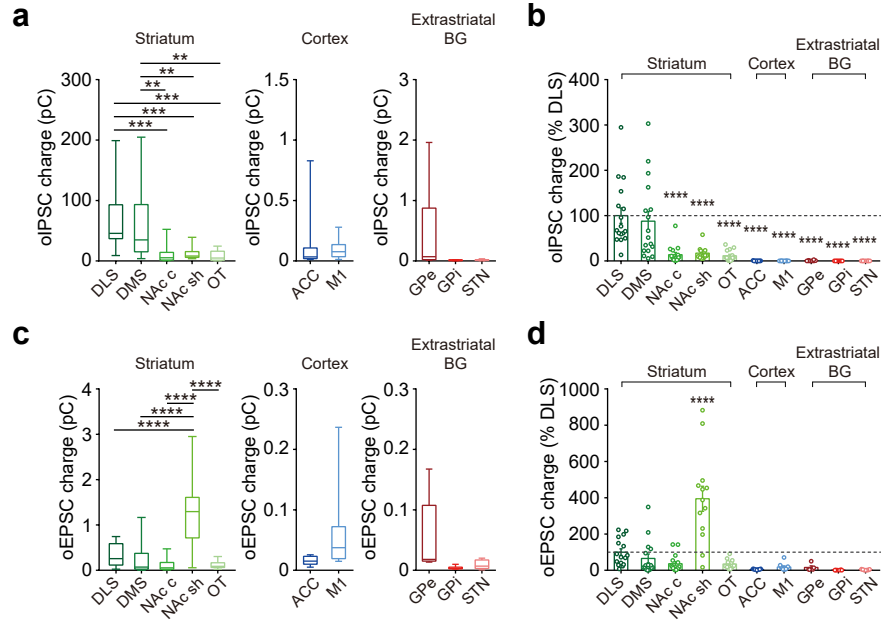
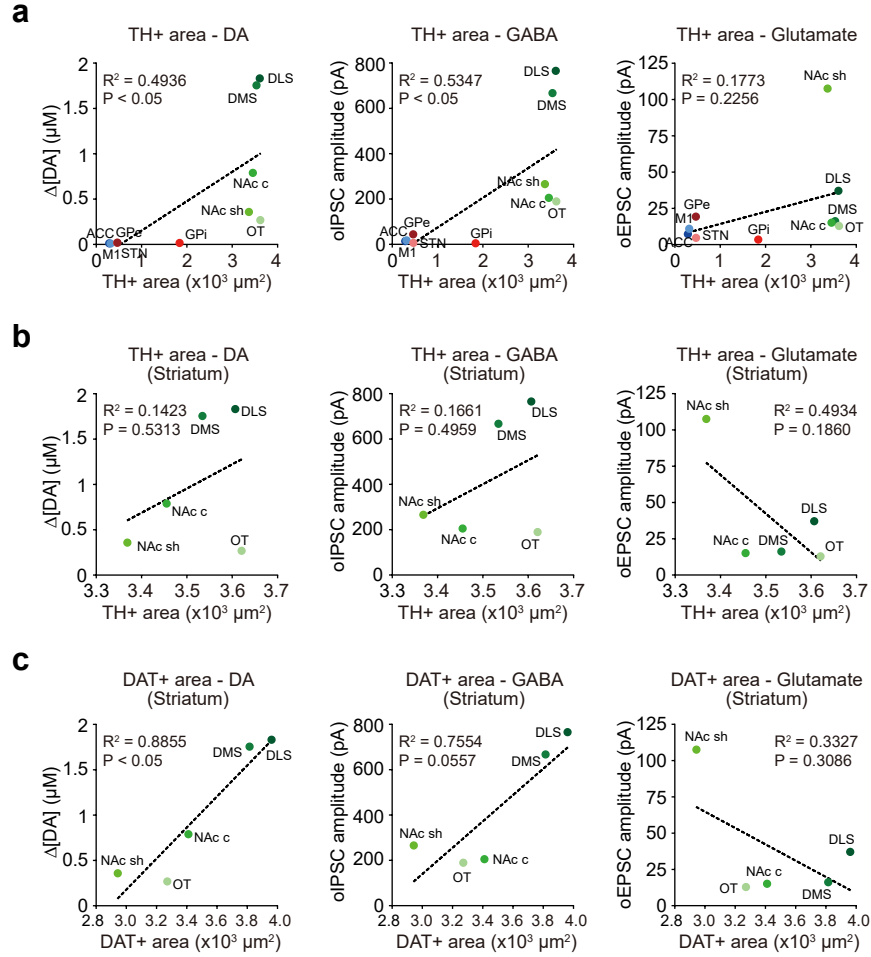
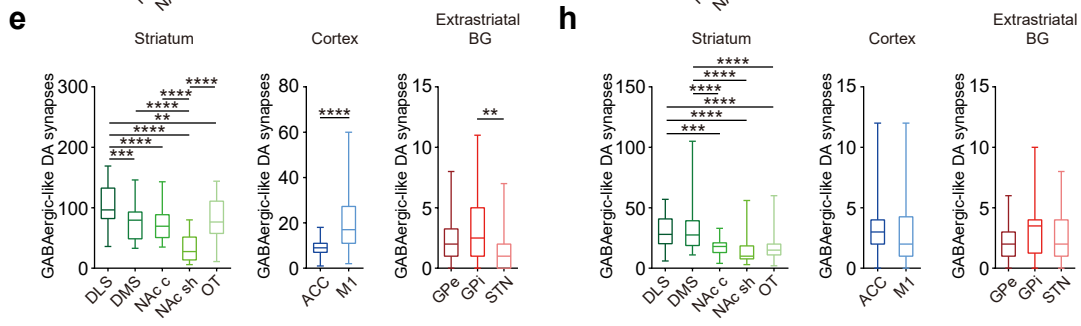
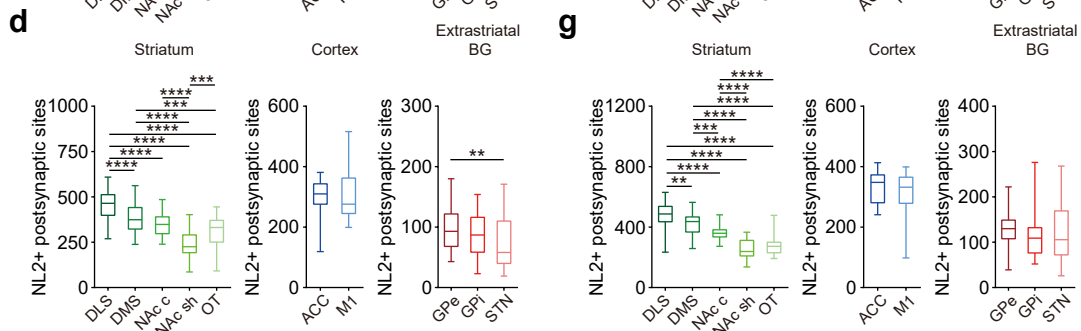
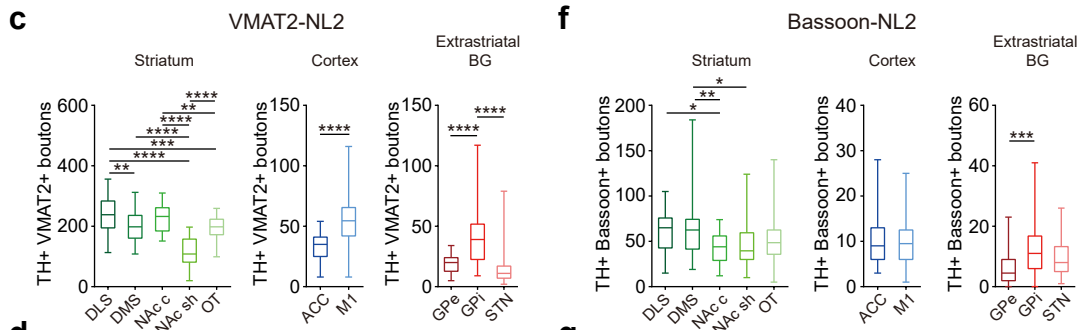
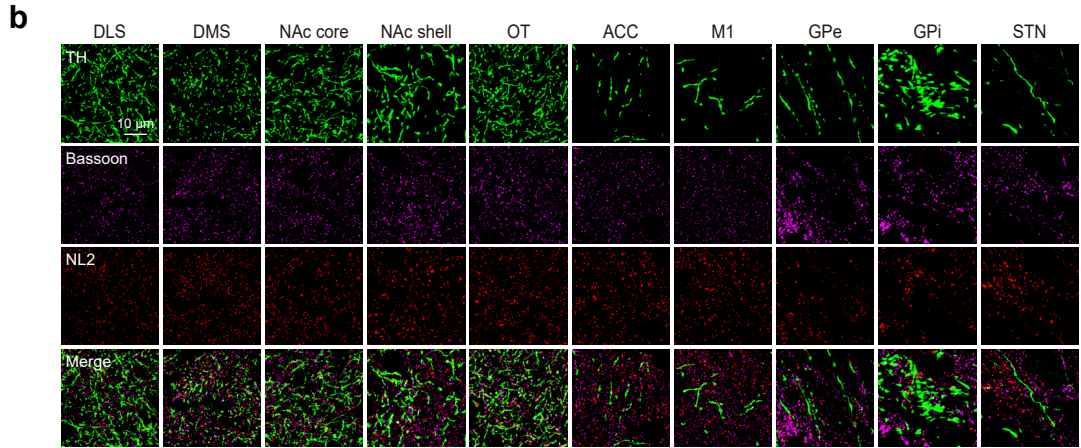
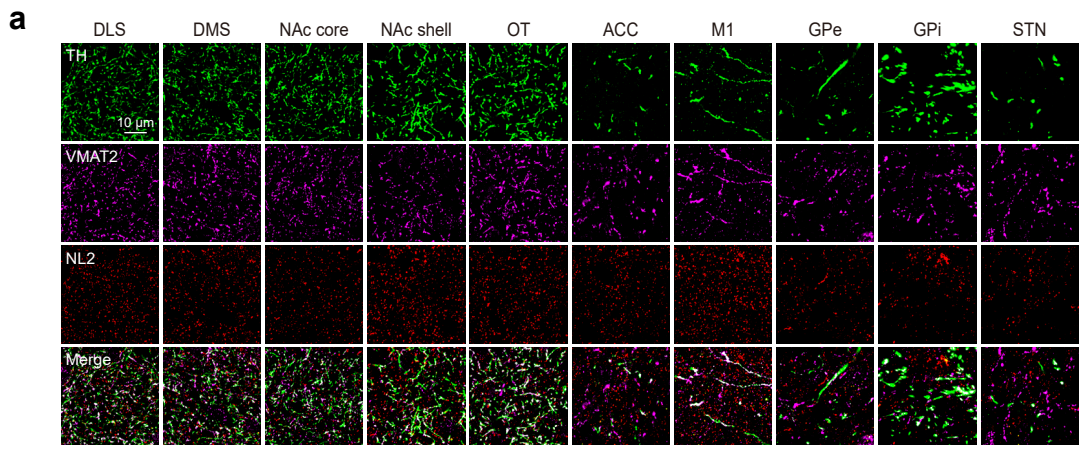




