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Beyond Games

Using Virtual Reality to Improve Health

Virtual reality—often referred to as "VR"—used to be science fiction. Today, it's everywhere. All you need is a smartphone and a headset to immerse yourself in 3-D virtual worlds or games. This booming technology may also be useful for health care and research.

"In the last few years, there's been a huge expansion in the number of exciting clinical applications of virtual reality," says Dr. Andrew Huberman, a VR researcher at Stanford University.

NIH-funded researchers are finding that VR may help with many areas of medicine. These include tailoring rehabilitation exercises, improving mental health, and reducing pain.

Restoring Movement • Scientists have been testing VR to treat movement problems. These can be caused by a stroke, a brain injury, Parkinson's disease, or other conditions. Rehabilitation exercises can sometimes help people train their muscles to improve their movement. But these exercises can be boring—especially to kids.

Dr. Amy Bastian, a movement specialist at the Kennedy Krieger Institute, is using VR to make rehabilitation exercises more engaging for kids. It also lets her team tailor the exercises to individual children's needs.

"With VR, we can do things that are really hard to do in real-world therapy," Bastian says. "If we want you to learn to reach and control your balance in one direction, we can make all the game components move things in that direction."

VR can also help kids who have trouble following directions, she explains. "We can say something like, 'just punch the red things.' This can get them to do all kinds of complex tasks."

Bastian is also developing VR exercises for adults who have damage to the cerebellum, the part of the brain that coordinates movement. This type of brain injury makes people's movements jerky and uncoordinated.

The team is testing whether other parts of the brain can be taught to coordinate movements instead. But this can't happen if the eyes can see the body, because the damaged cerebellum tries to take over.

That's why her team is putting people into a VR scene where their bodies don't exist. They must reach for targets with now-invisible limbs. Because the people can't see their arms, other brain areas must take over to complete the task.

Coins fall from the virtual sky when the person makes a smooth movement to grab an object. This instant feedback for a successful movement is vital for the brain to forge new learning pathways, Bastian explains. "In VR, we can manipulate the environment in real time to help them learn to use another brain system."

Fighting Fear • Huberman is using VR to test techniques to help people cope with fear and anxiety. VR

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is ideal for studying such mental states, he explains.

"Vision, more than any other sense, is the sense that humans use to navigate the world and survive. And, more than any other sense, it drives phobias and anxiety."

What you see can be easily manipulated using a virtual environment. His team is using this aspect of VR to help people learn to manage their fears.

"We can create experiences that are very realistic," Huberman explains. "We can create an experience that's a little bit threatening, or one that's very threatening."

VR can show people scenes of sharks or spiders, put them high on top of a building, or have them standing in front of a crowd to speak.

After their participants have one of these VR experiences, the team teaches them ways to manage their stress and discomfort. These include focused breathing exercises and other techniques.

The researchers then put people back into the stressful VR environment to see if the techniques can help them reduce their anxiety in the moment.

A unique advantage of VR, Huberman explains, is that researchers can directly measure signs of anxiety. These include changes in eye movements and pupil size.

The study is still in progress, but Huberman says the training seems to be helping people with their anxiety.

Distracting From Pain • In addition to helping people process uncomfortable mental experiences, VR may help people cope with physical discomfort. Researchers are testing how VR can help reduce the pain from certain medical procedures.

Dr. Sam Sharar, a pain expert at the University of Washington, uses VR to distract children and adults who are recovering from burns.

"Burn pain can be really, really bad. It's hard to tolerate," Sharar says. For burns to heal, the wounds must be washed and covered again every day. These procedures are very painful. Drugs that reduce pain often provide only partial relief for people with burn injuries.

Sharar believes VR can relieve pain by distracting the brain. "People have a fixed amount of conscious attention," he says. "If you divert some of that from experiencing a painful procedure to another task, the brain experiences less pain. This happens even though the same pain signal is coming through the skin."

