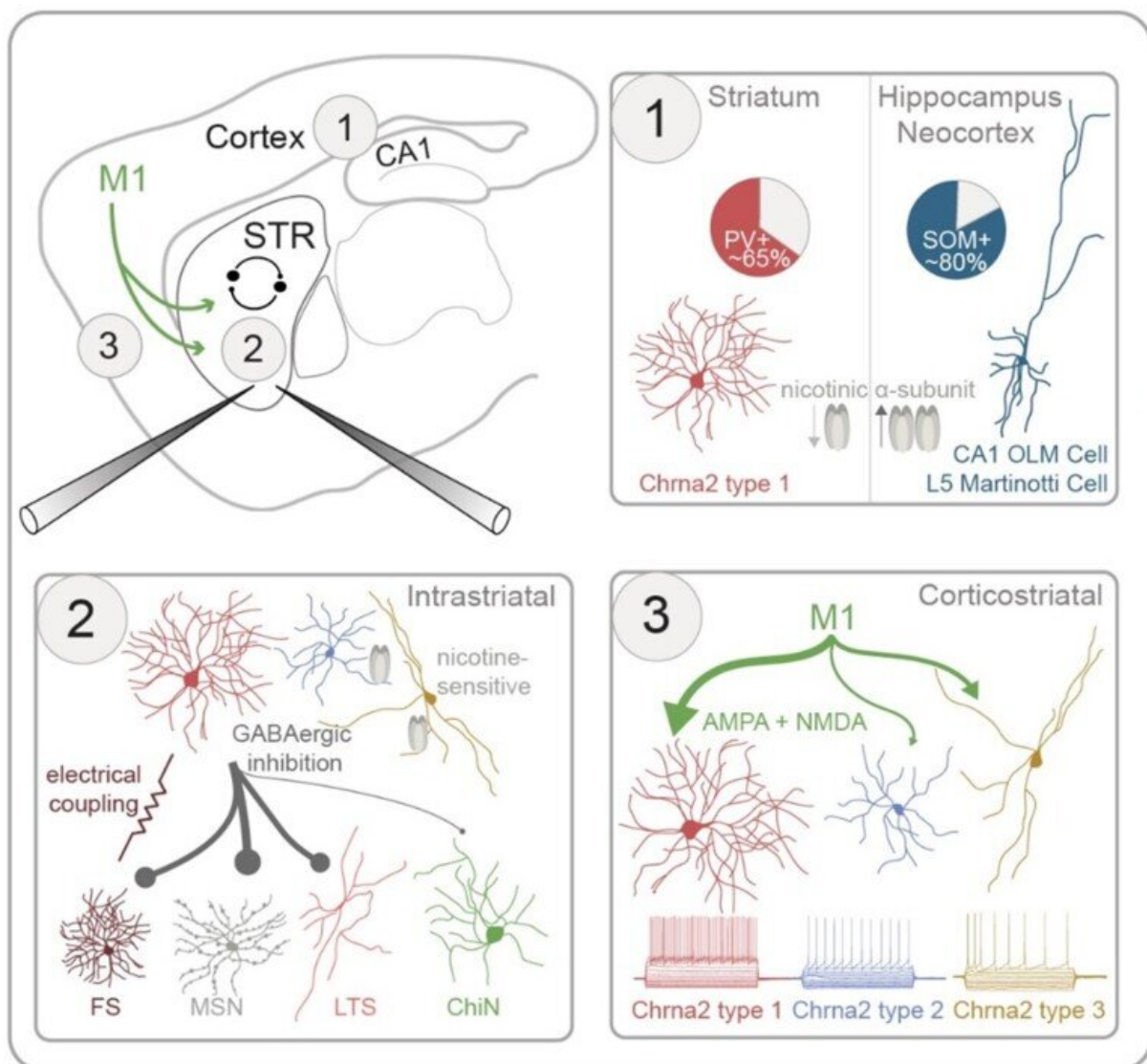


Synaptic connectivity of a novel cell population in the striatum

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Tokarska and Silberberg characterize the properties of striatal interneurons expressing *Chrna2*, the gene encoding for the nicotinic $\alpha 2$ receptor subunit. Using patch-clamp recordings they find that striatal *Chrna2*-interneurons form a diverse neuronal population, which is distinct from *Chrna2* neurons in other brain regions (1). Using optogenetics they then map their synaptic outputs (2) and inputs (3) within the striatal network. Credit: Anna Tokarska, Gilad Silberberg

A new study from the Department of Neuroscience at Karolinska Institutet characterizes a novel neuronal population in the basal ganglia, responsible for the interaction between two types of neurotransmitters, GABA and acetylcholine. The study was recently published in *Cell Reports*.

The striatum is the main input structure of the [basal ganglia](#), a brain region involved in a variety of sensorimotor functions and reinforcement learning. 99% of [striatal neurons](#) are inhibitory GABAergic cells, and the only exception is the population of cholinergic interneurons.

"In previous studies we have showed the interactions between cholinergic interneurons and the [dopamine system](#), and here we focused on the interactions between the cholinergic and GABAergic systems in the striatum," explains Gilad Silberberg, Professor at the Department of Neuroscience, and main author of the study.

The striatum is strongly modulated by acetylcholine and early treatment for Parkinson's disease was based on the cholinergic system. Cholinergic interneurons have been shown to change their activity in Parkinson's disease, Huntington's disease and in various forms of dyskinesia, all of which are disorders related to striatal function.

"Here we wanted to study how the cholinergic activity shapes striatal

activity via nicotine receptors, a specific receptor of acetylcholine," says Anna Tokarska, Ph.D. student in the Silberberg laboratory and first author of the study.

"To do that, we used [transgenic mice](#), marking the striatal interneurons expressing these [nicotinic receptors](#) through the *Chrna2* gene. We could then use various methods including patch-clamp and optogenetics, to characterize these neurons and their synaptic connectivity in the striatum," she continues.

The striatal *Chrna2* interneuron population was very diverse, including at least three main subpopulations with distinct anatomical and electrical properties. One population was of particular interest, showing novel characteristics including strong response to acetylcholine.

Future steps in this line of research will be to study this population in further detail, including its involvement in striatal function and dysfunction.

More information: Anna Tokarska et al, GABAergic interneurons expressing the $\alpha 2$ nicotinic receptor subunit are functionally integrated in the striatal microcircuit, *Cell Reports* (2022). [DOI: 10.1016/j.celrep.2022.110842](#)

Provided by Karolinska Institutet

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