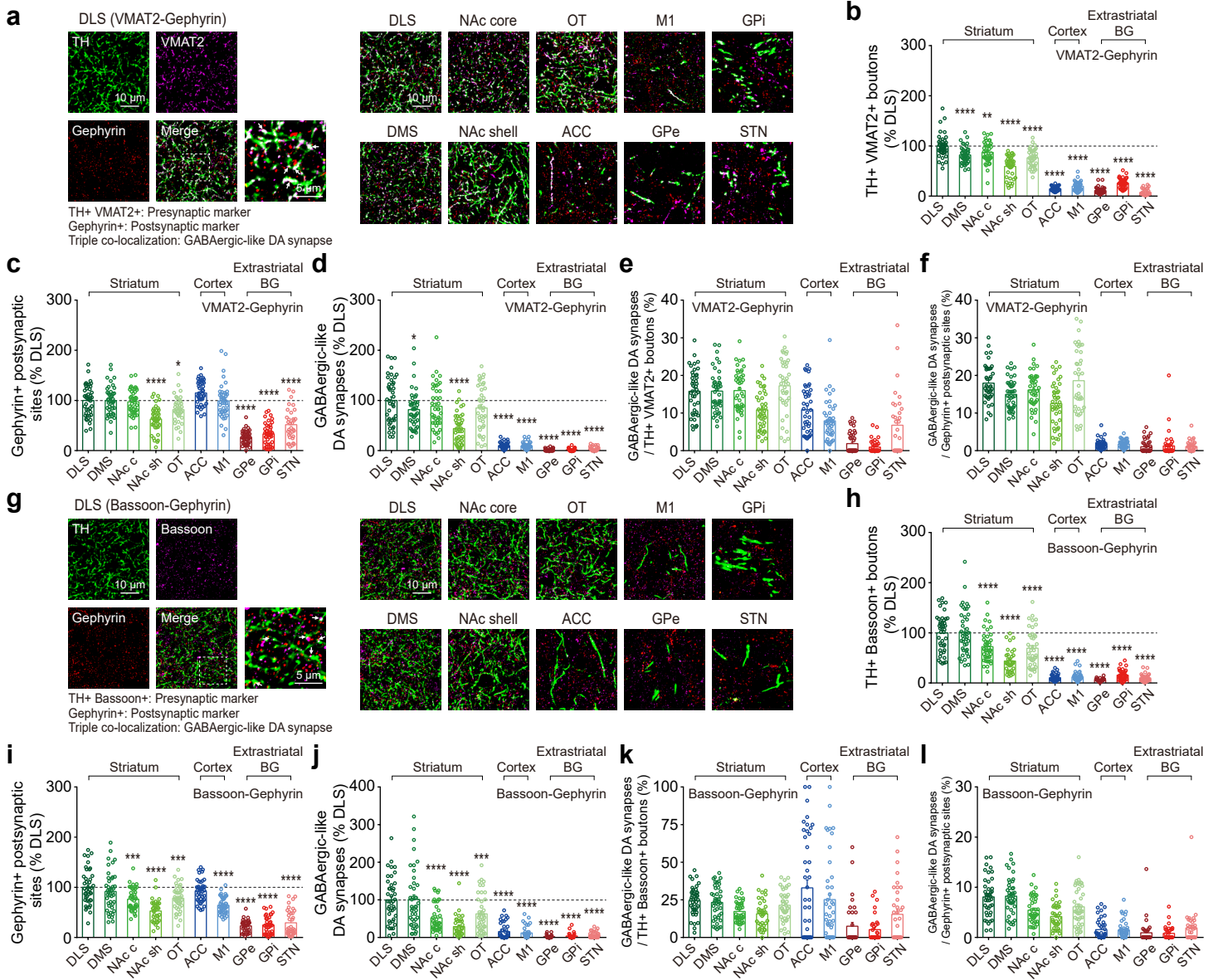
Extended Data Figure 1 | Brain-wide GABA and glutamate transmission at DA synapses. **a**, Summary statistics for oIPSC charge, Striatum (DLS, DMS: $n = 17$ cells; NAc core: $n = 16$ cells; NAc shell: $n = 13$ cells; OT: $n = 14$ cells; $P < 0.0001$), Cortex (ACC: $n = 9$ cells; M1: $n = 10$ cells; $P = 0.6847$), Extrastriatal BG (GPe, STN: $n = 8$ cells; GPi: $n = 7$ cells; $P = 0.0706$). **b**, Summary statistics for oIPSC charge from each brain region normalized by DLS ($P < 0.0001$). **c**, Summary statistics for oEPSC charge, Striatum (DLS, DMS, NAc core: $n = 16$ cells; NAc shell, OT: $n = 13$ cells; $P < 0.0001$), Cortex (ACC: $n = 9$ cells; M1: $n = 10$ cells; $P = 0.0622$), Extrastriatal BG (GPe: $n = 5$ cells; GPi: $n = 6$ cells; STN: $n = 7$ cells; $P = 0.0664$). **d**, Summary statistics for oEPSC charge from each brain region normalized by DLS ($P < 0.0001$). Statistical significance is determined by one-way ANOVA with post hoc Sidak's multiple comparison test, one-way ANOVA with post hoc Sidak's multiple comparison test (DLS as a control group), and unpaired t-test. Data are presented as box and whisker plot or mean $\pm$ SEM. $**P < 0.01$, $***P < 0.001$, $****P < 0.0001$.



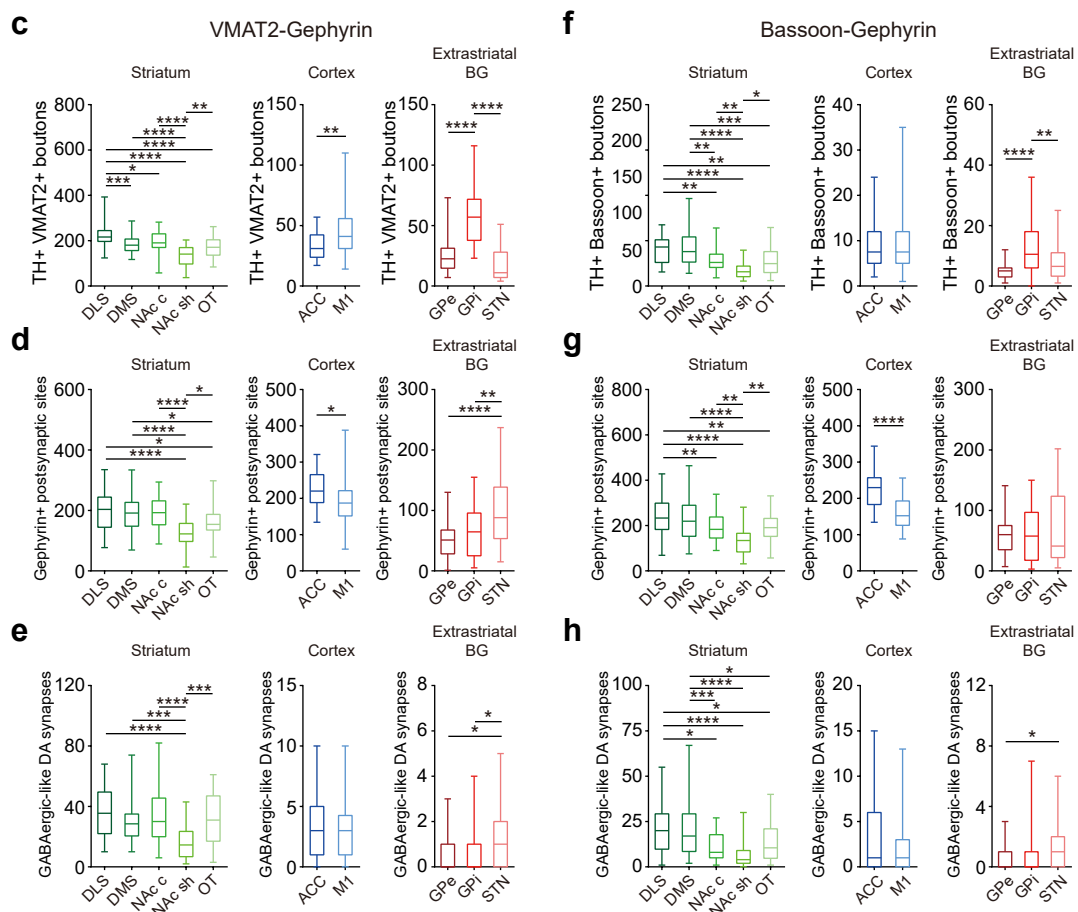
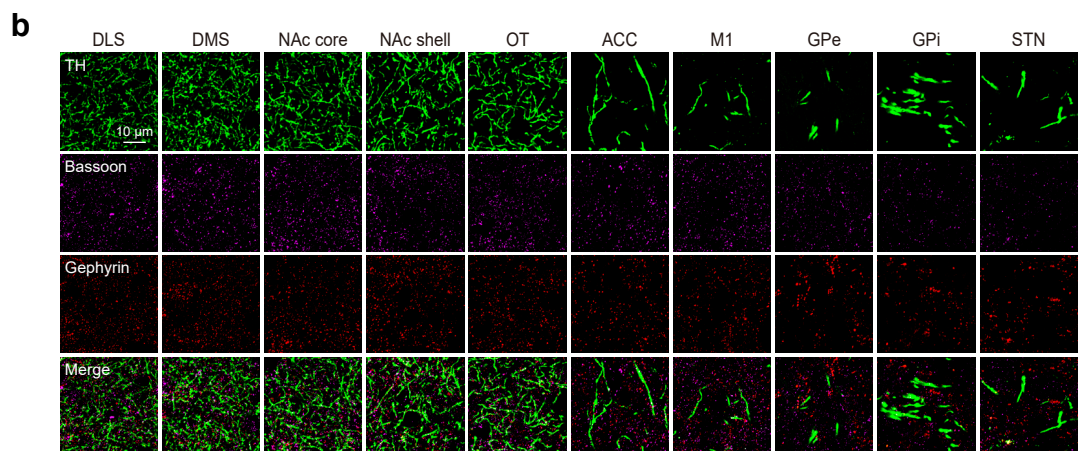
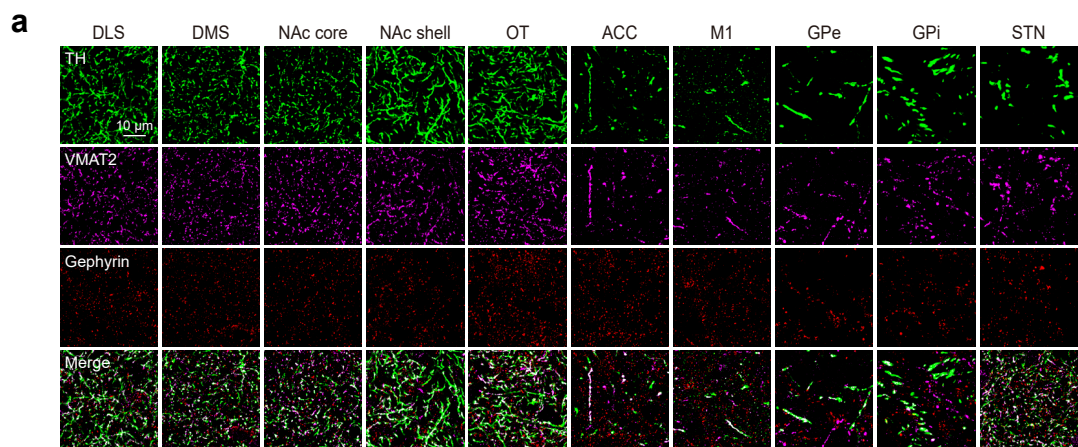
Extended Data Figure 2 | Correlation between DA axonal area and neurotransmitters release at DA synapses. a, Relationships between TH+ area and neurotransmitters release at DA synapses in the brain. **b,** Relationships between TH+ area and neurotransmitters release at striatal DA synapses. **c,** Relationships between DAT+ area and neurotransmitters release at striatal DA synapses.



