Supplementary Information

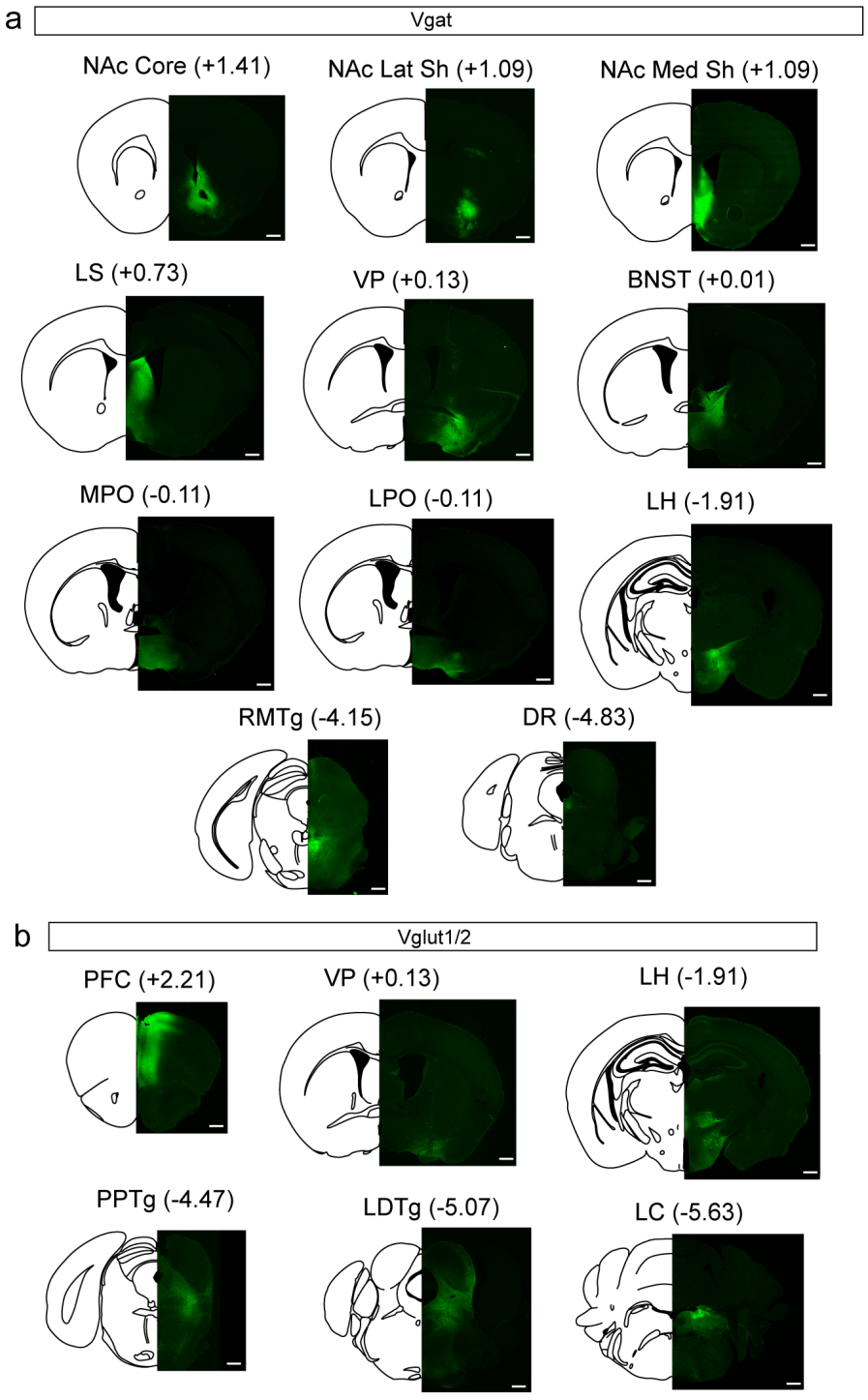
Table 1. Mouse lines

Mouse Line	Origin	Stock Number
Vgat Cre (*Slc32a1-IRES-Cre*)	Jackson	016962
Vglut1 Cre (*Slc17a7-IRES-Cre*)	Jackson	023527
Vglut2 Cre (*Slc17a6-IRES-Cre*)	Jackson	028863
Vglut3 Cre (*Slc17a8-iCre*)	Jackson	018147
Chat Cre (*Chat-IRES-Cre*)	Jackson	006410
