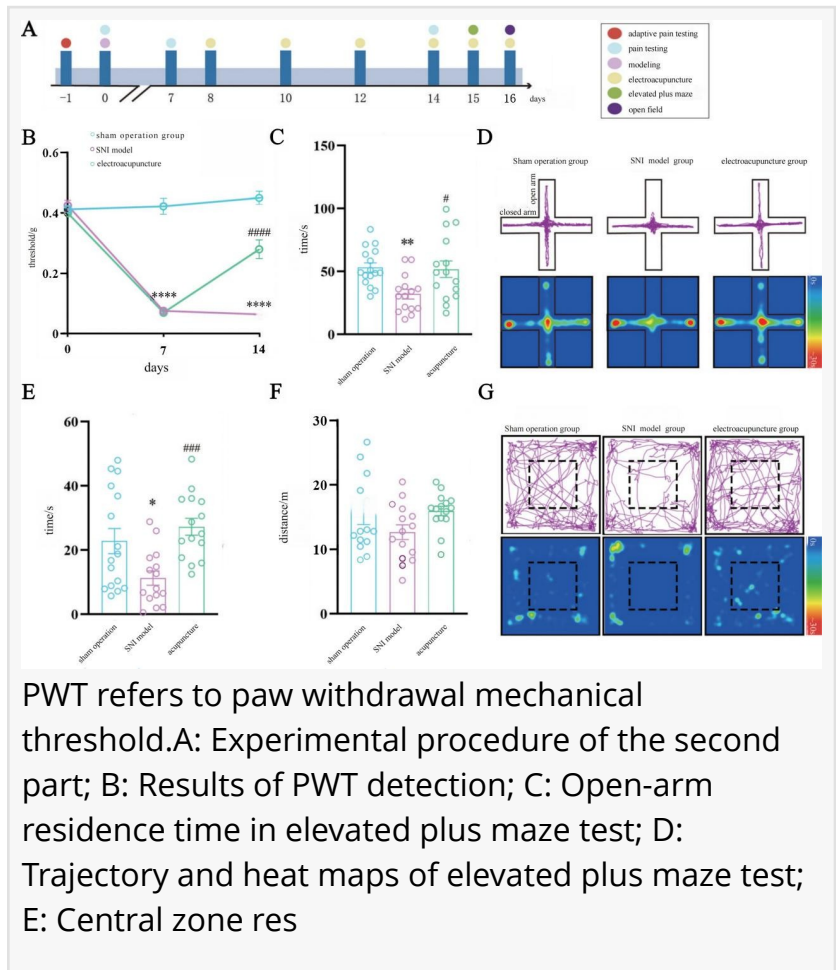


Pain and anxiety share a brain circuit — electroacupuncture can calm both, scientists find

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/EINPresswire.com/ -- Chronic neuropathic pain often brings a cruel companion: debilitating anxiety. These two conditions fuel each other, making treatment notoriously difficult. A new study in mice reveals that [electroacupuncture](#) — a modern form of acupuncture using electrical stimulation — can relieve both pain and anxiety at once by acting on a specific brain circuit. The researchers identified a direct neural connection between the dorsal raphe nucleus (DRN) and the basolateral amygdala (BLA), a circuit that uses serotonin (5-HT) as its messenger. When electroacupuncture activates this circuit, it restores normal neuronal activity and behaviors. The findings open a fresh path for treating pain and its emotional toll together.



Neuropathic pain affects nearly 10% of the global population, and up to 60% of those individuals also struggle with anxiety or other mood disorders. Anxiety, in turn, can amplify the perception of pain, trapping patients in a vicious cycle. The brain's limbic system — especially emotion-processing centers such as the amygdala — holds clues to breaking this loop. However, the precise wiring that links pain perception to anxiety has remained poorly understood. Previous experimental and clinical studies have suggested that electroacupuncture may relieve pain and pain-related emotional disturbances, but the neural circuits underlying these effects remain incompletely understood. Based on these challenges, there is an urgent need to investigate how electroacupuncture-based therapies work at the neural circuit level.

Researchers from Zhejiang Chinese Medical University, its affiliated hospitals, and Hangzhou Red Cross Hospital in China published their findings on August 25, 2025, in *Acupuncture Research*. The team used a mouse model of neuropathic pain induced by partial nerve injury in the leg. They combined electroacupuncture (100 Hz, 0.3 mA, 30 min/session, 6 sessions) at two classic acupoints — Zusanli (ST36) and Sanyinjiao (SP6) — with advanced tools including viral tracing, chemogenetics, and fiber photometry to track and manipulate neuronal activity in real time.

The study first showed that 5-HT neurons in the DRN directly connect to the BLA, a major input station of the amygdala that integrates sensory information from the cortex and thalamus. In injured mice, these 5-HT neurons in the DRN became abnormally quiet, and the animals developed both heightened pain sensitivity and anxiety-like behaviors, such as avoiding open spaces in elevated maze tests. After just six sessions of 100 Hz electroacupuncture delivered over several days, pain thresholds increased significantly, and anxious behaviors subsided. Calcium imaging showed that the activity of DRN 5-HT neurons within the DRN5-HT-BLA circuit was reduced after injured. Immunofluorescence analyses further showed that electroacupuncture increased c-Fos expression in DRN 5-HT neurons and increased the proportion of c-Fos-positive CaMK II neurons in the BLA, supporting the involvement of the DRN5-HT-BLA circuit in the treatment effect. To prove this circuit's necessity, the researchers chemogenetically inhibited the DRN5-HT-BLA connection. When that circuit was suppressed, electroacupuncture no longer relieved pain or anxiety — a clean demonstration that the circuit is not just involved but required. Immunofluorescence staining further showed that electroacupuncture increased the expression of c-Fos, a marker of neuronal activation, in 5-HT neurons. The effects were specific to the targeted circuit, with no change in general movement or exploratory drive.

“We were surprised to see that a relatively short course of electroacupuncture could restore the activity of a specific 5-HT pathway that goes inhibited during chronic pain,” the authors said. “When we inhibited that circuit on purpose, electroacupuncture no longer produced significant analgesic or anxiolytic behavioral effects — that told us we had found a key mechanism.” The researchers explained that understanding how electroacupuncture talks to 5-HT circuits gives them a concrete neural target. “Instead of just dampening pain signals anywhere in the brain, electroacupuncture seems to rebalance a system that controls both sensation and emotion. That is why it can tackle two problems at once.”

These findings suggest that electroacupuncture could offer a non-drug strategy for treating neuropathic pain and its frequent psychiatric burden together. The study also provides a neurobiological foundation for optimizing electroacupuncture protocols, such as refining stimulation parameters or acupoint selection. Future work might test whether there are interactions between DRN5-HT-BLA circuit and other neural circuits. The research also highlights how traditional Chinese medicine practices can be understood through the lens of modern systems neuroscience.

References

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Lucy Wang

BioDesign Research

[email us here](#)

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