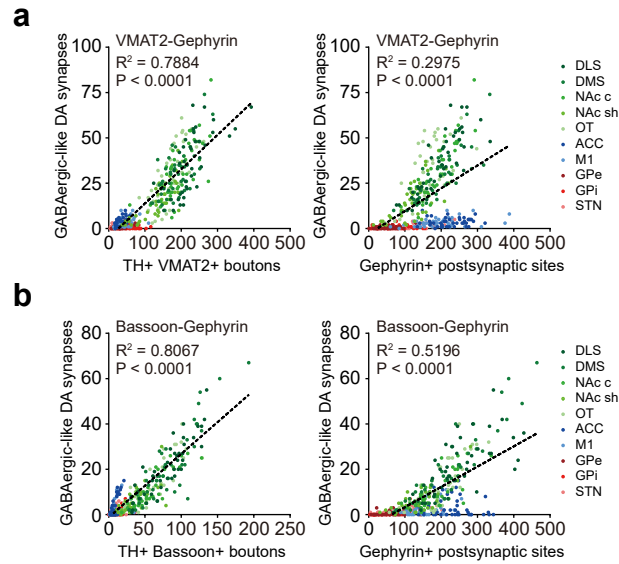
Extended Data Figure 3 | Brain-wide GABAergic-like DA synapses identified by using NL2 as a postsynaptic marker. **a**, Enhanced confocal fluorescence images exhibit brain-wide DA terminals and GABAergic-like DA synapses immunostained by TH, VMAT2, and NL2 antibodies in DAT-Cre mice. **b**, Brain-wide DA terminals and GABAergic-like DA synapses immunostained by TH, Bassoon, and NL2 antibodies in DAT-Cre mice. **c**, Summary statistics of the number of TH+, VMAT2+ boutons in the Striatum ($n = 42$ images; $P < 0.0001$), Cortex ($n = 42$ images; $P < 0.0001$), and Extrastriatal BG (GPe, GPi: $n = 42$ images; STN: $n = 39$ images; $P < 0.0001$). **d**, Summary statistics of the number of NL2+ postsynaptic sites in the Striatum ($P < 0.0001$), Cortex ($P = 0.7032$), and Extrastriatal BG ($P < 0.01$). **e**, Summary statistics of the number of GABAergic-like DA synapses (TH+ VMAT2+ NL2+) in the Striatum ($P < 0.0001$), Cortex ($P < 0.0001$), and Extrastriatal BG ($P < 0.01$). **f**, Summary statistics of the number of TH+, Bassoon+ boutons in the Striatum (DMS, NAc shell, OT: $n = 42$ images; DLS: $n = 40$ images; NAc core: $n = 39$ images; $P < 0.001$), Cortex ($n = 42$ images; $P = 0.8977$), and Extrastriatal BG (GPe, GPi: $n = 36$ images; STN: $n = 42$ images; $P < 0.001$). **g**, Summary statistics of the number of NL2+ postsynaptic sites in the Striatum ($P < 0.0001$), Cortex ($P = 0.1328$), and Extrastriatal BG ($P = 0.7261$). **h**, Summary statistics of the number of GABAergic-like DA synapses (TH+ Bassoon+ NL2+) in the Striatum ($P < 0.0001$), Cortex ($P = 0.9298$), and Extrastriatal BG ($P < 0.05$). Statistical significance is determined by one-way ANOVA with post hoc Sidak's multiple comparison test and unpaired t-test. Data are presented as box and whisker plot. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$, **** $P < 0.0001$.



Extended Data Figure 4 | Spatial distribution and characteristics of GABAergic-like DA synapses identified by using Gephyrin as a postsynaptic marker. **a**, Enhanced confocal fluorescence images of brain-wide DA terminals and synapses immunostained by TH, VMAT2, and Gephyrin antibodies (white arrow: triple co-localization). **b**, Summary statistics of TH+, VMAT2+ boutons from each brain region normalized by DLS (DLS, DMS, NAc core, NAc shell, ACC, M1, GPe, GPi; $n = 42$ images; OT: $n = 39$ images; STN: $n = 33$ images; $P < 0.0001$). **c**, Summary statistics of Gephyrin+ postsynaptic sites from each brain region normalized by DLS ($P < 0.0001$). **d**, Summary statistics of GABAergic-like DA synapses (TH+ VMAT2+ Gephyrin+) from each brain region normalized by DLS ($P < 0.0001$). **e**, Proportion of GABAergic-like DA synapses (TH+ VMAT2+ Gephyrin+) from TH+, VMAT2+ total presynaptic boutons. **f**, Proportion of GABAergic-like DA synapses (TH+ VMAT2+ Gephyrin+) from Gephyrin+ total GABAergic postsynaptic sites. **g**, Enhanced confocal fluorescence images of brain-wide DA terminals and synapses immunostained by TH, Bassoon, and Gephyrin antibodies. **h**, Summary statistics of TH+, Bassoon+ boutons from each brain region normalized by DLS (DLS, DMS, NAc core, OT, ACC, M1: $n = 42$ images; NAc shell, GPi, STN: $n = 36$ images; GPe: $n = 35$ images; $P < 0.0001$). **i**, Summary statistics of Gephyrin+ postsynaptic sites from each brain region normalized by DLS ($P < 0.0001$). **j**, Summary statistics of GABAergic-like DA synapses (TH+ Bassoon+ Gephyrin+) from each brain region normalized by DLS ($P < 0.0001$). **k**, Proportion of GABAergic-like DA synapses (TH+ Bassoon+ Gephyrin+) from TH+, Bassoon+ total presynaptic boutons. **l**, Proportion of GABAergic-like DA synapses (TH+ Bassoon+ Gephyrin+) from Gephyrin+ total GABAergic postsynaptic sites. Statistical significance is determined by one-way ANOVA with post hoc Sidak's multiple comparison test (DLS as a control group). Data are presented as mean $\pm$ SEM. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$, **** $P < 0.0001$.



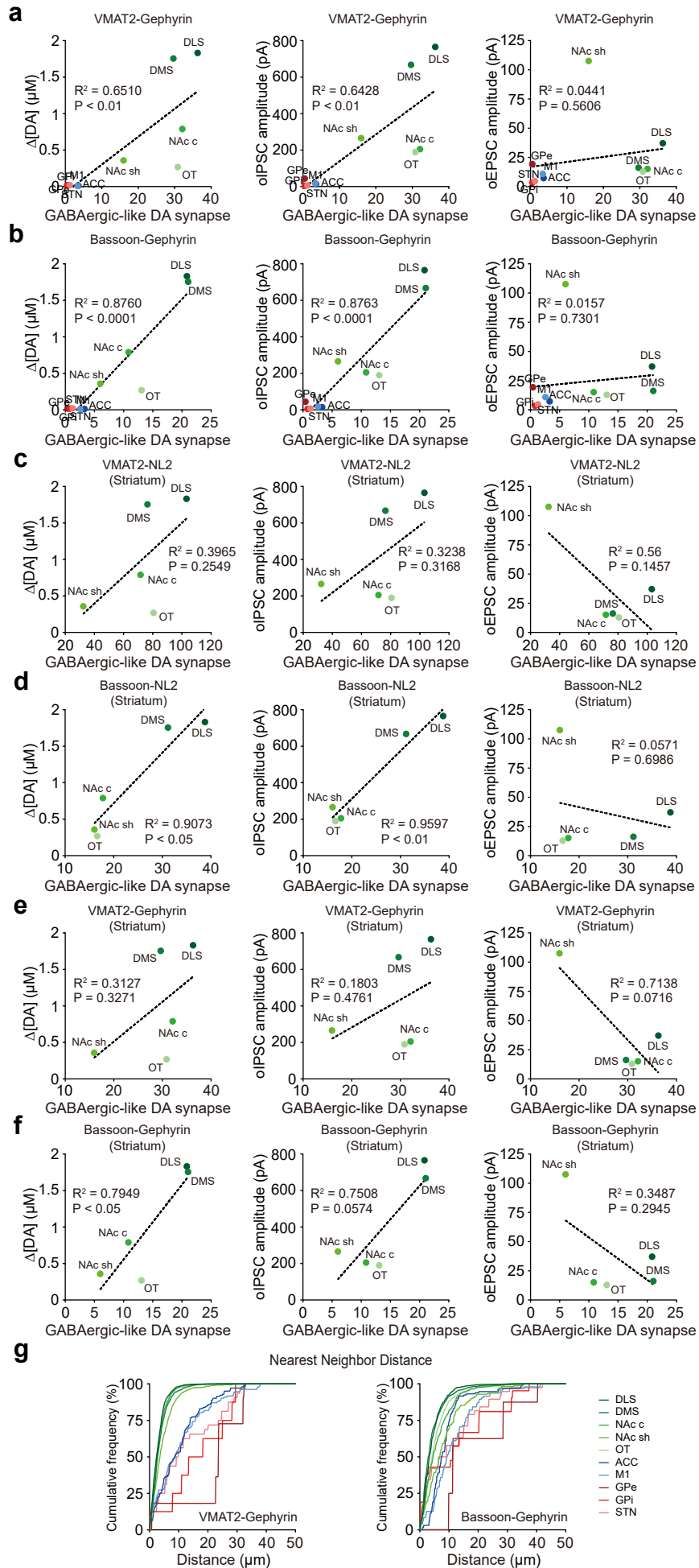
Extended Data Figure 5 | Brain-wide GABAergic-like DA synapses identified by using Gephyrin as a postsynaptic marker. **a**, Enhanced confocal fluorescence images exhibit brain-wide DA terminals and GABAergic-like DA synapses immunostained by TH, VMAT2, and Gephyrin antibodies in DAT-Cre mice. **b**, Brain-wide DA terminals and GABAergic-like DA synapses immunostained by TH, Bassoon, and Gephyrin antibodies in DAT-Cre mice. **c**, Summary statistics of the number of TH+, VMAT2+ boutons in the Striatum (DLS, DMS, NAc core, NAc shell: $n = 42$ images; OT: $n = 39$ images; $P < 0.0001$), Cortex ($n = 42$ images; $P < 0.01$), and Extrastriatal BG (GPe, GPi: $n = 42$ images; STN: $n = 33$ images; $P < 0.0001$). **d**, Summary statistics of the number of Gephyrin+ postsynaptic sites in the Striatum ($P < 0.0001$), Cortex ($P < 0.05$), and Extrastriatal BG ($P < 0.0001$). **e**, Summary statistics of the number of GABAergic-like DA synapses (TH+ VMAT2+ Gephyrin+) in the Striatum ($P < 0.0001$), Cortex ($P = 0.6483$), and Extrastriatal BG ($P < 0.01$). **f**, Summary statistics of the number of TH+, Bassoon+ boutons in the Striatum (DLS, DMS, NAc core, OT: $n = 42$ images; NAc shell: $n = 36$ images; $P < 0.0001$), Cortex ($n = 42$ images; $P = 0.4248$), and Extrastriatal BG (GPe: $n = 35$ images; GPi, STN: $n = 36$ images; $P < 0.0001$). **g**, Summary statistics of the number of Gephyrin+ postsynaptic sites in the Striatum ($P < 0.0001$), Cortex ($P < 0.0001$), and Extrastriatal BG ($P = 0.3681$). **h**, Summary statistics of the number of GABAergic-like DA synapses (TH+ Bassoon+ Gephyrin+) in the Striatum ($P < 0.0001$), Cortex ($P = 0.3906$), and Extrastriatal BG ($P < 0.05$). Statistical significance is determined by one-way ANOVA with post hoc Sidak's multiple comparison test and unpaired t-test. Data are presented as box and whisker plot. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$, **** $P < 0.0001$.



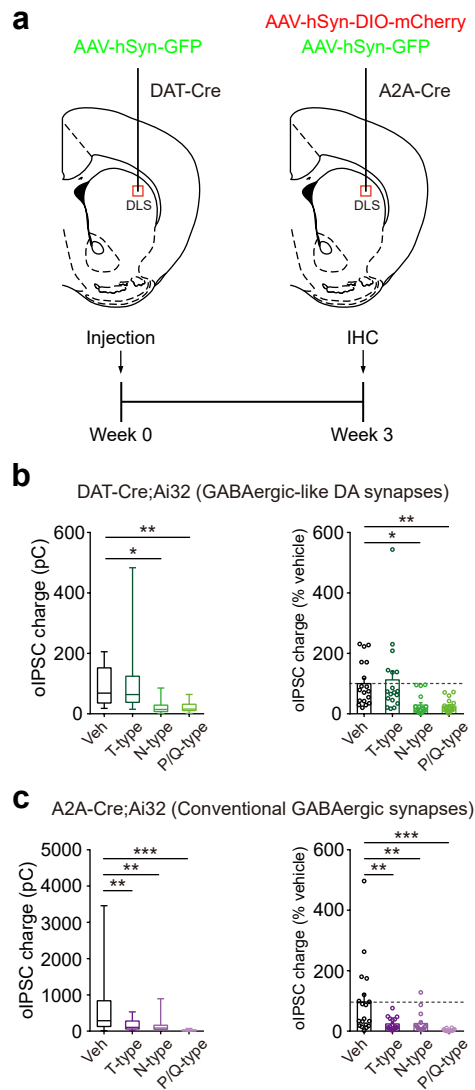
Extended Data Figure 6 | Brain-wide correlation analysis between GABAergic-like DA synapses and DA presynaptic boutons (or GABAergic postsynaptic sites).

a, Relationships between GABAergic-like DA synapses (TH+ VMAT2+ Gephyrin+) and DA presynaptic (TH+ VMAT2+) boutons (or Gephyrin+ postsynaptic sites).

b, Relationships between GABAergic-like DA synapses (TH+ Bassoon+ Gephyrin+) and DA presynaptic (TH+ Bassoon+) boutons (or Gephyrin+ postsynaptic sites).

