Virtual reality therapy system aids clients, therapists with real-time brain data

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The Eather mother avatar is shown in the forest setting of the EEG-enabled Virtual Therapy System. Credit: Chris Tacca

Clients seeking therapy need to feel comfortable in an environment that is conducive to examining mental health and with a counselor they can trust. Meeting those needs can be challenging in a remote therapy

environment. A University of Kansas research team has developed a virtual therapy system that addresses many of the issues of remote counseling while also providing therapists with real-time data on brain activity.

The EEG-enabled Virtual Therapy System has received a provisional patent and is being refined for wide market use. The system can take users to several virtual settings in which they meet with a counselor in the form of a VR wizard, Mother Earth figure or other avatars. And recent clinical trials show that users have believed the virtual settings address many of the problems of remote counseling.

The system originated from a personal experience of Christopher Tacca, a recent doctoral graduate of KU. Just as he was starting his studies, a tragedy occurred.

"I remember celebrating graduation with my family and friends and being nervous about coming to Kansas and the Midwest," Tacca said. "About a week later, one of my friends took his life. I didn't how to process it, but I felt like I wanted to do something that could help someone like him."

A bioengineering student and Madison and Lila Self Graduate Fellow, Tacca was working with adviser Elizabeth Friis, professor of mechanical engineering. Friis introduced him to Barbara Kerr, Williamson Family Distinguished Professor of Counseling Psychology. Kerr had trained psychologists throughout her career and has used both virtual reality and EEG brain biofeedback in working with creative students and clients. The Virtual Therapy System originated from their discussions and was developed over the next few years as the team studied the technology and how it could be applied in psychological contexts.

"We really wanted to meet the needs of people who would use this.

Much of that was from Dr. Kerr's experience, but I also called a lot of therapists around Kansas to get their input and shadowed counselors doing what they do," Tacca said. "We thought it was a cool idea, but we wanted it to be more than that. We wanted it to be useful and meaningful."

The team recognized the need for a virtual setting conducive to therapy and discussing mental health, and current virtual therapy sometimes can come up short on providing that sense of security. The system also had to provide a "therapeutic alliance," or way to build a trusting, meaningful relationship between the therapist and client.

The system features a choice of three virtual environments: a forest, log cabin or a simulation of Sigmund Freud's office. The forest features settings of nature such as trees, waterfalls, ponds and even nature sounds, while the cabin features a fireplace and windows with scenic "outdoor" imagery. The office features large furniture, framed credentials and bookshelves.

"One of the things that makes it restorative and comfortable is if people have control over the environment," Tacca said. "So people can say, 'I want to sit by this tree or pond.' Nature is a place that's very restorative, and people go there all the time. Here, people can also control sound elements like hearing a nearby waterfall."

The office was modeled after Freud's famous office, which Tacca and fellow students viewed on trips to Vienna, Austria, and Leipzig, Germany, as part of Kerr's history and systems of psychology course.

Academic literature in topics ranging from psychology and neuroscience to anthropology informed the development of avatars for counselors. Kaylie Ridgeway, Kerr's doctoral student with a fine arts background, designed the avatars. Clients can choose which type of person they trust,

and appropriate male, female and nonbinary counselors voice the characters in real time.

"We can think of therapists as having various personality features, and we've found from cultures around the world people tend to trust certain figures as healers," Kerr said. "So we have a 'wizard' or avatar that is a wise elder and a mother figure. And we're also developing a 'trickster' humorous counselor and fantasy animal characters, because virtual reality doesn't restrict us to human forms, and young people especially are familiar and comfortable with these types of figures from gaming and online experiences. In addition, there will be diversity of ethnicity of avatars."

The system also provides data that clients cannot obtain through traditional remote sessions. The Virtual Therapy System is EEG-equipped, which provides data on brain activity in real time. Clients wear a commercially available headband that places nodes on the forehead and monitors activity, similar to how a FitBit or similar device monitors physiological activity, Tacca said. That information can help therapists gauge how a client is feeling, if they are experiencing anxiety or are struggling to process or discuss certain topics. Those feelings are more easily detected in person and can be addressed, but can be missed in remote settings.

"When Chris first came to me, I thought this was an ideal way to merge EEG technology with counseling work," Kerr said. "We found it was very powerful for counselors to see the brainwaves of clients while working with them. It was a chance for our doctoral students to learn a new way of experiencing what we've known for a long time about what makes therapy work, live a restorative environment."

The Virtual Therapy System has received a provisional patent, and the KU Center for Technology Commercialization is in the process of

acquiring a full patent. The goal is to make the system commercially available to any counseling professional. The research team has also conducted a series of studies on the system's effectiveness from the counselor's point of view and its results with clients comparing their experiences with counseling virtually and remotely through the Zoom platform. Users rated the virtual system more highly than counseling via Zoom in effectiveness and other factors.

Tacca has presented his findings at the Virtual Reality and Healthcare Global Symposium and the Institute of Electrical and Electronics Engineers Conference on Virtual Reality + 3D User Interfaces, and the studies are forthcoming in peer-reviewed journals as well.

The research team continues to refine the Virtual Therapy System. In the meantime, it has already proven effective in helping both clients and counselors in new ways.

"We always say the problem with virtual reality is you can't see emotion," Kerr said. "But our system makes that visible and solves a major problem of VR and allows deeper context for counselors to help clients."

Provided by University of Kansas

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