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A Virtual Test for Post-Traumatic Stress Disorder

Researchers hope the use of multiple sensors will result in a more objective way of diagnosing this anxiety disorder.

By Emily Singer

By combining virtual reality with data from physiological sensors, researchers at [Draper Laboratory](#) are trying to develop a new way to diagnose post-traumatic stress disorder (PTSD), in which people who have undergone a traumatic event experience it again and again.

The research is of particular interest to the military, because many fighters returning from Iraq and Afghanistan have PTSD. Many have also been subjected to explosions or other trauma, often resulting in mild traumatic brain injury. The two disorders have similar symptoms but require different treatments, so accurate diagnosis is crucial.

A diagnosis of PTSD is currently based on interviews with a physician and the presence of certain symptoms, such as flashbacks of the trauma and difficulty in sleeping and concentrating. But if the disorder could be diagnosed more precisely and objectively, it could help physicians distinguish [PTSD from other disorders](#), and also help in assessing the effectiveness of specific treatments.

In a pilot study of seven people with PTSD, seven healthy people, and 11 people with trauma but not PTSD, Andrea Webb, who is a psychophysicologist at Draper, and collaborators measured heart rate, finger pulse, respiration, and skin conductance (a measure of stress and excitement), first when the person was calm and then when he or she was shown potentially frightening scenes via virtual-reality goggles. The virtual-reality scenes became progressively more intense. For example, the first might be a helicopter flying overhead; the last might be an insurgent running toward the subject while shooting his weapon.

Previous research by others in the field has shown that people with PTSD tend to have an exaggerated response to these kinds of scenes, with more dramatic increases in heart rate and blood pressure than those recorded in healthy people. Webb's goal is to take data from the sensors and create algorithms to reliably detect who has PTSD. Although data collection and analysis are still underway, Webb says that preliminary findings show several instances in which people with PTSD did react more strongly than those in the other groups.

Psychologists have used tools like this to study PTSD in a research context for more than 20 years, but bringing the technology into clinical practice has been a challenge. "I have felt for years that there are potential clinical applications in these findings," says [Scott Orr](#), a psychologist at Massachusetts General Hospital who was not involved in the Draper research. "But the type of equipment we use requires a fair amount of training and experience and knowledge of psychophysiology."

Thanks in part to technological advances in physiological sensors, the tools have become simpler, more user-friendly, and more compact, "making them more attractive to clinicians," says Orr. "The real challenge now is being able to make sense of the information you are collecting." Webb and collaborators are trying to solve that problem using different approaches to data analysis, including machine learning.

There's nothing simple about reliably distinguishing people with PTSD from those with other anxiety disorders. For example, both PTSD sufferers and people with obsessive-compulsive disorder, a very different disorder, tend to have an exaggerated startle reaction to loud noises. In addition, not everyone with PTSD reacts to frightening situations in the same way. Previous research suggests that some are "non-responders"—they show less change in heart rate and other indicators than people without the disorder. Webb's team plans to examine these groups as well.

Beyond diagnosis, the technology might also help assess the effectiveness of different treatments for individual patients. "Lots of times, people aren't good at telling us how they feel," says Orr. "They may say, I could feel myself getting worked up, and there is nothing in the data," says Orr. "Or they don't think they reacted to anything and we see large increases in heart rate or activity."

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