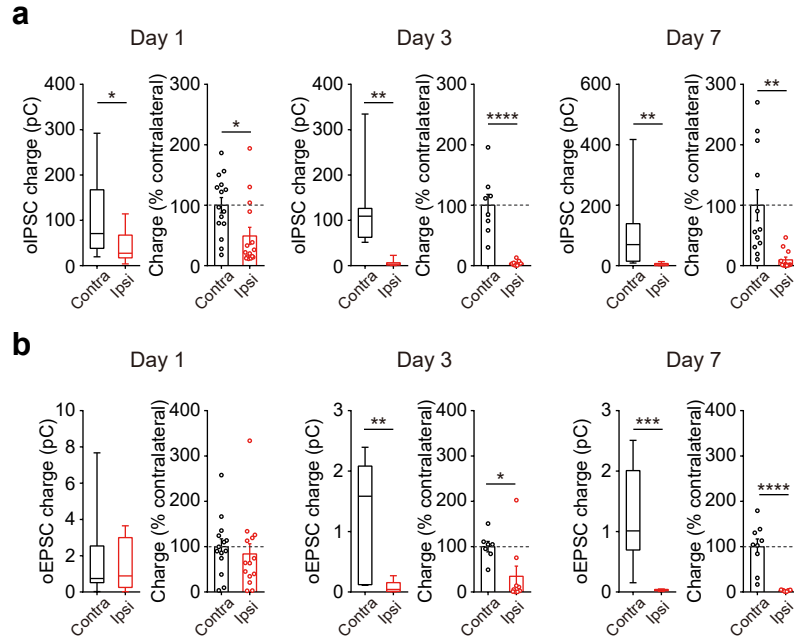


Extended Data Figure 7 | GABAergic-like DA synapses are strongly correlated with DA and GABA transmission in the brain. **a**, Relationships between GABAergic-like DA synapses (TH+ VMAT2+ Gephyrin+) and neurotransmitters release at DA synapses in the brain. **b**, Relationships between GABAergic-like DA synapses (TH+ Bassoon+ Gephyrin+) and neurotransmitters release at DA synapses in the brain. **c**, Relationships between GABAergic-like DA synapses (TH+ VMAT2+ NL2+) and neurotransmitters release at DA synapses in the striatum. **d**, Relationships between GABAergic-like DA synapses (TH+ Bassoon+ NL2+) and neurotransmitters release at DA synapses in the striatum. **e**, Relationships between GABAergic-like DA synapses (TH+ VMAT2+ Gephyrin+) and neurotransmitters release at DA synapses in the striatum. **f**, Relationships between GABAergic-like DA synapses (TH+ Bassoon+ Gephyrin+) and neurotransmitters release at DA synapses in the striatum. **g**, Cumulative frequency of the nearest neighbor distance among GABAergic-like DA synapses. VMAT2 (left) or Bassoon (right) are used as presynaptic markers and Gephyrin is used as a postsynaptic marker.



Extended Data Figure 8 | Spatial and functional properties of GABAergic-like DA synapses and conventional GABAergic synapses in the dorsal striatum.

a, Schematic illustration describing virus injection into DLS of DAT-Cre and A2A-Cre mice. **b**, Summary statistics of GABA transmission (olPSC charge) at GABAergic-like DA synapses, showing the effects of calcium channel blockers on GABA release (Vehicle, T-type blocker NNC 55-0396, N-type blocker ω -conotoxin: $n = 18$ cells; P/Q-type blocker ω -agatoxin: $n = 19$ cells; $P < 0.001$). **c**, Summary statistics of GABA transmission (olPSC charge) at conventional GABAergic synapses (iSPN to dSPN) (Vehicle: $n = 19$ cells; T-type, N-type blocker: $n = 17$ cells; P/Q-type blocker: $n = 14$ cells; $P < 0.001$). Statistical significance is determined by one-way ANOVA with post hoc Sidak's multiple comparison test (Vehicle as a control group). Data are presented as box and whisker plot or mean $\pm$ SEM. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.



Extended Data Figure 9 | Weakening of GABA and glutamate co-transmission in an animal model of Parkinsonism. **a**, Summary statistics of GABA transmission (oIPSC charge) (day 1: $n = 15$ cells, $P < 0.05$; day 3 contralateral: $n = 8$ cells, day 3 ipsilateral: $n = 9$ cells, $P < 0.01$; day 7: $n = 12$ cells, $P < 0.01$) and GABA transmission (oIPSC charge) normalized by contralateral hemisphere at DA synapses in 6-OHDA-injected mice (day 1: $P < 0.05$; day 3: $P < 0.0001$; day 7: $P < 0.01$). **b**, Summary statistics of glutamate transmission (oEPSC charge) (day 1: $n = 14$ cells, $P = 0.5380$; day 3 contralateral: $n = 7$ cells, day 3 ipsilateral: $n = 9$ cells, $P < 0.01$; day 7: $n = 9$ cells, $P < 0.001$) and glutamate transmission (oEPSC charge) normalized by contralateral hemisphere at DA synapses in 6-OHDA-injected mice (day 1: $P = 0.5747$; day 3: $P < 0.05$; day 7: $P < 0.0001$). Statistical significance is determined by unpaired t-test. Data are presented as box and whisker plot or mean $\pm$ SEM. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$, **** $P < 0.0001$.

FIGURE	DESCRIPTION	VALUE	N NUMBER	STATISTIC	P VALUE	POST TEST	POST TEST P VALUE
a	Schematic illustration	N/A	N/A	N/A	N/A	N/A	N/A
b	Representative immunostaining images	N/A	N/A	N/A	N/A	N/A	N/A
c	TH+ area (DLS)	3607 ± 43.44 μm ²	34 images / 6 mice	Ordinary one-way ANOVA Group effect, F(4, 164) = 2.467	< 0.05	Post hoc Sidak's test	> 0.05
	TH+ area (DMS)	3534 ± 65.86 μm ²	34 images / 6 mice				
	TH+ area (NAc c)	3455 ± 65.35 μm ²	34 images / 6 mice				
	TH+ area (NAc sh)	3369 ± 65.74 μm ²	34 images / 6 mice				
	TH+ area (OT)	3621 ± 90 μm ²	33 images / 6 mice				
	TH+ area (ACC)	286.70 ± 22.02 μm ²	34 images / 6 mice	t(66) = 1.137 (Unpaired t-test)	0.2596	N/A	N/A
d	TH+ area (M1)	317.20 ± 15.34 μm ²	34 images / 6 mice	Ordinary one-way ANOVA Group effect, F(2, 69) = 139.4	< 0.0001	Post hoc Sidak's test GPe vs. GPI GPI vs. STN	< 0.0001 < 0.0001 < 0.0001
	TH+ area (GPe)	461.80 ± 33.35 μm ²	24 images / 4 mice				
	TH+ area (GPI)	1840 ± 107.30 μm ²	24 images / 4 mice				
	TH+ area (STN)	466.30 ± 31.01 μm ²	24 images / 4 mice				
	DAT+ area (DLS)	3961 ± 70.09 μm ²	34 images / 6 mice				
	DAT+ area (DMS)	3816 ± 86.25 μm ²	34 images / 6 mice				
DAT+ area (NAc c)	3411 ± 58.57 μm ²	34 images / 6 mice					
DAT+ area (NAc sh)	2943 ± 61.47 μm ²	34 images / 6 mice					
DAT+ area (OT)	3271 ± 55.09 μm ²	33 images / 6 mice					
e	DAT+ area (ACC)	145.40 ± 18.63 μm ²	34 images / 6 mice	Ordinary one-way ANOVA Group effect, F(2, 69) = 125.1	< 0.0001	Post hoc Sidak's test GPe vs. GPI GPI vs. STN	< 0.0001 < 0.0001 < 0.0001
	DAT+ area (M1)	155.60 ± 22.29 μm ²	34 images / 6 mice				
	DAT+ area (GPe)	493.10 ± 42.77 μm ²	24 images / 4 mice				
	DAT+ area (GPI)	1555 ± 90.78 μm ²	24 images / 4 mice				
	DAT+ area (STN)	330.40 ± 23.25 μm ²	24 images / 4 mice				
	TH+ area compared to DLS (DLS)	100 ± 1.20 %	34 images / 6 mice	Ordinary one-way ANOVA Group effect, F(9, 299) = 681.8	< 0.0001	Post hoc Sidak's test DLS vs. NAc sh DLS vs. ACC DLS vs. M1 DLS vs. GPe DLS vs. GPI DLS vs. STN	< 0.05 < 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001
TH+ area compared to DLS (DMS)	97.99 ± 1.83 %	34 images / 6 mice					
TH+ area compared to DLS (NAc c)	95.80 ± 1.81 %	34 images / 6 mice					
TH+ area compared to DLS (NAc sh)	93.40 ± 1.82 %	34 images / 6 mice					
TH+ area compared to DLS (OT)	100.40 ± 2.50 %	33 images / 6 mice					
