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## Striatopallidal NMDA-receptors control locomotor and conditioning behaviours.

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The basal ganglia (BG) are composed of several interconnected nuclei that have a critical role in goal-directed action selection, motor control, and habits. The striatum, the major input site of the BG, is predominantly composed of medium spiny neurons (MSN), which give rise to two projection circuits originating from two distinct populations of MSN: the striatonigral MSN (dMSN) give rise to the direct pathway and the striatopallidal MSN (iMSN) to the indirect pathway. Balanced activity between both pathways is crucial for harmonious functions of the BG. Imbalance of those two neuronal subpopulations is implicated in major neuropsychiatric disorders such as Parkinson and Huntington diseases as well as drug addiction. Despite the increasing knowledge concerning the key role of the striatal glutamate NMDA receptor (NMDA-R) for the BG physiology, it is still challenging to understand the specific functions of striatopallidal neuron NMDA-R. In this study, by a conditional deletion of the essential GluN1 subunit of NMDA-R specifically in striatopallidal neurons (cKO), the functions of the NMDA-R in the indirect pathway were adressed. At the cellular level, the deletion of GluN1 in iMSN leads to the reduced number and strength of the excitatory corticostriatopalidal synapses and the intrinsic electroresponsiveness of the iMSN was higher, reflecting an homeostatic adaptation partially compensating the reduced synaptic inputs. The behavioral consequence of the NMDA-R absence in iMSN is an aberrant action selection in goal directed behaviour, without alteration of motor learning but changing of motor strategy, as well as alteration in habituation and amphetamine locomotor sensitization. Taken together, these data indicate that the loss of NMDA-R in the striatopallidal neurons disrupts operant and habituation behaviours.

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