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Presentation Abstract

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Presentation Title: Pharmacological inhibition of noradrenergic system impairs a spatial decision-making task via prefrontal cortex

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Authors: ***S. AMEMIYA**, T. NOJI, N. KUBOTA, T. NISHIJIMA, I. KITA;
Tokyo Metropolitan Univ., Tokyo, Japan

Abstract: Electrophysiological and computational studies have suggested that noradrenergic system originating form locus coeruleus (LC) is crucial for an optimal decision-making, which needs to assess and comprehend the utility of options. According to adaptive gain theory, higher discharge activity of LC-noradrenaline neurons should enhance exploration state to assess the utility and to search for an optimal choice. However, few study empirically examine neural mechanisms of the noradrenergic regulation of decision-making. Therefore, we examined the effects of pharmacological inhibition of noradrenergic system in T-maze decision-making task in rats. In the task, an advantage arm has 3 pellets and disadvantage arm has 1 pellet, and this task requires subjects to assess and compare utility of both arms for advantageous choice. To evaluate exploration state, we recorded vicarious trial and error behavior (VTE), which is thought to be attributed to medial prefrontal cortex (mPFC). Noradrenergic system was inhibited with clonidine, the α2 noradrenergic receptor agonist. First experiment, clonidine (20μg/kg or 50μg/kg) was intraperioneally injected to examine involvement of noradrenergic system for decision-making. Second experiment, clonidine (10nM/0.5μl) was locally injected into mPFC to examine a brain region involved in noradrenergic modulation of decision-making. These results showed that clonidine injection decreased the advantage arm choice and VTE. These data suggest that noradrenergic system (i.e. LC-mPFC noradrenergic projection) is required for an optimal decision-making through regulation of the exploration state.

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EXPLORATION

MEDIAL PREFRONTAL CORTEX