f	TH+ area compared to DLS (ACC)	7.95 ± 0.61 %	34 images / 6 mice	Ordinary one-way ANOVA Group effect, F(9, 299) = 777.9	< 0.0001	Post hoc Sidak's test DLS vs. NAc DLS vs. NAc sh DLS vs. OT DLS vs. ACC DLS vs. M1 DLS vs. GPe DLS vs. GPI DLS vs. STN	< 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001
	TH+ area compared to DLS (M1)	8.80 ± 0.43 %	34 images / 6 mice				
	TH+ area compared to DLS (GPe)	12.80 ± 0.92 %	24 images / 4 mice				
	TH+ area compared to DLS (GPI)	51.01 ± 2.98 %	24 images / 4 mice				
	TH+ area compared to DLS (STN)	12.93 ± 0.86 %	24 images / 4 mice				
	DAT+ area compared to DLS (DLS)	100 ± 1.77 %	34 images / 6 mice	Ordinary one-way ANOVA Group effect, F(9, 299) = 777.9	< 0.0001	Post hoc Sidak's test DLS vs. NAc DLS vs. NAc sh DLS vs. OT DLS vs. ACC DLS vs. M1 DLS vs. GPe DLS vs. GPI DLS vs. STN	< 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001
DAT+ area compared to DLS (DMS)	96.34 ± 2.18 %	34 images / 6 mice					
DAT+ area compared to DLS (NAc c)	86.11 ± 1.48 %	34 images / 6 mice					
DAT+ area compared to DLS (NAc sh)	74.31 ± 1.55 %	34 images / 6 mice					
DAT+ area compared to DLS (OT)	82.59 ± 1.39 %	33 images / 6 mice					
g	DAT+ area compared to DLS (ACC)	3.67 ± 0.47 %	34 images / 6 mice	Ordinary one-way ANOVA Group effect, F(2, 33) = 0.4634	0.6332	Post hoc Sidak's test	> 0.05
	DAT+ area compared to DLS (M1)	3.93 ± 0.56 %	34 images / 6 mice				
	DAT+ area compared to DLS (GPe)	12.45 ± 1.08 %	24 images / 4 mice				
	DAT+ area compared to DLS (GPI)	39.26 ± 2.29 %	24 images / 4 mice				
	DAT+ area compared to DLS (STN)	8.34 ± 0.59 %	24 images / 4 mice				
	h	Schematic illustration	N/A	N/A	N/A	N/A	N/A
i	Representative FSCV recording traces in brain regions	N/A	N/A	N/A	N/A	N/A	N/A
	DA peak amplitude (DLS)	1.83 ± 0.12 μM	24 slices / 4 mice	Ordinary one-way ANOVA Group effect, F(4, 100) = 83.81	< 0.0001	Post hoc Sidak's test DLS vs. NAc c DLS vs. NAc sh DLS vs. OT DMS vs. NAc c DMS vs. NAc sh DMS vs. OT NAc c vs. NAc sh NAc c vs. OT	< 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.01 < 0.0001
	DA peak amplitude (DMS)	1.76 ± 0.07 μM	18 slices / 3 mice				
	DA peak amplitude (NAc c)	0.79 ± 0.08 μM	22 slices / 4 mice				
	DA peak amplitude (NAc sh)	0.36 ± 0.04 μM	17 slices / 3 mice				
	DA peak amplitude (OT)	0.27 ± 0.05 μM	24 slices / 4 mice				
DA peak amplitude (ACC)	10.47 ± 1.56 nM	11 slices / 2 mice	t(27) = 0.6742 (Unpaired t-test)	0.5059	N/A	N/A	
j	DA peak amplitude (M1)	11.72 ± 1.09 nM	18 slices / 3 mice	Ordinary one-way ANOVA Group effect, F(9, 162) = 111	< 0.0001	Post hoc Sidak's test DLS vs. NAc c DLS vs. NAc sh DLS vs. OT DLS vs. ACC DLS vs. M1 DLS vs. GPe DLS vs. GPI DLS vs. STN	< 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001
	DA peak amplitude (GPe)	18.45 ± 1.47 nM	12 slices / 2 mice				
	DA peak amplitude (GPI)	16.59 ± 2.41 nM	12 slices / 4 mice				
	DA peak amplitude (STN)	19.61 ± 2.67 nM	12 slices / 3 mice				
	DA peak amplitude compared to DLS (DLS)	100 ± 6.70 %	24 slices / 4 mice				
	DA peak amplitude compared to DLS (DMS)	95.81 ± 4.01 %	18 slices / 3 mice				
k	DA peak amplitude compared to DLS (NAc c)	43.12 ± 4.15 %	22 slices / 4 mice	Ordinary one-way ANOVA Group effect, F(2, 20) = 3.697	< 0.05	Post hoc Sidak's test	> 0.05
	DA peak amplitude compared to DLS (NAc sh)	19.56 ± 2.13 %	17 slices / 3 mice				
	DA peak amplitude compared to DLS (OT)	14.64 ± 2.52 %	24 slices / 4 mice				
	DA peak amplitude compared to DLS (ACC)	0.57 ± 0.09 %	11 slices / 2 mice				
	DA peak amplitude compared to DLS (M1)	0.64 ± 0.06 %	18 slices / 3 mice				
	DA peak amplitude compared to DLS (GPe)	1.01 ± 0.08 %	12 slices / 2 mice				
l	DA peak amplitude compared to DLS (GPI)	0.87 ± 0.12 %	12 slices / 4 mice	Ordinary one-way ANOVA Group effect, F(4, 72) = 7.819	< 0.0001	Post hoc Sidak's test DLS vs. NAc c DLS vs. NAc sh DLS vs. OT DMS vs. NAc c DMS vs. OT	< 0.01 < 0.01 < 0.01 < 0.05 < 0.05
	DA peak amplitude compared to DLS (STN)	1.07 ± 0.15 %	12 slices / 3 mice				
	oIPSC amplitude (DLS)	765.40 ± 100.80 pA	17 cells / 5 mice				
	oIPSC amplitude (DMS)	667.40 ± 148.60 pA	17 cells / 5 mice				
	oIPSC amplitude (NAc c)	205 ± 64.94 pA	16 cells / 3 mice				
	oIPSC amplitude (NAc sh)	265.60 ± 67.28 pA	13 cells / 4 mice				
oIPSC amplitude (OT)	189.70 ± 59.23 pA	14 cells / 5 mice					
m	oIPSC amplitude (ACC)	14.10 ± 2.97 pA	9 cells / 2 mice	Ordinary one-way ANOVA Group effect, F(2, 33) = 0.4634	0.6332	Post hoc Sidak's test	> 0.05
	oIPSC amplitude (M1)	17.48 ± 3.31 pA	10 cells / 2 mice				
	oIPSC amplitude (GPe)	44.21 ± 19.29 pA	8 cells / 2 mice				
	oIPSC amplitude (GPI)	4.92 ± 0.71 pA	7 cells / 3 mice				
	oIPSC amplitude (STN)	6.42 ± 1.21 pA	8 cells / 2 mice				
	oIPSC amplitude compared to DLS (DLS)	100 ± 13.18 %	17 cells / 5 mice	Ordinary one-way ANOVA Group effect, F(9, 109) = 10.48	< 0.0001	Post hoc Sidak's test DLS vs. NAc c DLS vs. NAc sh DLS vs. OT DLS vs. ACC DLS vs. M1 DLS vs. GPe DLS vs. GPI DLS vs. STN	< 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001 < 0.0001
oIPSC amplitude compared to DLS (DMS)	87.19 ± 19.42 %	17 cells / 5 mice					
oIPSC amplitude compared to DLS (NAc c)	26.79 ± 8.48 %	16 cells / 3 mice					
oIPSC amplitude compared to DLS (NAc sh)	34.70 ± 8.79 %	13 cells / 4 mice					
oIPSC amplitude compared to DLS (OT)	24.78 ± 7.74 %	14 cells / 5 mice					
oIPSC amplitude compared to DLS (ACC)	1.84 ± 0.39 %	9 cells / 2 mice					
oIPSC amplitude compared to DLS (M1)	2.28 ± 0.43 %	10 cells / 2 mice					
oIPSC amplitude compared to DLS (GPe)	5.78 ± 2.52 %	8 cells / 2 mice					
oIPSC amplitude compared to DLS (GPI)	0.64 ± 0.09 %	7 cells / 3 mice					
oIPSC amplitude compared to DLS (STN)	0.84 ± 0.16 %	8 cells / 2 mice					
n	Representative oEPSC traces in brain regions	N/A	N/A	N/A	N/A	N/A	N/A
	oEPSC amplitude (DLS)	37.08 ± 5.22 pA	16 cells / 5 mice	Ordinary one-way ANOVA		Post hoc Sidak's test	

