

[J Neurosci](#). 2003 Dec 3;23(35):11054-64.

# The prefrontal cortex regulates lateral amygdala neuronal plasticity and responses to previously conditioned stimuli.

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## Abstract

The amygdala plays a role in learning and memory processes that involve an emotional component. However, neural structures that regulate these amygdala-dependent processes are unknown. Previous studies indicate that regulation of affect may be imposed by the prefrontal cortex (PFC) and its efferents to the amygdala. The presentation of conditioned affective stimuli enhances activity of neurons in the lateral nucleus of the amygdala (LAT), which is thought to drive conditioned affective responses. Moreover, plasticity of LAT neuronal responses to stimuli during the course of conditioning is believed to underlie affective learning. This study examines the role of the PFC in the regulation of affective behaviors by evaluating how the PFC affects LAT neuronal plasticity and activity that is evoked by previously conditioned stimuli. In vivo intracellular recordings were performed from the LAT of anesthetized rats during pavlovian conditioning and during the presentation of stimuli that were conditioned in the awake rat before recording. Train stimulation of the PFC suppressed LAT neuronal activity that was evoked by both previously conditioned and neutral stimuli. In addition, PFC stimulation blocked LAT neuronal plasticity associated with an affective conditioning procedure. These results indicate that the PFC has the potential to regulate affective processes by inhibition of the LAT. Patients with disruptions of the PFC-LAT interaction often display an inability to regulate affective responses. This may be attributable to the loss of PFC-imposed inhibition of the emotional response to a stimulus but may also include the formation or diminished extinction of inappropriate associations.

PMID:

14657162

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