His team and others developed a VR program that places people in a freezing cold virtual world. It engages their eyes and ears to block out what's happening to their skin. It also has a game where people hit a target to distract more of their attention.

The team's studies have shown that the immersive program reduced people's pain during burn care by half compared with playing a regular video game.

Wise Choices
Virtual Reality Trials

NIH funds clinical trials that are testing virtual reality to help treat many conditions, including:

- Attention deficit hyperactivity disorder (ADHD)
- Anxiety
- Balance problems
- Pain
- Post-traumatic stress disorder (PTSD)
- Mild cognitive impairment
- Traumatic brain injury (TBI)

To find a trial in your area, talk with your doctor or visit ClinicalTrials.gov.

Sharar and other researchers continue looking for ways to use virtual environments to provide more effective pain relief. For people with chronic pain, which lasts for more than three months, using VR distraction hasn't been found to be helpful. His team and others are now using VR to expand access to techniques that have proven to help people manage chronic pain, like cognitive behavioral therapy (CBT).

"If VR could be used to deliver this type of therapy in an immersive, virtual environment," Sharar says, "I think that would have tremendous potential to improve self-management of pain."

VR continues to drop in cost and grow in popularity, Huberman adds. He thinks the feedback it can provide to the senses will also continue to improve. Such improvements could potentially open doors to its use in more areas of health care. See the Wise Choices boxes to learn more about NIH-funded studies testing VR. ■

Web Links

For more about virtual reality, see "Links" in the online article: newsinhealth.nih.gov/2019/07/beyond-games

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Hypnosis for Health

Can Trances Work?

Have you seen someone get hypnotized? They may have been put in a trance and told to do silly things. But hypnosis can be used for more than just show. It's also being studied to treat certain health conditions.

Medical hypnosis aims to improve health and wellness. It can help relax and focus your mind—and make you more open to new ideas.

The technique usually has two parts. First, the health care provider gets your attention by inviting you to focus on something, such as an object or breathing. When you focus like this, your brain becomes more open to suggestion.

"Focusing makes the brain more flexible," explains Dr. Mark P. Jensen, a pain expert at the University of Washington who researches hypnosis.

Then the health care provider can offer a helpful suggestion. For example, if your goal is to manage pain, the provider may suggest that you feel greater comfort. Or they may suggest that you focus on being able to handle the pain more easily.

"Hypnosis takes advantage of the fact that people are able to be open to absorbing new ideas," Jensen says. "You get someone's attention and then you offer them a new way of looking at a problem that will make the problem easier for them to manage."

In addition to pain, studies suggest that hypnosis may help manage irritable bowel syndrome and post-traumatic stress disorder. Researchers are also studying hypnosis for mood disorders.

"There's emerging evidence that it's useful for helping people to manage depression and anxiety, including anxiety around medical procedures and surgery," Jensen says.

Some people respond to hypnosis more easily than others. It's also more effective if you want to be hypnotized. Hypnosis is not mind control by another person.

"We're all open to new ideas at some level," he says. "With people who have more hypnotic talent, it just takes fewer sessions. But everybody can respond at some level to hypnosis."

Imaging studies are shedding light on what happens in the brain during hypnosis.

"Hypnosis is a particularly powerful technique for changing brain activity," Jensen says.

Researchers have found that different hypnotic suggestions can affect different parts of the brain. Pain involves both sensation and emotion.

A hypnotic suggestion for greater comfort changes the brain activity in the areas that process the intensity of the sensations.

"If I make the suggestion that these sensations don't bother you anymore, then the part of the brain that processes how upset you are by pain decreases in activity," Jensen says. "But the part of the brain that processes intensity of sensation doesn't necessarily change."

The way a drug treats pain is different. If you take an opioid to relieve pain, your whole brain can be affected, including the parts that process sensation. The pain may go away, but there can be side effects. These may include constipation, breathing problems, and even addiction.

More studies are needed to fully evaluate the potential benefits of hypnosis and how it might work.

