Using virtual reality to create therapeutic experiences: From treating phobias to rehabilitating abusers

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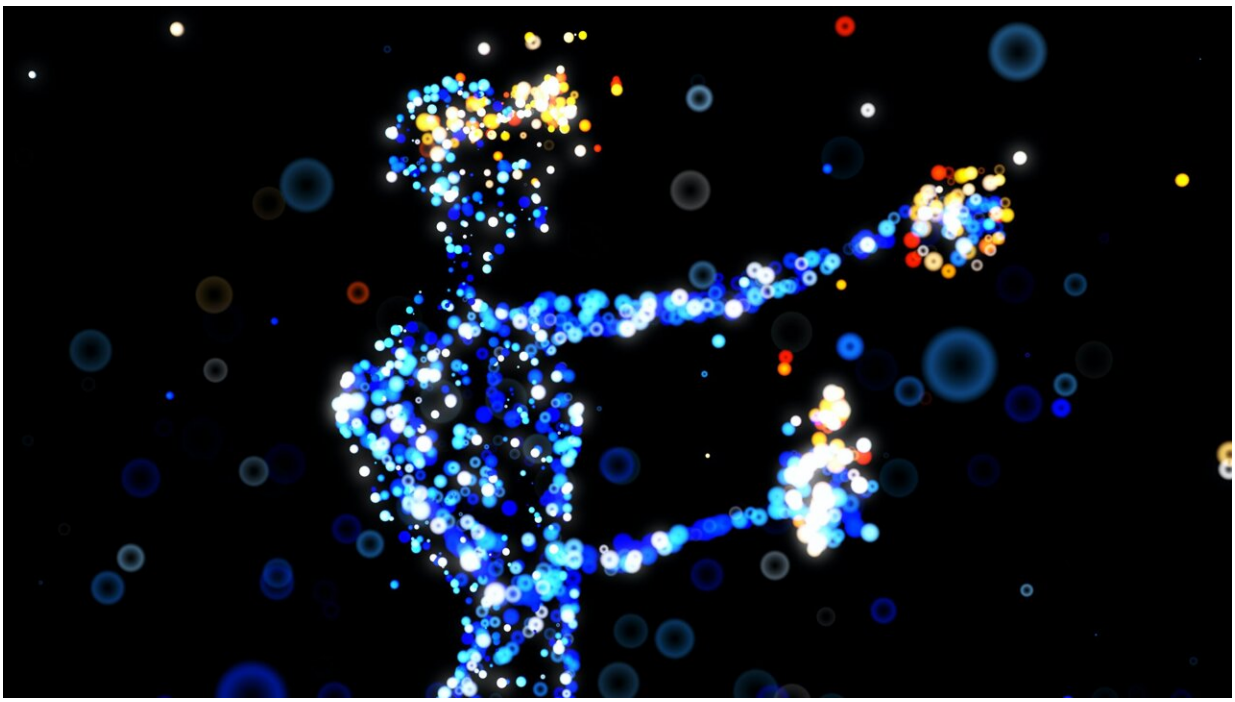

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Can an abuser perceive fear in their victim? Lack of connection and empathy are common factors in cases of gender violence, child abuse, and other scenarios. In view of this, it's also one of the core issues in abuser rehabilitation therapies. In the last few years, virtual reality has

become a very significant tool in such therapies, as it makes it possible, for example, for abusers to put themselves in victims' shoes and feel the threats and violence in a similar way to how they were felt by their victims.

However, the uses of what is known as virtual embodiment, a technology that is making the leap from labs to therapeutic practice, go well beyond this.

Two researchers from the Universitat Oberta de Catalunya (UOC), Pierre Bourdin, XR Lab coordinator, dedicated to immersive technologies—virtual, augmented and mixed reality—and member of the Faculty of Computer Science, Multimedia and Telecommunications, and Sofia Seinfeld, of the Faculty of Psychology and Education Sciences, have been using virtual reality for years to study how we deal with emotions, how we face existential matters such as death or loneliness, or how the links between the brain and the body work.

Now that we know more about this technology, the new challenge is finding out how to use this knowledge for therapy.

Virtual embodiment and out-of-body experiences using virtual reality

Virtual reality technology has been developed over many years, mainly in connection with military or civil simulations and video games. Thanks to its immersive features, users can interact and move in a virtual environment by means of a virtual body or avatar, as if everything were real.

