

# Ultrasound stimulation of periaqueductal gray induces defensive behaviors

April 6 2020, by Li Yuan

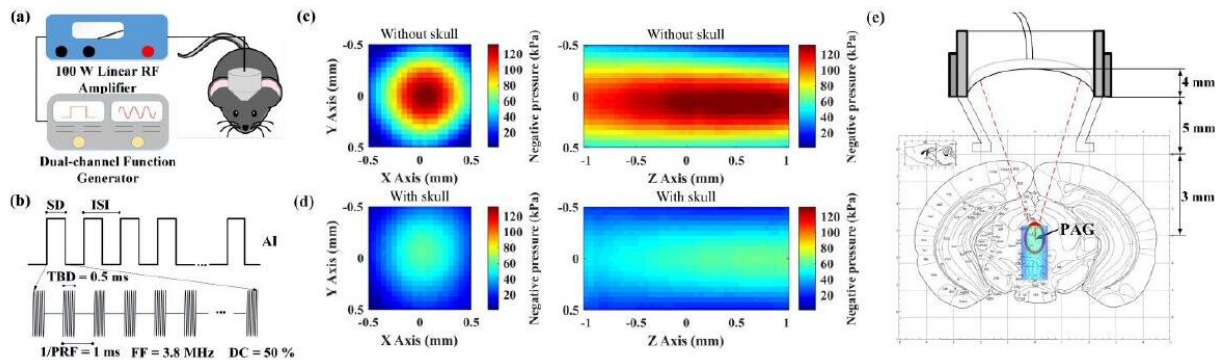


Illustration of ultrasound stimulation system. Credit: NIU Lili

Low-intensity focused ultrasound stimulation (LIFUS) is gaining attention as a non-surgical experimental approach of modulating brain activity.

The periaqueductal gray (PAG) is an area of gray matter found in the midbrain that is associated with the generation of defensive behaviors. A team of researchers from the Shenzhen Institutes of Advanced Technology (SIAT) of the Chinese Academy of Sciences demonstrated that the LIFUS of the PAG induces defensive behaviors in the mouse [brain](#). The study was published in *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*.

The team fabricated a 3.8 MHz head-mounted ultrasound transducer with a small focus size of 0.5 mm ×0.5 mm. They separated 12 mice into two groups, the [control group](#) and the [ultrasound](#) stimulation group, equally. Through a real-time place preference [test](#), open field test and rat exposure test, they designed multiple behavioral processes and observed complex behavioral patterns.

The results showed that LIFUS of the PAG induced multiple defensive behaviors, including location-specific passive avoidance [behavior](#), flight, and freezing, and did not cause injury to the brain tissue.

This study demonstrated that LIFUS of the PAG could induce a series of defensive responses in mice. "We expect that the LIFUS may be used as a novel neuromodulatory tool for the treatment of psychological diseases associated with defensive behaviors in the near future," said Dr. NIU Lili, a co-author of the study.

**More information:** Yibo Wang et al. Ultrasound stimulation of periaqueductal gray induces defensive behaviors, *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control* (2020). [DOI: 10.1109/TUFFC.2020.2975001](#)

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