We do know hypnosis doesn't work for everyone. "There are some people—very few—that it only helps a little," Jensen says. "There are others whose lives can be completely turned around for the better with hypnotic treatments. Most people are somewhere in between." ■

Wise Choices

If You're Interested in Hypnosis

- Talk with your health care provider about whether hypnosis may be able to improve your health or well-being.
- Ask your health care provider to refer you to someone certified in medical hypnosis.
- Choose a hypnosis provider who is trained to treat your condition. Dentists, doctors, psychologists, social workers, nurses, physical therapists, and others may be certified in hypnosis.
- Find studies recruiting people for research on hypnosis at ClinicalTrials.gov.

Web Links

For more about hypnosis, see "Links" in the online article: newsinhealth.nih.gov/2019/07/hypnosis-health

Health Capsules

For links to more information, please visit our website and see these stories online.

Highly Processed Foods Linked to Weight Gain

A study found that when people consumed a diet of highly processed foods, they took in more calories and gained more weight than when on a diet of minimally processed foods.

Researchers compared the effects of a highly processed and a minimally processed diet in 10 men and 10 women residing for four weeks at the NIH Clinical Center. Each diet lasted for two weeks. People received three meals per day plus snacks. They could eat as much or as little as they wanted.

Processed foods usually have a lot of calories, salt, sugar, and fat and are low in fiber, but the researchers matched the meals for these nutrients.

The highly processed diet had foods like canned ravioli, hot dogs, chicken nuggets, pork sausage, and tater tots. The minimally processed diet had foods like salad, grilled beef roast and vegetables, and baked fish. People noted that the diets both tasted good and were satisfying.

On the highly processed diet, people ate more calories and gained an average of 2 pounds. On the unprocessed diet, they ate fewer calories and lost about 2 pounds.

The results support the benefits of unprocessed foods. But the researchers note that processed foods can be difficult to avoid.

"Just telling people to eat healthier may not be effective for some people without improved access to healthy foods," says NIH obesity expert Dr. Kevin Hall, who led the study.

More studies are needed to better understand how processed food affects weight.

Test Your Home for Radon

Radon is a radioactive gas that you can't smell or see. Breathing it in can damage your lungs. Radon is the second leading cause of lung cancer in the U.S. It causes thousands of deaths each year.

Radon comes from the natural decay of radioactive metals in rocks and soil. This harmful gas can move from the ground into the home through cracks in the floor and foundation.

Radon can give off radioactive particles. Being exposed to high levels of radioactive particles for a long time can cause lung cancer years later.

Testing your home for radon is easy. You can do it yourself. Experts suggest testing all homes below the third floor.

You can get a radon test kit through the mail or at a hardware store. Or you can hire a radon professional. The test will measure radioactivity in the air. The average home has about 1.3 picocuries of radioactivity per liter of air.

Experts suggest taking action if the level is at 4 picocuries or higher. In that case, contact a licensed professional for an evaluation. If your home's levels are between 2.0 to 4.0, you may also want to consider taking steps to reduce radon. These levels may also pose increased risk.

Find out more about how to lower radon levels at www.niehs.nih.gov/health/topics/agents/radon.

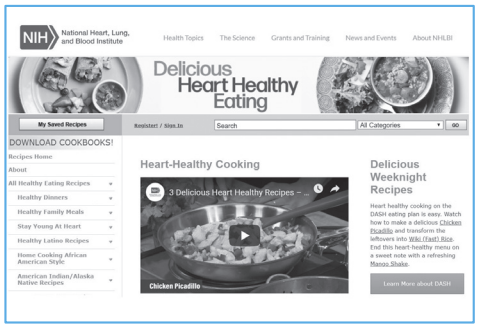
Featured Website

Delicious Heart-Healthy Eating

healthyeating.nhlbi.nih.gov

Making the move to heart-healthy eating can help lower your risk for heart disease and other conditions.

Need help starting a healthy eating plan? Find tips for shopping, cooking, and eating healthy. And check out more than 100 recipes. You can even save favorites to your own personalized recipe box on the site.



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