1	o	oEPSC amplitude (DMS)	16.19 ± 4.99 pA	16 cells / 5 mice	Group effect, F(4, 69) = 26.92	< 0.0001	DLS vs. NAc sh	< 0.0001															
		oEPSC amplitude (NAc c)	15.14 ± 3.63 pA	16 cells / 3 mice					DMS vs. NAc sh	< 0.0001													
		oEPSC amplitude (NAc sh)	107.60 ± 15.88 pA	13 cells / 4 mice					NAc c vs. NAc sh	< 0.0001													
		oEPSC amplitude (OT)	12.89 ± 1.95 pA	13 cells / 5 mice					NAc sh vs. OT	< 0.0001													
		oEPSC amplitude (ACC)	7.21 ± 0.48 pA	9 cells / 2 mice	t(17) = 2.621 (Unpaired t-test)	< 0.05	N/A	N/A															
		oEPSC amplitude (M1)	10.96 ± 1.28 pA	10 cells / 2 mice																			
		oEPSC amplitude (GPe)	19.29 ± 10.38 pA	5 cells / 2 mice					Ordinary one-way ANOVA														
		oEPSC amplitude (GPI)	3.45 ± 0.56 pA	6 cells / 3 mice						Group effect, F(2, 15) = 2.86													
		oEPSC amplitude (STN)	4.67 ± 0.85 pA	7 cells / 2 mice	0.0887	Post hoc Sidak's test	> 0.05																
		p	oEPSC amplitude compared to DLS (DLS)	100 ± 14.09 %				16 cells / 5 mice	Ordinary one-way ANOVA	< 0.0001	Post hoc Sidak's test	< 0.0001											
oEPSC amplitude compared to DLS (DMS)			43.65 ± 13.45 %	16 cells / 5 mice				Group effect, F(9, 101) = 20.5					DLS vs. DMS	< 0.05									
oEPSC amplitude compared to DLS (NAc c)			40.82 ± 9.79 %	16 cells / 3 mice											DLS vs. ACC	< 0.05							
oEPSC amplitude compared to DLS (NAc sh)	290 ± 42.82 %		13 cells / 4 mice	DLS vs. GPI	< 0.05																		
oEPSC amplitude compared to DLS (OT)	34.76 ± 5.25 %		13 cells / 5 mice			DLS vs. STN	< 0.05																
oEPSC amplitude compared to DLS (ACC)	19.45 ± 1.29 %		9 cells / 2 mice																				
oEPSC amplitude compared to DLS (M1)	29.56 ± 3.46 %		10 cells / 2 mice																				
oEPSC amplitude compared to DLS (GPe)	52.03 ± 28 %		5 cells / 2 mice																				
oEPSC amplitude compared to DLS (GPI)	9.31 ± 1.51 %		6 cells / 3 mice																				
oEPSC amplitude compared to DLS (STN)	12.60 ± 2.29 %	7 cells / 2 mice																					
q	Relationships between DA - GABA, DA - glutamate, glutamate - GABA	N/A	N/A					Linear regression DA - GABA: R ² = 0.9524 DA - glutamate: R ² = 0.0229 glutamate - GABA: R ² = 0.0848	< 0.0001 0.6761 0.4142	N/A	N/A												
r	Relationships between DAT+ area - DA, DAT+ area - GABA, DAT+ area - glutamate	N/A	N/A					Linear regression DAT+ area - DA: R ² = 0.6383 DAT+ area - GABA: R ² = 0.6639 DAT+ area - glutamate: R ² = 0.1360	< 0.01 < 0.01 0.2944	N/A	N/A												
2	a	Representative immunostaining images	N/A	N/A	N/A			N/A	N/A	N/A													
	b	Number of TH+ VMAT2+ boutons compared to DLS (DLS)	100 ± 3.50 %	42 images / 3 mice	Ordinary one-way ANOVA	< 0.0001	Post hoc Sidak's test	< 0.0001															
		Number of TH+ VMAT2+ boutons compared to DLS (DMS)	85.28 ± 3.16 %	42 images / 3 mice					Group effect, F(9, 407) = 285	DLS vs. DMS	< 0.0001												
		Number of TH+ VMAT2+ boutons compared to DLS (NAc c)	97.26 ± 2.97 %	42 images / 3 mice								DLS vs. NAc sh	< 0.0001										
		Number of TH+ VMAT2+ boutons compared to DLS (NAc sh)	46.88 ± 3 %	42 images / 3 mice										DLS vs. OT	< 0.0001								
		Number of TH+ VMAT2+ boutons compared to DLS (OT)	82.67 ± 2.41 %	42 images / 3 mice												DLS vs. ACC	< 0.0001						
		Number of TH+ VMAT2+ boutons compared to DLS (ACC)	14.11 ± 0.70 %	42 images / 3 mice														DLS vs. M1	< 0.0001				
		Number of TH+ VMAT2+ boutons compared to DLS (M1)	22.44 ± 1.42 %	42 images / 3 mice																DLS vs. GPe	< 0.0001		
		Number of TH+ VMAT2+ boutons compared to DLS (GPe)	8.05 ± 0.53 %	42 images / 3 mice																		DLS vs. GPI	< 0.0001
		Number of TH+ VMAT2+ boutons compared to DLS (GPI)	17.72 ± 1.65 %	42 images / 3 mice																			
Number of TH+ VMAT2+ boutons compared to DLS (STN)	7.13 ± 1.19 %	39 images / 3 mice																					
c	Number of NL2+ postsynaptic sites compared to DLS (DLS)	100 ± 2.78 %	42 images / 3 mice	Ordinary one-way ANOVA	< 0.0001	Post hoc Sidak's test	< 0.0001																
	Number of NL2+ postsynaptic sites compared to DLS (DMS)	82.64 ± 2.69 %	42 images / 3 mice					Group effect, F(9, 407) = 168.5	DLS vs. DMS	< 0.0001													
	Number of NL2+ postsynaptic sites compared to DLS (NAc c)	74.44 ± 2.01 %	42 images / 3 mice								DLS vs. NAc c	< 0.0001											
	Number of NL2+ postsynaptic sites compared to DLS (NAc sh)	51.61 ± 2.41 %	42 images / 3 mice										DLS vs. NAc sh	< 0.0001									
	Number of NL2+ postsynaptic sites compared to DLS (OT)	67.43 ± 2.65 %	42 images / 3 mice												DLS vs. OT	< 0.0001							
	Number of NL2+ postsynaptic sites compared to DLS (ACC)	65.28 ± 2.03 %	42 images / 3 mice														DLS vs. ACC	< 0.0001					
	Number of NL2+ postsynaptic sites compared to DLS (M1)	66.62 ± 2.87 %	42 images / 3 mice																DLS vs. M1	< 0.0001			
	Number of NL2+ postsynaptic sites compared to DLS (GPe)	21.68 ± 1.15 %	42 images / 3 mice																		DLS vs. GPe	< 0.0001	
	Number of NL2+ postsynaptic sites compared to DLS (GPI)	19.09 ± 1.16 %	42 images / 3 mice																				DLS vs. GPI
Number of NL2+ postsynaptic sites compared to DLS (STN)	15.40 ± 1.37 %	39 images / 3 mice	DLS vs. STN	< 0.0001																			
d	Number of GABAergic-like DA synapses compared to DLS (DLS)	100 ± 5.32 %			42 images / 3 mice	Ordinary one-way ANOVA	< 0.0001	Post hoc Sidak's test	< 0.0001														
	Number of GABAergic-like DA synapses compared to DLS (DMS)	74.05 ± 4.49 %			42 images / 3 mice					Group effect, F(9, 407) = 143.1	DLS vs. DMS	< 0.0001											
	Number of GABAergic-like DA synapses compared to DLS (NAc c)	69.48 ± 3.41 %			42 images / 3 mice								DLS vs. NAc c	< 0.0001									
	Number of GABAergic-like DA synapses compared to DLS (NAc sh)	31.39 ± 3.11 %			42 images / 3 mice										DLS vs. NAc sh	< 0.0001							
	Number of GABAergic-like DA synapses compared to DLS (OT)	78.07 ± 4.94 %			42 images / 3 mice												DLS vs. OT	< 0.0001					
	Number of GABAergic-like DA synapses compared to DLS (ACC)	8.75 ± 0.48 %			42 images / 3 mice														DLS vs. ACC	< 0.0001			
	Number of GABAergic-like DA synapses compared to DLS (M1)	19.16 ± 1.86 %			42 images / 3 mice																DLS vs. M1	< 0.0001	
	Number of GABAergic-like DA synapses compared to DLS (GPe)	2.17 ± 0.29 %			42 images / 3 mice																		DLS vs. GPe
	Number of GABAergic-like DA synapses compared to DLS (GPI)	2.98 ± 0.45 %	42 images / 3 mice	DLS vs. GPI	< 0.0001																		
Number of GABAergic-like DA synapses compared to DLS (STN)	1.32 ± 0.23 %	39 images / 3 mice	DLS vs. STN			< 0.0001																	
e	Proportion of GABAergic-like DA synapses out of TH+ VMAT2+ boutons (DLS)	42.69 ± 1.11 %					42 images / 3 mice	N/A	N/A	N/A	N/A												
	Proportion of GABAergic-like DA synapses out of TH+ VMAT2+ boutons (DMS)	37.23 ± 1.30 %					42 images / 3 mice																
	Proportion of GABAergic-like DA synapses out of TH+ VMAT2+ boutons (NAc c)	31.07 ± 1 %					42 images / 3 mice																
	Proportion of GABAergic-like DA synapses out of TH+ VMAT2+ boutons (NAc sh)	27.91 ± 1.53 %					42 images / 3 mice																
	Proportion of GABAergic-like DA synapses out of TH+ VMAT2+ boutons (OT)	39.86 ± 1.82 %					42 images / 3 mice																
	Proportion of GABAergic-like DA synapses out of TH+ VMAT2+ boutons (ACC)	28.11 ± 1.40 %					42 images / 3 mice																
	Proportion of GABAergic-like DA synapses out of TH+ VMAT2+ boutons (M1)	35.40 ± 1.91 %					42 images / 3 mice																
	Proportion of GABAergic-like DA synapses out of TH+ VMAT2+ boutons (GPe)	12.27 ± 1.42 %		42 images / 3 mice																			
	Proportion of GABAergic-like DA synapses out of TH+ VMAT2+ boutons (GPI)	7.78 ± 1.24 %	42 images / 3 mice																				
Proportion of GABAergic-like DA synapses out of TH+ VMAT2+ boutons (STN)	9.73 ± 1.51 %	39 images / 3 mice																					
f	Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (DLS)	22.07 ± 0.81 %	42 images / 3 mice	N/A	N/A	N/A	N/A																
	Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (DMS)	19.71 ± 0.76 %	42 images / 3 mice																				
	Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (NAc c)	20.86 ± 0.73 %	42 images / 3 mice																				
	Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (NAc sh)	13.01 ± 0.89 %	42 images / 3 mice																				
	Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (OT)	25.35 ± 1.11 %	42 images / 3 mice																				
	Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (ACC)	3.14 ± 0.24 %	42 images / 3 mice																				
	Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (M1)	6.22 ± 0.49 %	42 images / 3 mice																				
	Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (GPe)	2.14 ± 0.22 %	42 images / 3 mice																				
	Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (GPI)	3.17 ± 0.38 %	42 images / 3 mice																				
Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (STN)	2.06 ± 0.31 %	39 images / 3 mice																					
g	Representative immunostaining images	N/A	N/A	N/A	N/A	N/A	N/A																
h	Number of TH+ Bassoon+ boutons compared to DLS (DLS)	100 ± 6.18 %	40 images / 3 mice	Ordinary one-way ANOVA	< 0.0001	Post hoc Sidak's test	< 0.001																
	Number of TH+ Bassoon+ boutons compared to DLS (DMS)	104.60 ± 7.69 %	42 images / 3 mice					Group effect, F(9, 393) = 65.7	DLS vs. NAc c	< 0.05													
	Number of TH+ Bassoon+ boutons compared to DLS (NAc c)	70.47 ± 4.20 %	39 images / 3 mice								DLS vs. NAc sh	< 0.0001											
	Number of TH+ Bassoon+ boutons compared to DLS (NAc sh)	79.08 ± 6.59 %	42 images / 3 mice										DLS vs. ACC	< 0.0001									
	Number of TH+ Bassoon+ boutons compared to DLS (OT)	84.34 ± 6.77 %	42 images / 3 mice												DLS vs. M1	< 0.0001							
	Number of TH+ Bassoon+ boutons compared to DLS (ACC)	17.06 ± 1.50 %	42 images / 3 mice														DLS vs. GPe	< 0.0001					
	Number of TH+ Bassoon+ boutons compared to DLS (M1)	16.78 ± 1.52 %	42 images / 3 mice																DLS vs. GPI	< 0.0001			
	Number of TH+ Bassoon+ boutons compared to DLS (GPe)	9.74 ± 1.41 %	36 images / 3 mice																		DLS vs. STN	< 0.0001	
	Number of TH+ Bassoon+ boutons compared to DLS (GPI)	21.87 ± 2.89 %	36 images / 3 mice																				
Number of TH+ Bassoon+ boutons compared to DLS (STN)	16 ± 1.59 %	42 images / 3 mice																					
i	Number of NL2+ postsynaptic sites compared to DLS (DLS)	100 ± 3.14 %	40 images / 3 mice	Ordinary one-way ANOVA	< 0.0001	Post hoc Sidak's test	< 0.01																
	Number of NL2+ postsynaptic sites compared to DLS (DMS)	89.43 ± 2.10 %	42 images / 3 mice					Group effect, F(9, 393) = 162.8	DLS vs. DMS	< 0.0001													
	Number of NL2+ postsynaptic sites compared to DLS (NAc c)	76.25 ± 1.50 %	39 images / 3 mice								DLS vs. NAc c	< 0.0001											
	Number of NL2+ postsynaptic sites compared to DLS (NAc sh)	53.28 ± 1.92 %	42 images / 3 mice										DLS vs. NAc sh	< 0.0001									
	Number of NL2+ postsynaptic sites compared to DLS (OT)	58.10 ± 1.74 %	42 images / 3 mice												DLS vs. OT	< 0.0001							
	Number of NL2+ postsynaptic sites compared to DLS (ACC)	70.76 ± 1.58 %	42 images / 3 mice														DLS vs. ACC	< 0.0001					
	Number of NL2+ postsynaptic sites compared to DLS (M1)	66.15 ± 2.59 %	42 images / 3 mice																DLS vs. M1	< 0.0001			
	Number of NL2+ postsynaptic sites compared to DLS (GPe)	26.86 ± 1.39 %	36 images / 3 mice																		DLS vs. GPe	< 0.0001	
	Number of NL2+ postsynaptic sites compared to DLS (GPI)	24.80 ± 1.94 %	36 images / 3 mice																				DLS vs. GPI