This immersive technology, which uses a virtual reality headset and a motion capture system that reflects the user's position and gestures in the

virtual world, makes building a virtual body ownership illusion possible. In other words, users feel the virtual body is their own.

"If you move your actual hand, you can see the virtual hand moving in the same way. This tricks the brain into believing to an extent that this virtual body is its own," said Seinfeld. "Virtual embodiment refers to the strong perceptual illusions made possible by virtual reality," she added.

This means that, despite knowing that what it is seeing isn't real, the brain can perceive the virtual situations it is placed in in a very similar fashion to how it perceives the real world, paving the way for using virtual embodiment in a variety of research fields and in many therapies.

However, the power of virtual environments does not end here. When working on his thesis, Bourdin went one step further and studied how, once you have created the connection with the virtual avatar, you can also create an out-of-body experience.

In other words, a person can be made to feel as if they are leaving their own body, something that is only possible in the real world in response to highly traumatic events, such as accidents, brain surgery or near-death experiences, or by using certain hallucinogens (all of which are very difficult to replicate). This has enabled researchers to start acquiring an understanding of how out-of-body experiences work in the brain.

Bourdin has just published an open paper—together with researchers from other countries in Europe and North America—analyzing the brain signature of virtual reality-induced out-of-body experiences.

"Thanks to technology, we can simulate these experiences in a realistic way, causing the same effects on the brain as those seen in real cases," he said. "This allows us, firstly, to study this phenomenon, because it's a very controversial issue in the scientific world and no one knows exactly

what causes that feeling of being outside your own body, despite being reported in every place and culture in the world; and, secondly, to develop various therapeutic applications."

Therapeutic applications of virtual reality

"In scientific research, virtual embodiment gives us many options for studying the relationships between our body and our senses or the brain," said Bourdin. "For example, in one of our most recent projects, we manipulated people's movements to alter what they were seeing in the virtual world. One of the things we discovered was that visual feedback is a dominant stimulus when it comes to establishing a person's perception of where they are and how their body is moving, even causing them to make a stronger muscular effort," he said.

Outside the lab, this and other studies have also led to all kinds of therapeutic applications.

Putting yourself in the other person's shoes: From racism to abuse

As Seinfeld explained, "In one of the first virtual embodiment studies I was involved in, we put Caucasian people in a black person's body and saw how this could affect their implicit racism." Placing this avatar in a neutral or positive context tended to reduce the person's implicit racism. Negative social contexts, on the other hand, for example, if the other avatars rejected them, usually led to higher levels of racism.

Seinfeld has also researched the use of virtual reality technology in rehabilitation therapy for people who have abused their partner or a child. The virtual embodiment experience designed for the study enabled abusers to see things from the victim's point of view and feel as if they

were the ones at the receiving end of the violence.

"This tool enabled us to work on their empathy. The results were quite positive: it improved subjects' ability to recognize certain emotions, which in turn triggered some very interesting dynamics in other processes of their therapy," she said.

Virtual reality, rehabilitation, and phobias

Virtual embodiment is increasingly being used as a motor rehabilitation resource. In some cases, it is used to simply give patients access to a more pleasant, entertaining, or motivating exercise environment. In others, virtual reality is used to encourage a greater effort or simulate better movement than that actually being achieved in order to reduce patient frustration.

Another common use is in cases of phantom limb syndrome, where a person can still feel a missing part of their body because their brain still has a physical representation of it. With virtual embodiment, these patients can see that limb again in a virtual environment, which has positive effects, such as reduced pain.

From a psychological point of view, virtual reality is also used to treat post-traumatic stress disorder and phobias. The benefit in this case is that the patient can be exposed to the stress trigger while retaining full control over the environment. So, for example, if a patient is scared of spiders, you can plan all kinds of interactions of varying intensities with virtual spiders, but with the ability to make them all disappear immediately if it becomes too hard for the patient.

"The great advantage of virtual reality, both in research and in therapy, is that you can define any situation that is useful for the scientist or therapist, which can range from stressful situations to moral dilemmas or

existential issues, and test it. This is something that would be impossible in the real world," said Bourdin.

The findings are published in the *Journal of Cognitive Neuroscience*.

More information: Charlotte Martial et al, Electroencephalographic Signature of Out-of-Body Experiences Induced by Virtual Reality: A Novel Methodological Approach, *Journal of Cognitive Neuroscience* (2023). DOI: 10.1162/jocn_a_02011