechanisms. One published case study has shown promising results. At the end of a 6-month trial consisting of 33 sessions, a patient with chronic neuropathic pain reported a decrease in intensity and unpleasantness an average of 36% and 33%, respectively. In addition, she reported both no pain and a reduction of pain for an average of 3.86 and 12.21 hours, respectively, after treatment sessions throughout the course of the VR hypnosis treatment. With these encouraging early results, the research is ongoing.

Stone Age of Virtual Reality

Although the work at the University of Washington School of Medicine and the Harborview Burn Center seems groundbreaking, the team is the first to admit the limitations of their virtual worlds, "It's been said that we are in the Stone Age of VR and this is one of the first worlds developed for pain control. Once we get the technology behind it for immersive VR, it's really going to be compelling. One needs to realize what we are using now is really crude, initial research," says Patterson.

Although the team pioneered the idea, developed the concept, and conducted the scientific research to back their hypothesis, their bank accounts won't see the benefits of their labor. "For us, it's scientific notoriety. We have it set up that we can't profit on VR because it is a scientific conflict of interest," says Patterson. Both Patterson and Jensen believe that improved technology and

the gaming world will advance the complexity and the accessibility of VR. Jensen predicts, "Virtual entertainment is going to become very routine in our time. It will be common place, like people with laptops are now," he speculates.

One Piece of the Puzzle

The team has seen how their work has benefited those suffering from pain, but they do not underestimate their formidable opponent. Acknowledging that acute pain was the easier challenge,

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the group grapples with chronic pain. Patterson admits, "Chronic pain is so much harder to treat than acute pain. It's a very messy problem. Therefore, it's not surprising that it is also difficult to study and to measure." Jensen adds, "The neurophysiologic underpinnings of chronic pain are incredibly complex. Pain is the end result of incredibly complex neurophysiological processes involving the whole body. That's the problem...with chronic pain everything gets involved. So to treat chronic pain, you need something that is going to address the whole system, the whole body, and the whole person. Not just the site of the pain. In persons with chronic pain, their brain has changed, so the whole brain is more reactive to pain." Jensen cites psychosocial intervention, self-hypnosis training, relaxation training, and cognitive behavior therapy as some of tools that can help a person feel better. In addition to using multiple modalities to treat chronic pain, Jensen believes

patient education is key. "A big part of the picture is helping patients understand the complexities of chronic pain so they can start applying these strategies to feel better. It needs to be explained to a patient so that they hear the message correctly and not the message that it's in their head or that they're crazy. That takes some sensitivity, because, in fact, chronic pain IS in their head. But it doesn't mean you are crazy and you aren't making it up. That's how the brain works. So in order to treat it, and treat it effectively, you have to treat the whole body."

In addition to the mechanisms noted above, Patterson also insists that increasing physical activity is essential for treating chronic pain. He sees VR hypnosis as one component in the pain management spectrum, but believes that it is inherently limited in its potential when used in isolation. "You obviously can't replace the

whole psychotherapy component and individualize it for the patient. VR hypnosis can do some things well, but it can't take care of the whole patient. Until we can discover a way that's tailored to each individual, comprehensive biopsychosocial support is needed to treat patients with chronic pain." One treatment modality is not sufficient to address chronic pain. Rather, a multifaceted approach is needed to address the complexities of this disease, as Jensen concludes, "The problem is the whole system. Not just the site".

Editor's Note: For clinicians and scientists who would like more information on VR hypnosis and pain control, the American Psychological Association will be publishing a book in April 2010 called *Clinical Hypnosis for Pain Control*. The book reviews in detail the work Patterson and his colleagues have conducted in VR and virtual reality hypnosis. ■