		Number of NL2+ postsynaptic sites compared to DLS (STN)	25.31 ± 2.06 %	42 images / 3 mice			DLS vs. STN	< 0.0001
	j	Number of GABAergic-like DA synapses compared to DLS (DLS)	100 ± 6.90 %	40 images / 3 mice	Ordinary one-way ANOVA Group effect, F(9, 393) = 59.84	< 0.0001	Post hoc Sidak's test	
		Number of GABAergic-like DA synapses compared to DLS (DMS)	102.40 ± 9.18 %	42 images / 3 mice			DLS vs. NAc c	< 0.0001
		Number of GABAergic-like DA synapses compared to DLS (NAc c)	58.36 ± 3.90 %	39 images / 3 mice			DLS vs. NAc sh	< 0.0001
		Number of GABAergic-like DA synapses compared to DLS (NAc sh)	52.62 ± 6.56 %	42 images / 3 mice			DLS vs. OT	< 0.0001
		Number of GABAergic-like DA synapses compared to DLS (OT)	54.58 ± 6.62 %	42 images / 3 mice			DLS vs. ACC	< 0.0001
		Number of GABAergic-like DA synapses compared to DLS (ACC)	10.63 ± 1.05 %	42 images / 3 mice			DLS vs. M1	< 0.0001
		Number of GABAergic-like DA synapses compared to DLS (M1)	10.48 ± 1.43 %	42 images / 3 mice			DLS vs. GPe	< 0.0001
		Number of GABAergic-like DA synapses compared to DLS (GPe)	6.66 ± 0.90 %	36 images / 3 mice			DLS vs. GPI	< 0.0001
		Number of GABAergic-like DA synapses compared to DLS (GPI)	10.58 ± 1.24 %	36 images / 3 mice			DLS vs. STN	< 0.0001
		Number of GABAergic-like DA synapses compared to DLS (STN)	7.90 ± 1.04 %	42 images / 3 mice				
	k	Proportion of GABAergic-like DA synapses out of TH+ Bassoon+ boutons (DLS)	50.44 ± 1.63 %	40 images / 3 mice	N/A	N/A	N/A	N/A
		Proportion of GABAergic-like DA synapses out of TH+ Bassoon+ boutons (DMS)	48.11 ± 1.33 %	42 images / 3 mice				
		Proportion of GABAergic-like DA synapses out of TH+ Bassoon+ boutons (NAc c)	41.35 ± 1.35 %	39 images / 3 mice				
		Proportion of GABAergic-like DA synapses out of TH+ Bassoon+ boutons (NAc sh)	31.16 ± 1.65 %	42 images / 3 mice				
		Proportion of GABAergic-like DA synapses out of TH+ Bassoon+ boutons (OT)	32.29 ± 1.28 %	42 images / 3 mice				
		Proportion of GABAergic-like DA synapses out of TH+ Bassoon+ boutons (ACC)	33.65 ± 2.51 %	42 images / 3 mice				
		Proportion of GABAergic-like DA synapses out of TH+ Bassoon+ boutons (M1)	32.51 ± 3.46 %	42 images / 3 mice				
		Proportion of GABAergic-like DA synapses out of TH+ Bassoon+ boutons (GPe)	42.56 ± 5.91 %	36 images / 3 mice				
		Proportion of GABAergic-like DA synapses out of TH+ Bassoon+ boutons (GPI)	26.30 ± 2.64 %	36 images / 3 mice				
		Proportion of GABAergic-like DA synapses out of TH+ Bassoon+ boutons (STN)	27.28 ± 3.66 %	42 images / 3 mice				
	l	Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (DLS)	6.49 ± 0.41 %	40 images / 3 mice	N/A	N/A	N/A	N/A
		Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (DMS)	7.26 ± 0.55 %	42 images / 3 mice				
		Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (NAc c)	4.95 ± 0.32 %	39 images / 3 mice				
		Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (NAc sh)	6.04 ± 0.65 %	42 images / 3 mice				
		Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (OT)	5.94 ± 0.46 %	42 images / 3 mice				
		Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (ACC)	0.98 ± 0.10 %	42 images / 3 mice				
		Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (M1)	1.04 ± 0.13 %	42 images / 3 mice				
		Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (GPe)	1.73 ± 0.25 %	36 images / 3 mice				
		Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (GPI)	2.87 ± 0.31 %	36 images / 3 mice				
		Proportion of GABAergic-like DA synapses out of NL2+ postsynaptic sites (STN)	2.15 ± 0.27 %	42 images / 3 mice				
	m	Relationships between GABAergic-like DA synapses and TH+ VMAT2+ boutons (VMAT2 - NL2)	N/A	N/A	Linear regression DA synapses - presynaptic boutons: R ² = 0.8801 DA synapses - postsynaptic sites: R ² = 0.6536	< 0.0001 < 0.0001	N/A	N/A
	n	Relationships between GABAergic-like DA synapses and TH+ Bassoon+ boutons (Bassoon - NL2)	N/A	N/A	Linear regression DA synapses - presynaptic boutons: R ² = 0.8804 DA synapses - postsynaptic sites: R ² = 0.4126	< 0.0001 < 0.0001	N/A	N/A
	o	Comprehensive illustration summarizing correlations using 4 different combinations of antibodies	N/A	N/A	N/A	N/A	N/A	N/A
	p	Relationships between GABAergic-like DA synapses and DA, GABA, glutamate transmission (VMAT2 - NL2)	N/A	N/A	Linear regression DA synapses - DA transmission: R ² = 0.6912 DA synapses - GABA transmission: R ² = 0.6955 DA synapses - glutamate transmission: R ² = 0.0227	< 0.01 < 0.01 0.6777	N/A	N/A
	q	Relationships between GABAergic-like DA synapses and DA, GABA, glutamate transmission (Bassoon - NL2)	N/A	N/A	Linear regression DA synapses - DA transmission: R ² = 0.9199 DA synapses - GABA transmission: R ² = 0.9562 DA synapses - glutamate transmission: R ² = 0.0923	< 0.0001 < 0.0001 0.3933	N/A	N/A
	r	Cumulative distribution of nearest neighbor distance (VMAT2-NL2, Bassoon-NL2)	N/A	N/A	N/A	N/A	N/A	N/A
3	a	Representative immunostaining images	N/A	N/A	N/A	N/A	N/A	N/A
	b	Cumulative distribution of mean nearest neighbor distance (DLS vs. null model) Cumulative distribution of mean nearest neighbor distance (DMS vs. null model) Cumulative distribution of mean nearest neighbor distance (NAc c vs. null model) Cumulative distribution of mean nearest neighbor distance (NAc sh vs. null model) Cumulative distribution of mean nearest neighbor distance (OT vs. null model)	N/A	16 images / 3 mice 15 images / 3 mice 16 images / 3 mice 17 images / 3 mice 14 images / 3 mice	Mann-Whitney test DLS vs. null model DMS vs. null model NAc c vs. null model NAc sh vs. null model OT vs. null model	 0.1468 < 0.05 0.2413 0.1212 0.1354	N/A	N/A
	c	Ripley's H function compared to null model (DLS vs. null model) Ripley's H function compared to null model (DMS vs. null model) Ripley's H function compared to null model (NAc c vs. null model) Ripley's H function compared to null model (NAc sh vs. null model) Ripley's H function compared to null model (OT vs. null model)	N/A	16 images / 3 mice 15 images / 3 mice 16 images / 3 mice 17 images / 3 mice 14 images / 3 mice	N/A	N/A	N/A	N/A
	d	Rejection rate compared to null model using DCLF test	N/A	N/A	DCLF test	N/A	N/A	N/A
	e	Ripley's H function compared to pooled DLS (DLS vs. pooled DLS) Ripley's H function compared to pooled DLS (DMS vs. pooled DLS) Ripley's H function compared to pooled DLS (NAc c vs. pooled DLS) Ripley's H function compared to pooled DLS (NAc sh vs. pooled DLS) Ripley's H function compared to pooled DLS (OT vs. pooled DLS)	N/A	16 images / 3 mice 15 images / 3 mice 16 images / 3 mice 17 images / 3 mice 14 images / 3 mice	N/A	N/A	N/A	
	f	Rejection rate compared to pooled DLS using DCLF test	N/A	N/A	DCLF test	N/A	N/A	N/A
	g	Ripley's H function compared to pooled OT (DLS vs. pooled OT) Ripley's H function compared to pooled OT (DMS vs. pooled OT) Ripley's H function compared to pooled OT (NAc c vs. pooled OT) Ripley's H function compared to pooled OT (NAc sh vs. pooled OT) Ripley's H function compared to pooled OT (OT vs. pooled OT)	N/A	16 images / 3 mice 15 images / 3 mice 16 images / 3 mice 17 images / 3 mice 14 images / 3 mice	N/A	N/A	N/A	N/A
	h	Rejection rate compared to pooled OT using DCLF test	N/A	N/A	DCLF test	N/A	N/A	N/A
	a	Representative immunostaining images	N/A	N/A	N/A	N/A	N/A	N/A
	b	Number of synapses per μm ² (DAT-Cre, Total) Number of synapses per μm ² (A2A-Cre, Total) Number of synapses per μm ² (DAT-Cre, Distal) Number of synapses per μm ² (A2A-Cre, Distal) Number of synapses per μm ² (DAT-Cre, Proximal) Number of synapses per μm ² (A2A-Cre, Proximal) Proportion of synapses out of postsynaptic sites (DAT-Cre) Proportion of synapses out of postsynaptic sites (A2A-Cre)	0.31 ± 0.02 0.24 ± 0.02 0.32 ± 0.03 0.24 ± 0.02 0.31 ± 0.02 0.23 ± 0.03 38.59 ± 1.43 % 32.38 ± 1.97 %	41 images / 3 mice 42 images / 4 mice 22 images / 3 mice 28 images / 4 mice 19 images / 3 mice 14 images / 4 mice 41 images / 3 mice 42 images / 4 mice	t(81) = 3.079 (Unpaired t-test) t(48) = 2.34 (Unpaired t-test) t(31) = 2.274 (Unpaired t-test) t(81) = 2.545 (Unpaired t-test)	< 0.01 < 0.05 < 0.05	N/A N/A N/A	N/A N/A N/A
	c	Cumulative distribution of inter-synapse distance (DAT-Cre, A2A-Cre)	N/A	N/A	Kolmogorov-Smirnov test	< 0.001	N/A	N/A
	d	Ripley's H function compared to pooled DAT-Cre Total (A2A-Cre Total vs. pooled DAT-Cre Total) Ripley's H function compared to pooled DAT-Cre Distal (A2A-Cre Distal vs. pooled DAT-Cre Distal) Ripley's H function compared to pooled DAT-Cre Proximal (A2A-Cre Proximal vs. pooled DAT-Cre Proximal)	N/A	42 images / 4 mice 28 images / 4 mice 14 images / 4 mice	N/A	N/A	N/A	N/A
	e	Rejection rate compared to pooled DAT-Cre	N/A	N/A	DCLF test	N/A	N/A	N/A
	f	Representative oIPSC traces in DAT-Cre; Ai32	N/A	N/A	N/A	N/A	N/A	N/A
	g	oIPSC amplitude, DLS, DAT-Cre;Ai32 (Vehicle) oIPSC amplitude, DLS, DAT-Cre;Ai32 (T-type blocker) oIPSC amplitude, DLS, DAT-Cre;Ai32 (N-type blocker) oIPSC amplitude, DLS, DAT-Cre;Ai32 (P/Q-type blocker) oIPSC amplitude, DLS, DAT-Cre;Ai32 (Vehicle), compared to Vehicle oIPSC amplitude, DLS, DAT-Cre;Ai32 (T-type blocker), compared to Vehicle oIPSC amplitude, DLS, DAT-Cre;Ai32 (N-type blocker), compared to Vehicle oIPSC amplitude, DLS, DAT-Cre;Ai32 (P/Q-type blocker), compared to Vehicle	848.60 ± 127.20 pA 721.50 ± 161.30 pA 360.10 ± 84.61 pA 277 ± 46.94 pA 100 ± 14.99 % 85.02 ± 19 % 42.44 ± 9.97 % 32.64 ± 5.53 %	18 cells / 3 mice 18 cells / 3 mice 18 cells / 3 mice 19 cells / 3 mice 18 cells / 3 mice 18 cells / 3 mice 18 cells / 3 mice 19 cells / 3 mice	Ordinary one-way ANOVA Group effect, F(3, 69) = 6.091 Ordinary one-way ANOVA Group effect, F(3, 69) = 6.091	< 0.001 < 0.001	Post hoc Sidak's test Vehicle vs. N-type blocker Vehicle vs. P/Q-type blocker Post hoc Sidak's test Vehicle vs. N-type blocker Vehicle vs. P/Q-type blocker	< 0.01 < 0.01 < 0.01
	h	Representative oIPSC traces in A2A-Cre; Ai32	N/A	N/A	N/A	N/A	N/A	N/A
		oIPSC amplitude, DLS, A2A-Cre;Ai32 (Vehicle) oIPSC amplitude, DLS, A2A-Cre;Ai32 (T-type blocker)	2701 ± 393.50 pA 1493 ± 234 pA	19 cells / 3 mice 17 cells / 3 mice	Ordinary one-way ANOVA Group effect, F(3, 63) = 11.88	< 0.0001	Post hoc Sidak's test Vehicle vs. T-type blocker	< 0.01

