

Reward seeking behavior towards food-related stimuli under amygdala activation in rats.

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Background

Stress, a disturbance to homeostasis, affects animals significantly. In face of acute stress, the physiological responses and behaviors of the animals are regulated to cope with the situation. The basolateral nucleus of the amygdala (BLA), a nucleus processing negative emotions, is one of the nuclei that is activated under acute stress. However, it is not clear that whether activation of the amygdala resembles the state of animals being under stress and whether the behavioral response is regulated through the BLA to central amygdala (CeA) pathway. Our previous study showed that animals adapted their behavioral strategies when facing different tasks and decreased their dopamine population activity under pharmacological activation of the BLA. In this study, we focused on how amygdala activation affects positive valence of behaviors in animals.

Aims & Objectives

In this study, we tested the reward seeking behavior towards food-related stimuli of animals under activation of the BLA or the CeA. We hypothesized that activation of the BLA or the CeA decreases the motivation of animals.

Methods

Male Long-Evans rats were implanted with cannulae targeted the BLA or the CeA. After recovery from the surgery, the rats were food restricted to 85-90% of their free-feeding weight and stayed food restricted until the end of the experiment. The rats were first trained to lever press for food until they reached a variable ratio (VR) 5 schedule. Every food pellet delivery was paired with a 5 sec conditioned stimulus (CS; light + 3k Hz tone). After 5 days of VR5 training, the rats were put under extinction training, where lever pressing no longer led to any food pellets or CS. The extinction training continued until the lever pressing number was below 10% of the last day of VR5 training. On the next day, the rats were tested with cue-induced reinstatement under BLA or CeA activation, to examine their reward seeking behavior when food-related CS was presented again. N-Methyl-D-aspartic acid (NMDA) at the dosage of 0.75 μ g (high; Experiment 1) and 0.05 μ g (low; Experiment 2) with infusion volume of 0.5 μ l per side was used. In Experiment 2, locomotor activity and free-feeding were monitored before and after reinstatement, respectively.

Results

In Experiment 1, compared to saline controls, rats significantly reduced their food-seeking behavior towards food-related stimuli under high dosage of NMDA infusion into either the BLA or the CeA. However, the high concentration of NMDA into the CeA caused seizure in some rats (n = 6 out of 10), and therefore the dosage was lowered in the following experiment. In Experiment 2, the rats showed a trend of reduced food-seeking behavior under low dosage of NMDA infusion into the amygdala (BLA or CeA). Importantly, locomotor activity and free-feeding test were not affected by activation of the amygdala.

Discussion & Conclusion

The results suggested that animals reduced their motivation towards foods under amygdala activation. In addition, this positive valence of behavior may be regulated by the BLA to CeA pathway.