ePet Cre (*Fev-Cre*)	Jackson	012712
Th Flp (*Th-2A-Flpo*)	Poulin et al. (2018)	
Vgat lox/lox (*Slc23a1 lox/lox*)	Jackson	012897

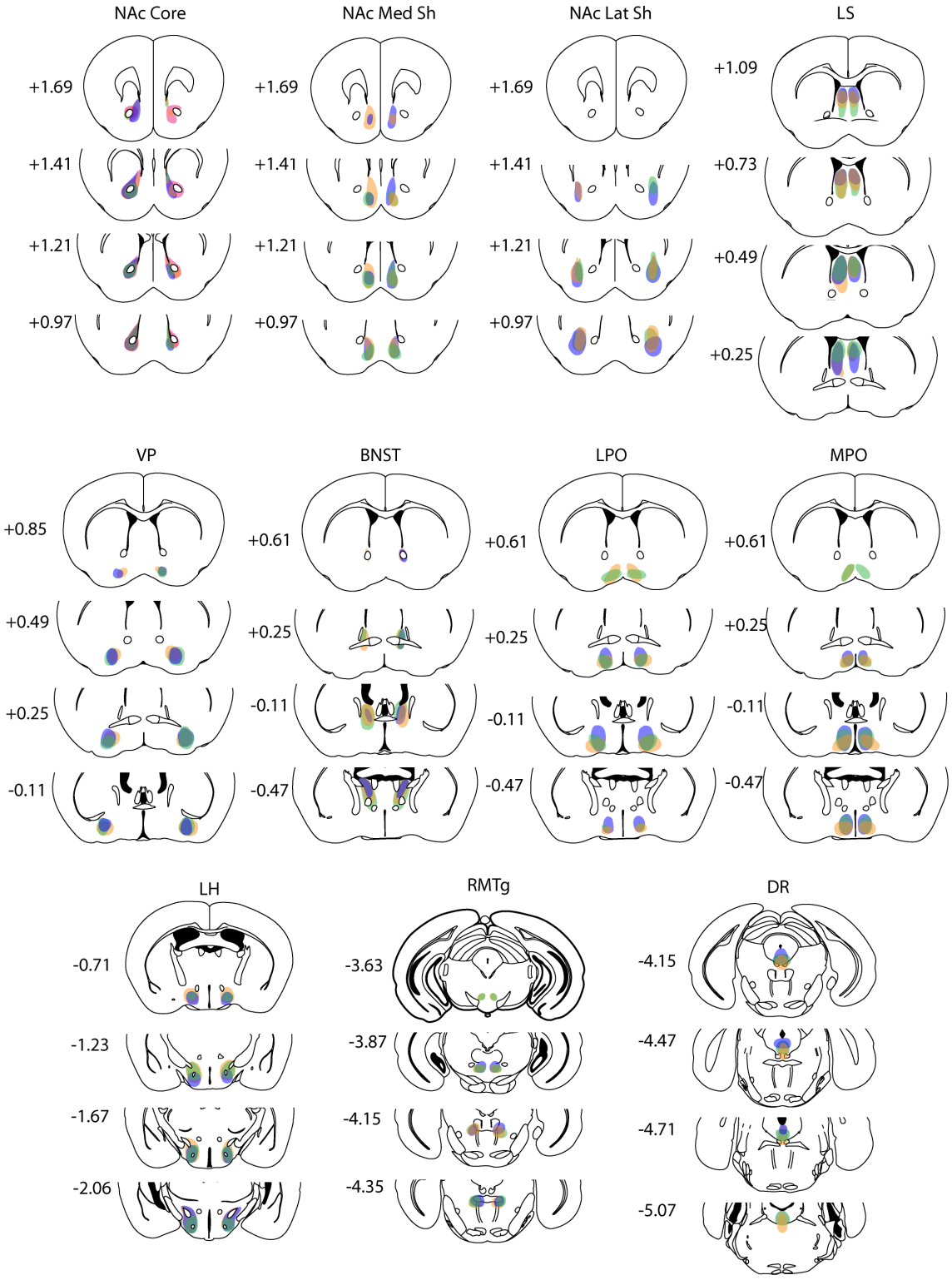
Table 2. Injection coordinates (mm relative to bregma)

Region	**X**	**Y**	**Z**
PFC (2 injections)	0.35	+1.4, +2.1	2.0
NAc Core	1.0	+1.4	4.25
NAc medial shell	0.5	+1.25	4.6