4	i	oIPSC amplitude, DLS, A2A-Cre:Al32 (N-type blocker)	1485 ± 176.70 pA	17 cells / 3 mice			Vehicle vs. N-type blocker	< 0.01
		oIPSC amplitude, DLS, A2A-Cre:Al32 (P/Q-type blocker)	380.10 ± 103.60 pA	14 cells / 3 mice			Vehicle vs. P/Q-type blocker	< 0.0001
		oIPSC amplitude DLS in A2A-Cre:Al32 (Vehicle), compared to Vehicle	100.90 ± 14.71 %	19 cells / 3 mice	Ordinary one-way ANOVA Group effect, F(3, 63) = 11.88	< 0.0001	Post hoc Sidak's test	
		oIPSC amplitude, DLS, A2A-Cre:Al32 (T-type blocker), compared to Vehicle	55.81 ± 8.75 %	17 cells / 3 mice			Vehicle vs. T-type blocker	< 0.01
		oIPSC amplitude, DLS, A2A-Cre:Al32 (N-type blocker), compared to Vehicle	55.51 ± 6.60 %	17 cells / 3 mice			Vehicle vs. N-type blocker	< 0.01
		oIPSC amplitude, DLS, A2A-Cre:Al32 (P/Q-type blocker), compared to Vehicle	14.21 ± 3.87 %	14 cells / 3 mice			Vehicle vs. P/Q-type blocker	< 0.0001
j		Representative recording traces of asynchronous GABA release in DAT-Cre:Al32 and A2A-Cre:Al32	N/A	N/A	N/A	N/A	N/A	N/A
k		Frequency of asynchronous oIPSC (DAT-Cre:Al32, Ca ²⁺)	4.88 ± 0.75 Hz	30 cells / 10 mice	Repeated measures two-way ANOVA Genotype effect, F(1, 40) = 4.788	< 0.05	Post hoc Sidak's test DAT-Cre Ca ²⁺ vs. DAT-Cre Sr ²⁺	< 0.01
		Frequency of asynchronous oIPSC (DAT-Cre:Al32, Sr ²⁺)	7.91 ± 0.59 Hz	30 cells / 10 mice				
		Frequency of asynchronous oIPSC (A2A-Cre:Al32, Ca ²⁺)	4.27 ± 0.73 Hz	12 cells / 6 mice	Divalent cation effect, F(1, 40) = 42.25 Interaction, F(1, 40) = 9.571	< 0.0001	A2A-Cre Ca ²⁺ vs. A2A-Cre Sr ²⁺ DAT-Cre Sr ²⁺ vs. A2A-Cre Sr ²⁺	< 0.0001
		Frequency of asynchronous oIPSC (A2A-Cre:Al32, Sr ²⁺)	12.81 ± 1.62 Hz	12 cells / 6 mice				
		Amplitude of asynchronous oIPSC (DAT-Cre:Al32, Ca ²⁺)	24.08 ± 1.21 pA	27 cells / 10 mice	Repeated measures two-way ANOVA Genotype effect, F(1, 36) = 39.51	< 0.0001	Post hoc Sidak's test DAT-Cre Ca ²⁺ vs. DAT-Cre Sr ²⁺	< 0.05
		Amplitude of asynchronous oIPSC (DAT-Cre:Al32, Sr ²⁺)	19.98 ± 0.57 pA	27 cells / 10 mice				
		Amplitude of asynchronous oIPSC (A2A-Cre:Al32, Ca ²⁺)	26.40 ± 2.28 pA	11 cells / 6 mice	Divalent cation effect, F(1, 36) = 1.132 Interaction, F(1, 36) = 15.28	< 0.0001	A2A-Cre Ca ²⁺ vs. A2A-Cre Sr ²⁺ DAT-Cre Sr ²⁺ vs. A2A-Cre Sr ²⁺	< 0.05
Amplitude of asynchronous oIPSC (A2A-Cre:Al32, Sr ²⁺)	34.21 ± 2.08 pA	11 cells / 6 mice						
l		Cumulative distribution of asynchronous oIPSC (amplitude, Sr ²⁺ application)	N/A	N/A	Kolmogorov-Smirnov test	< 0.0001	N/A	N/A
		Cumulative distribution of asynchronous oIPSC (inter-event interval, Sr ²⁺ application)	N/A	N/A	Kolmogorov-Smirnov test	< 0.0001	N/A	N/A
m		Representative immunostaining images (DAT-Cre)	N/A	N/A	N/A	N/A	N/A	N/A
n		Representative immunostaining images (A2A-Cre:Al32)	N/A	N/A	N/A	N/A	N/A	N/A
o		Proportion of synaptotagmin-colocalized presynaptic boutons out of total presynaptic boutons (DAT-Cre, Syt1)	57.97 ± 2.03 %	18 images / 3 mice	Ordinary one-way ANOVA Group effect, F(2, 51) = 212.8	< 0.0001	Post hoc Sidak's test Syt1 vs. Syt7 Syt7 vs. Syt5/9 Syt1 vs. Syt5/9	< 0.0001
		Proportion of synaptotagmin-colocalized presynaptic boutons out of total presynaptic boutons (DAT-Cre, Syt7)	36.68 ± 1.89 %	18 images / 3 mice				
		Proportion of synaptotagmin-colocalized presynaptic boutons out of total presynaptic boutons (DAT-Cre, Syt5/9)	9.44 ± 0.81 %	18 images / 3 mice	Ordinary one-way ANOVA Group effect, F(2, 51) = 30.22	< 0.0001	Post hoc Sidak's test Syt1 vs. Syt7 Syt7 vs. Syt5/9 Syt1 vs. Syt5/9	< 0.0001
		Proportion of synaptotagmin-colocalized presynaptic boutons out of total presynaptic boutons (A2A-Cre:Al32, Syt1)	45.64 ± 1.12 %	18 images / 3 mice				
		Proportion of synaptotagmin-colocalized presynaptic boutons out of total presynaptic boutons (A2A-Cre:Al32, Syt7)	34.40 ± 1.85 %	18 images / 3 mice				
		Proportion of synaptotagmin-colocalized presynaptic boutons out of total presynaptic boutons (A2A-Cre:Al32, Syt5/9)	26.78 ± 2.07 %	18 images / 3 mice				< 0.01
p		Proportion of synaptotagmin-colocalized presynaptic boutons out of total presynaptic boutons (Syt1, DAT-Cre)	57.97 ± 2.03 %	18 images / 3 mice	t(34) = 5.313 (Unpaired t-test)	< 0.0001	N/A	N/A
		Proportion of synaptotagmin-colocalized presynaptic boutons out of total presynaptic boutons (Syt1, A2A-Cre:Al32)	45.64 ± 1.12 %	18 images / 3 mice				
		Proportion of synaptotagmin-colocalized presynaptic boutons out of total presynaptic boutons (Syt7, DAT-Cre)	36.68 ± 1.89 %	18 images / 3 mice	t(34) = 0.8654 (Unpaired t-test)	0.3929	N/A	N/A
		Proportion of synaptotagmin-colocalized presynaptic boutons out of total presynaptic boutons (Syt7, A2A-Cre:Al32)	34.40 ± 1.85 %	18 images / 3 mice				
		Proportion of synaptotagmin-colocalized presynaptic boutons out of total presynaptic boutons (Syt5/9, DAT-Cre)	9.44 ± 0.81 %	18 images / 3 mice	t(34) = 7.821 (Unpaired t-test)	< 0.0001	N/A	N/A
		Proportion of synaptotagmin-colocalized presynaptic boutons out of total presynaptic boutons (Syt5/9, A2A-Cre:Al32)	26.78 ± 2.07 %	18 images / 3 mice				
a		Schematic illustration	N/A	N/A	N/A	N/A	N/A	N/A
		Representative immunostaining images	N/A	N/A	N/A	N/A	N/A	N/A
b		Synapse number (Day 1, contralateral)	43 ± 3.15	18 images / 2 mice	t(34) = 1.019 (Unpaired t-test)	0.3154	N/A	N/A
		Synapse number (Day 1, ipsilateral)	38.33 ± 3.32	18 images / 2 mice				
		Synapse number compared to contralateral (Day 1, contralateral)	100 ± 7.33 %	18 images / 2 mice	t(34) = 1.019 (Unpaired t-test)	0.3154	N/A	N/A
		Synapse number compared to contralateral (Day 1, ipsilateral)	89.15 ± 7.73 %	18 images / 2 mice				
		Synapse number (Day 3, contralateral)	32.56 ± 3.02	18 images / 2 mice	t(34) = 8.327 (Unpaired t-test)	< 0.0001	N/A	N/A
		Synapse number (Day 3, ipsilateral)	7 ± 0.55	18 images / 2 mice				
		Synapse number compared to contralateral (Day 3, contralateral)	100 ± 9.27 %	18 images / 2 mice	t(34) = 8.327 (Unpaired t-test)	< 0.0001	N/A	N/A
		Synapse number compared to contralateral (Day 3, ipsilateral)	21.50 ± 1.70 %	18 images / 2 mice				
		Synapse number (Day 7, contralateral)	33.72 ± 3.31	18 images / 2 mice	t(34) = 8.3 (Unpaired t-test)	< 0.0001	N/A	N/A
		Synapse number (Day 7, ipsilateral)	5.61 ± 0.74	18 images / 2 mice				
c		Synapse number compared to contralateral (Day 7, contralateral)	100 ± 9.80 %	18 images / 2 mice	t(34) = 8.3 (Unpaired t-test)	< 0.0001	N/A	N/A
		Synapse number compared to contralateral (Day 7, ipsilateral)	16.64 ± 2.19 %	18 images / 2 mice				
		Cumulative distribution of nearest neighbor distance of synapses (Day 1)	N/A	N/A	Kolmogorov-Smirnov test	0.0531	N/A	N/A
		Cumulative distribution of nearest neighbor distance of synapses (Day 3)	N/A	N/A				
		Cumulative distribution of nearest neighbor distance of synapses (Day 7)	N/A	N/A	Kolmogorov-Smirnov test	< 0.0001	N/A	N/A
d		Schematic illustration	N/A	N/A	N/A	N/A	N/A	N/A
f		Representative FSCV recording traces (DLS, 6-OHDA lesion)	N/A	N/A	N/A	N/A	N/A	N/A
g		DA peak amplitude (Day 1, contralateral)	2.08 ± 0.25 μM	9 slices / 3 mice	t(16) = 1.346 (Unpaired t-test)	0.1970	N/A	N/A
		DA peak amplitude (Day 1, ipsilateral)	1.70 ± 0.12 μM	9 slices / 3 mice				
		DA peak amplitude compared to contralateral (Day 1, contralateral)	100 ± 4.32 %	9 slices / 3 mice	t(16) = 1.21 (Unpaired t-test)	0.2439	N/A	N/A
		DA peak amplitude compared to contralateral (Day 1, ipsilateral)	88.51 ± 8.46 %	9 slices / 3 mice				
		DA peak amplitude (Day 3, contralateral)	1.96 ± 0.18 μM	9 slices / 3 mice	t(16) = 8.45 (Unpaired t-test)	< 0.0001	N/A	N/A
		DA peak amplitude (Day 3, ipsilateral)	0.29 ± 0.08 μM	9 slices / 3 mice				
		DA peak amplitude compared to contralateral (Day 3, contralateral)	100 ± 7.82 %	9 slices / 3 mice	t(16) = 10.11 (Unpaired t-test)	< 0.0001	N/A	N/A
		DA peak amplitude compared to contralateral (Day 3, ipsilateral)	13.61 ± 3.45 %	9 slices / 3 mice				
		DA peak amplitude (Day 7, contralateral)	1.28 ± 0.12 μM	9 slices / 3 mice	t(16) = 8.161 (Unpaired t-test)	< 0.0001	N/A	N/A
		DA peak amplitude (Day 7, ipsilateral)	0.24 ± 0.04 μM	9 slices / 3 mice				
h		DA peak amplitude compared to contralateral (Day 7, contralateral)	100 ± 6.80 %	9 slices / 3 mice	t(16) = 11.37 (Unpaired t-test)	< 0.0001	N/A	N/A
		DA peak amplitude compared to contralateral (Day 7, ipsilateral)	17.70 ± 2.49 %	9 slices / 3 mice				
i		Representative oIPSC traces (DLS, 6-OHDA lesion)	N/A	N/A	N/A	N/A	N/A	N/A
		oIPSC amplitude (Day 1, contralateral)	841.90 ± 151.50 pA	15 cells / 5 mice	t(28) = 2.674 (Unpaired t-test)	< 0.05	N/A	N/A
		oIPSC amplitude (Day 1, ipsilateral)	377.40 ± 85.08 pA	15 cells / 5 mice				
		oIPSC amplitude compared to contralateral (Day 1, contralateral)	100 ± 13.47 %	15 cells / 5 mice	t(28) = 2.401 (Unpaired t-test)	< 0.05	N/A	N/A
		oIPSC amplitude compared to contralateral (Day 1, ipsilateral)	52.04 ± 14.75 %	15 cells / 5 mice				
		oIPSC amplitude (Day 3, contralateral)	1036 ± 224.30 pA	8 cells / 3 mice	t(15) = 4.35 (Unpaired t-test)	< 0.001	N/A	N/A
		oIPSC amplitude (Day 3, ipsilateral)	108 ± 32.40 pA	9 cells / 3 mice				
		oIPSC amplitude compared to contralateral (Day 3, contralateral)	100 ± 16.09 %	8 cells / 3 mice	t(15) = 5.849 (Unpaired t-test)	< 0.0001	N/A	N/A
		oIPSC amplitude compared to contralateral (Day 3, ipsilateral)	10.26 ± 2.54 %	9 cells / 3 mice				
		oIPSC amplitude (Day 7, contralateral)	998.80 ± 272.90 pA	12 cells / 6 mice	t(22) = 3.295 (Unpaired t-test)	< 0.01	N/A	N/A
oIPSC amplitude (Day 7, ipsilateral)	95.11 ± 27.02 pA	12 cells / 6 mice						
j		oIPSC amplitude compared to contralateral (Day 7, contralateral)	100 ± 22.58 %	12 cells / 6 mice	t(22) = 3.706 (Unpaired t-test)	< 0.01	N/A	N/A
		oIPSC amplitude compared to contralateral (Day 7, ipsilateral)	14.37 ± 4.92 %	12 cells / 6 mice				
k		Representative oEPSC traces (DLS, 6-OHDA lesion)	N/A	N/A	N/A	N/A	N/A	N/A
		oEPSC amplitude (Day 1, contralateral)	98.26 ± 25.49 pA	14 cells / 5 mice	t(26) = 0.5529 (Unpaired t-test)	0.5850	N/A	N/A
		oEPSC amplitude (Day 1, ipsilateral)	80.16 ± 20.52 pA	14 cells / 5 mice				
		oEPSC amplitude compared to contralateral (Day 1, contralateral)	100 ± 15.28 %	14 cells / 5 mice	t(26) = 0.589 (Unpaired t-test)	0.5609	N/A	N/A
		oEPSC amplitude compared to contralateral (Day 1, ipsilateral)	85.06 ± 20.26 %	14 cells / 5 mice				
		oEPSC amplitude (Day 3, contralateral)	49.85 ± 10.66 pA	7 cells / 3 mice	t(14) = 4.516 (Unpaired t-test)	< 0.001	N/A	N/A
		oEPSC amplitude (Day 3, ipsilateral)	6.97 ± 1.66 pA	9 cells / 3 mice				
		oEPSC amplitude compared to contralateral (Day 3, contralateral)	100 ± 7.90 %	7 cells / 3 mice	t(14) = 5.036 (Unpaired t-test)	< 0.001	N/A	N/A
		oEPSC amplitude compared to contralateral (Day 3, ipsilateral)	27.72 ± 11.01 %	9 cells / 3 mice				
		oEPSC amplitude (Day 7, contralateral)	71.40 ± 15.29 pA	9 cells / 6 mice	t(16) = 4.16 (Unpaired t-test)	< 0.001	N/A	N/A
oEPSC amplitude (Day 7, ipsilateral)	7.66 ± 1.08 pA	9 cells / 6 mice						
l		oEPSC amplitude compared to contralateral (Day 7, contralateral)	100 ± 21.32 %	9 cells / 6 mice	t(16) = 4.167 (Unpaired t-test)	< 0.001	N/A	N/A
		oEPSC amplitude compared to contralateral (Day 7, ipsilateral)	10.88 ± 1.66 %	9 cells / 6 mice				

Supplementary Table

All values and statistics for Fig. 1 to 5