

Brain stimulation for PTSD patients

August 7 2019, by Laurie Fickman



The tiny bursts of sweat released in response to psychologically arousing stimuli can be measured using wearable technology. Credit: University of Houston

For 8-million adults who suffer from post-traumatic stress disorder in any given year, medication and cognitive therapy have been the

treatment protocol. Now, University of Houston assistant professor of electrical engineering Rose T. Faghieh is reporting in *Frontiers in Neuroscience* that a closed-loop brain stimulator, based on sweat response, can be developed not only for PTSD patients, but also for those who suffer an array of neuropsychiatric disorders.

"Sweat primarily helps maintain body temperature; however, tiny bursts of sweat are also released in response to psychologically arousing stimuli. Tracking the associated changes in the conductivity of the skin, which can be seamlessly measured using wearables in real-world settings, thus provides a window into a person's emotions," reports Faghieh.

For people with movement disorders like Parkinson's disease and essential tremor, who have not responded to medication, application of high-frequency electric current to the [brain](#), or [deep brain stimulation](#), is regarded as most effective. Electrodes are placed in certain areas of the brain to regulate abnormal functions and a pacemaker-like device, placed in the upper chest, controls the amount of stimulation the brain receives. Open-loop stimulators, the most widely-used, deliver continuous stimulation until manually re-adjusted by a physician. Closed-loop stimulators, which provide stimulation in response to biomarkers of pathologic brain activity, have been developed for [movement disorders](#), but are yet to be explored for the treatment of neuropsychiatric disorders.



University of Houston assistant professor of electrical engineering Rose T. Faghieh is reporting that a closed-loop brain stimulator, based on sweat response, can be developed for PTSD and an array of neuropsychiatric disorders. Credit: University of Houston

Signaling the onset of a PTSD episode, skin develops the tiniest sheen of perspiration. That symptom of the body's fight or flight response signals a change in the skin's electrical conductivity and provides a window into the brain's state of emotional arousal. Using [skin conductance](#) to create the framework for a deep brain stimulator seemed logical to Faghieh after reviewing group studies of Vietnam combat veterans with PTSD. Among the findings, PTSD subjects had the largest skin conductance responses

when confronted with combat-related words. In a similar study comparing Vietnam combat veterans with and without PTSD and non-combat controls, PTSD veterans had the highest baseline skin conductance levels.

"Skin conductance additionally has the advantage of being easily measured with wearable devices that afford convenience, seamless integration into clothing and do not involve risk of surgically implanted sensors," said Faghieh.

The ultimate goal will be to develop closed-loop prototypes that can eventually be used for treating patients in a variety of neuropsychiatric disorders. Faghieh's graduate researchers Dilranjan Wickramasuriya and Md. Rafiul Amin were first and second authors, respectively, of the article.

More information: Dilranjan S. Wickramasuriya et al. Skin Conductance as a Viable Alternative for Closing the Deep Brain Stimulation Loop in Neuropsychiatric Disorders, *Frontiers in Neuroscience* (2019). [DOI: 10.3389/fnins.2019.00780](https://doi.org/10.3389/fnins.2019.00780)

Provided by University of Houston

Citation: Brain stimulation for PTSD patients (2019, August 7) retrieved 17 April 2024 from <https://medicalxpress.com/news/2019-08-brain-ptsd-patients.html>

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