Functional left/right hemispheric difference of dopamine D2 neurons in rat dorsolateral striatum

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Functional asymmetry in the left/right hemisphere is a well-known feature in human, e.g., the left-sided function of the language area and the right-sided spacial cognitive function. However, such asymmetrical function is not specific in human but also in the various animals. The left-sided planned (skilled) behavior is one of the most well-studied lateralized function, and it has been revealed that dorsolateral striatum (DLS) plays an important role in behavioral transition from the goal-directed to the habitual. Functional inhibition of this brain area leads to inhibit the formation of the habit. These evidences would suggest the left hemispheric preference of the habitual behavior. In addition to it, the dopamine D2, not D1 receptor in DLS plays an important role in forming habits. Then, we examined how down regulation of D2R activity by microinjection of D2R-antagonist to rat DLS (left or right hemisphere) affects the habit formation. Experimental design was the place/response test with a plus-maze. As a result, the choice ratio of the response arm (habitual) remained low level through all trials in the left-injected group compared to the control group. Conversely, the habitualization of the right-injected group was significantly preceded. Thus, from present results, we concluded that the left DLS-D2 neurons have a higher contribution to the habit formation than the right one. This suggests left/right functional dissociation of the basal ganglia, at least rat striatum.