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Activity of the prefrontal cortex during extinction of conditioned fear.

In *fear extinction*, a model of exposure-based therapy, a tone-*conditioned* stimulus previously paired with a footshock is presented repeatedly in the absence of the aversive outcome, resulting in *fear* reduction. It is well documented that the dorsal (including the prelimbic area, PL) and the ventral (the infralimbic area, IL) regions of the medial prefrontal cortex (mPFC) differentially regulate conditioned fear responses. The PL stimulation increases, whereas the IL stimulation decreases fear expression. In addition, the IL is critical for consolidation of extinction memories. Little is known, however, how different parts of the prefrontal cortex interact with each other and how their activity changes in the course of the extinction training. We aimed at detailed description of neural activity changes within the PL and IL during fear extinction. We performed single unit recordings simultaneously in the PL and IL, during the habituation and two sessions of fear extinction in freely moving mice. Recorded neurons were divided into excitatory pyramidal cells and interneurons,—The neuronal responses to the conditioned stimuli were analyzed and the activity of significantly responsive neurons was averaged. We found patterns of the single unit activity that differed along the dorso-ventral axis of the mPFC. The averaged IL activity followed the behavior during the extinction session, while the PL pronouncedly showed activity during the fear expression at the beginning of the extinction session but not at later times. The results suggest different involvement of the PL and IL during the acquisition of extinction association,, with the PL being mostly active during the high fear state, while the IL being active throughout the entire extinction session.