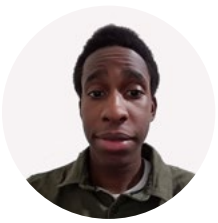
Various tests induce, then measure, stress

Graduate student uses both traditional and high-tech methods to simulate stressful situations



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We all experience stress in some shape or form, especially university students facing final exams and graduating seniors under pressure to find a job. Now these nerve-wracking situations are being replicated in a lab – but this isn't as sadistic as it may sound.

The Trier Social Stress Test puts participants in pressure-filled simulations and then measures their physiological reaction, including heart rate, blood pressure, skin conductance (sweat) and cortisol (a stress hormone).

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The TSST tries to replicate the type of stress you’d deal with in everyday life. “What you’re really trying to do frankly is get someone really stressed out,” said Sage Hawn, a third-year doctoral student at VCU who has worked extensively with such tests.

Hawn is pursuing her doctorate in clinical psychology under Dr. Ananda Amstadter, an associate professor in the departments of psychiatry and molecular genetics. Hawn specializes in stress/trauma and behavioral genetics, and the TSST is an important tool in that field.

“The Trier is pretty vastly used,” Hawn said. “Even where my lab is downtown, there are three studies right now that are using Trier.”

Before the test begins, the researchers takes the participant’s blood pressure and other signs. Then, under the traditional TSST, the individual enters a room with three confederates (actors), who remain stone-faced during a mock job interview.

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If the test subject pauses or concludes the speech too quickly, the confederates respond in a robotic-like manner, saying something like “Your time is not finished; please continue.” After the speech, the subject must take a mental math test – starting with the number 1,022 and repeatedly subtracting 13 for five minutes. Then the researchers measure the participant’s vital signs again and compare them with the initial readings.

Though the TSST is generally effective, it has plenty of limitations – notably the lack of standardization. The confederates are rarely consistent. They may vary by race or gender in each trial because certain actors might be unavailable at different times. Moreover,

Graduate student Sage Hawn

even the same confederate might act slightly differently from one testing scenario to the next. Such variations could affect the test subjects' responses and skew the results.

So Hawn has been experimenting with a technological trend – virtual reality – to simulate the stressful situations. The advantage: With VR, each test subject experiences the exact same scenario.

The medical school at the University of South Carolina has pioneered this "eTSST." Participants put on a VR headset such as the Oculus Rift, and then they are immersed in a virtual version of the TSST.

The eTSST avoids the traditional test's inconsistencies by using recordings of the confederates. Though it solved many of the standardization problems, the VR technique has not produced measurements satisfactory enough to justify its continued use.

However, Hawn recently gave a professor at another university instructions for administering the eTSST, so it may be improved in the future.

Hawn has also worked with other stress-inducing methods. In one test, carbon dioxide (CO_2) is administered to the participants to elicit stress in a manner similar to the TSST.

Under this "CO_2 challenge," participants inhale small amounts of carbon dioxide and do particular tasks before, during and after, attempting to mirror the physiological responses of anxiety.

The test uses low, controlled doses of CO_2 that don't cause the participant harm. However, researchers had to overcome extensive hurdles to get approval from VCU's Institutional Review

Board, which oversees studies involving human subjects.

Moreover, the cost of conducting the “CO2 challenge” is staggering. “You have to buy these huge CO2 tanks, all of the equipment. You have to make sure your lab is amenable to support that type of equipment,” Hawn said.

For obvious reasons, the CO2 test is not performed on children, so the TSST is typically preferred. For children, the TSST does not involve a mock job interview – though it would be amusing to imagine an 8-year-old explaining why he or she wants to be a firefighter. Instead, the researchers ask age-appropriate questions like, “What is your ideal day?” •