Researchers discover new pathways in brain's amygdala

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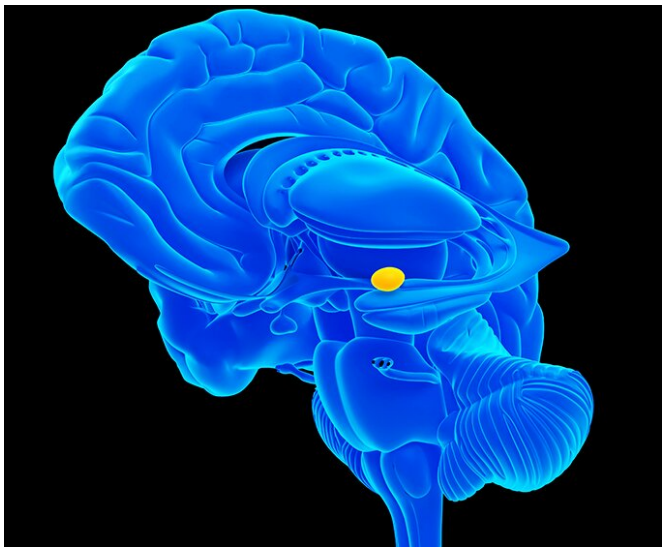

A rendering of the human brain highlighting the amygdala. Credit: UTSA

Researchers at The University of Texas at San Antonio (UTSA) are pioneering an innovative brain study that sheds light on how the amygdala portion of the brain functions and could contribute to a better understanding of post-traumatic stress disorder, anxiety, depression and Alzheimer's disease.

The researchers, Alfonso Apicella, an associate professor in the Department of Biology, research associate Alice Bertero, postdoctoral fellow Paul Luc Caroline Feyen, and graduate student Hector Zurita, published their study, "A non-canonical cortico-amygdala inhibitory loop," in the *Journal of Neuroscience*, the flagship journal of the Society for Neuroscience. Their research was also featured on the Oct. 23 cover of the journal.

Conditions such as PTSD, anxiety and depression are thought to be linked to the abnormal functioning of the amygdala, which is located within the temporal lobes and plays a key role in processing emotions, actions and cognition.

"This novel research paper provides anatomical and physiological evidence for the existence of a long-range inhibitory pathway from the auditory cortex to the amygdala in the mouse brain," Apicella said. "For the first time, in our paper we show this emotional pathway."

Apicella explained that advances in the techniques for labeling individual neuronal cells made it possible to study the individual neurons extending from the auditory cortex to the amygdala.

He added that the inhibitory cortical neurons can alter the activity of the amygdala's principal neurons and can therefore directly control the output of the amygdala. The neurons contain a substance called somatostatin, and it regulates physiological functions and forms a connection with principal neurons that project to other brain regions outside the amygdala that are involved in fear and aversive behavior.

"The discovery that the amygdala receives both excitatory and inhibitory inputs from that cortex suggests that the timing and relative strength of these inputs can affect the activity of the amygdala," Acipella said.

Apicella and his research team noted that future experiments should examine whether this is a general mechanism by which sensory stimuli can influence the processes controlled by the amygdala , such as fear/aversive behavior and how the disruption of this pathway can lead to several neurological and psychiatric disorders, such as,Alzheimer's, anxiety, depression and PTSD.

Research related to this topic will continue in Apicella's lab. His research group investigates the neural basis of perception. More specifically, the researchers want to understand how cortical

microcircuits process sensory information leading to behavioral outcomes.

More information: Alice Bertero et al, A Non-Canonical Cortico-Amygdala Inhibitory Loop, *The Journal of Neuroscience* (2019). DOI: 10.1523/JNEUROSCI.1515-19.2019