NAc lateral shell	1.75	+1.4	4.5
Dorsal striatum	1.5	+0.75	3.0
VP	1.8	+0.4	5.3
LS	0.5	+0.5	3.25
BNST	0.8	+0.4	4.2
MPO	0.4	0	5.1
LPO	1.0	+0.25	5.1
LH (GABA)*	1.0	-1.25	4.8
LH (glutamate)*	1.0	-0.6	4.9
VTA	0.5	-3.25	4.25
RMTg	0.5	-4.25	4.25
PPTg	1.2	-4.5	3.75
DR	0	-5.0	3.0
LDTg	0.5	-5.0	3.25
LC	0.9	-5.45	4.0

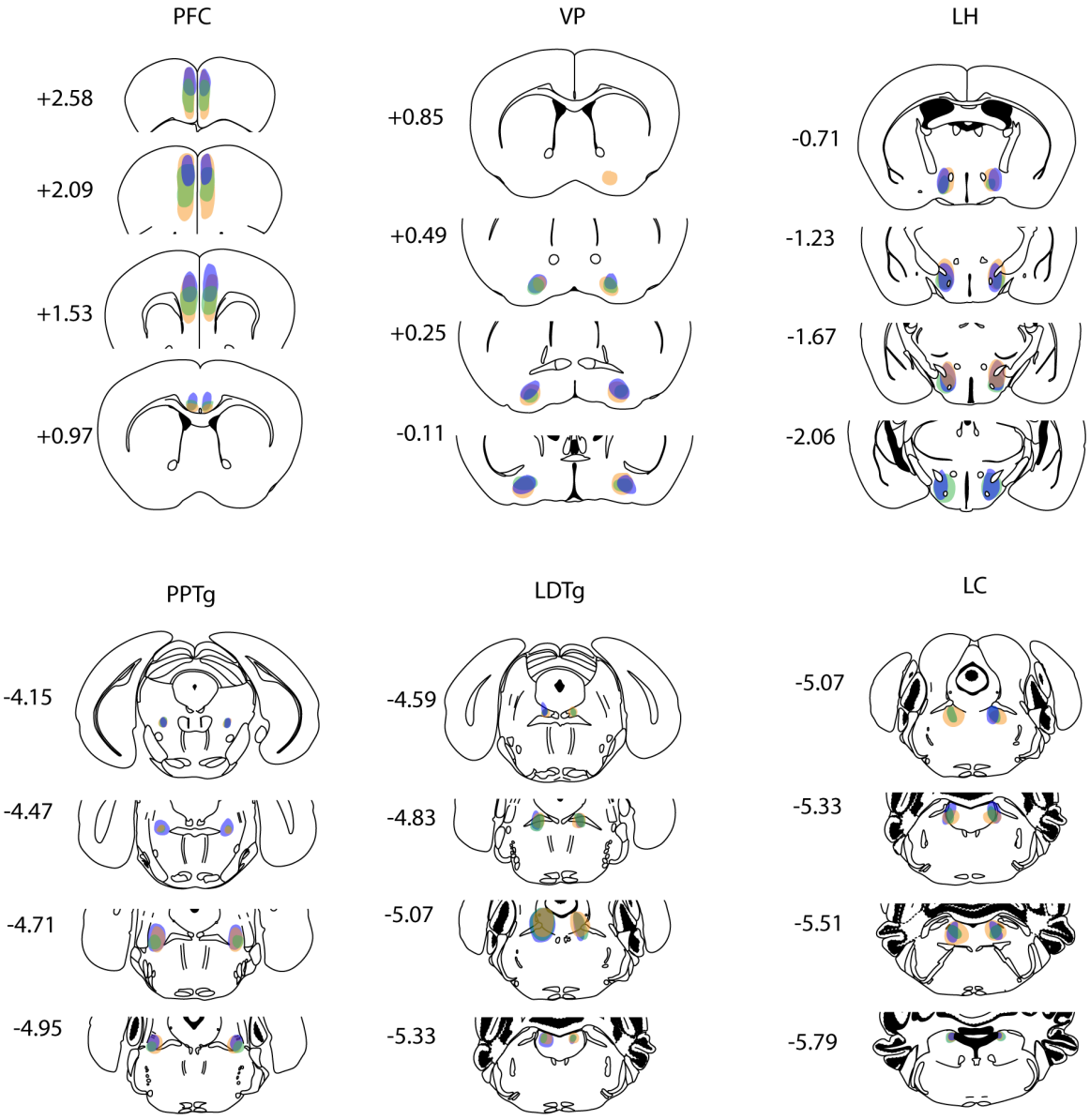
*See Methods for details on LH injection coordinates



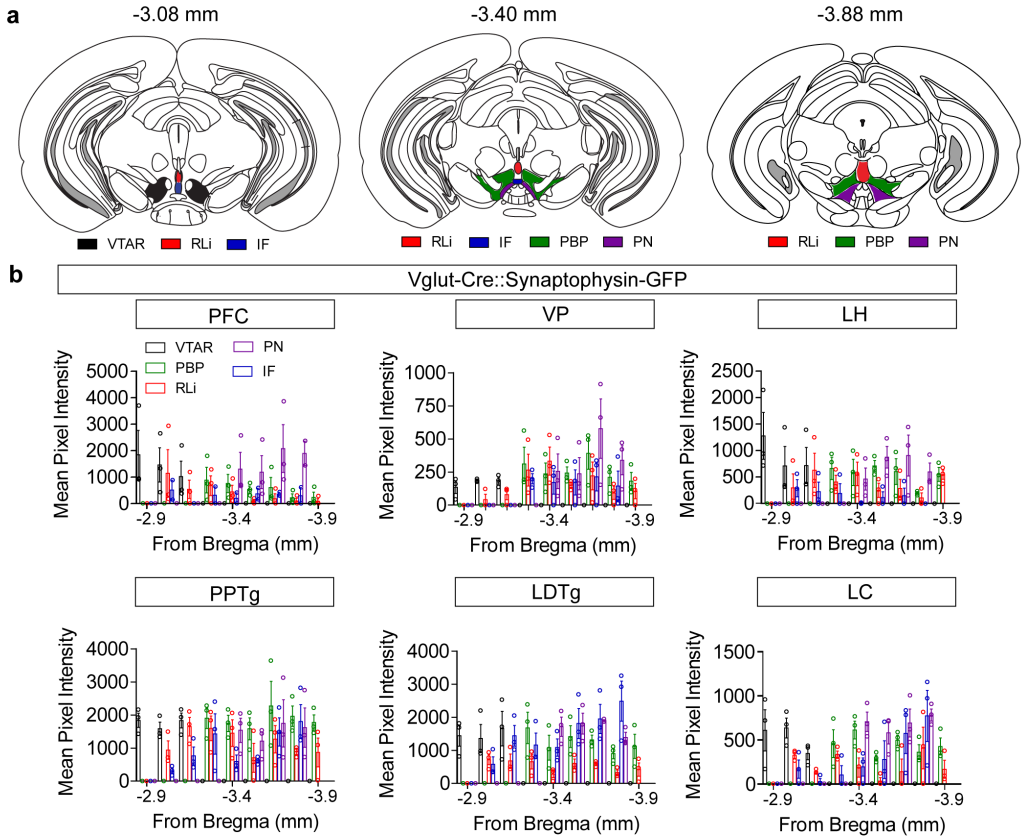
Supplementary Figure 1. Representative images of AAV-FLEX-synaptophysin-GFP injection sites in Vgat **(a)** and Vglut **(b)** mice from designated areas. Numbers indicate distance from bregma. Scale bars = 500 μm.



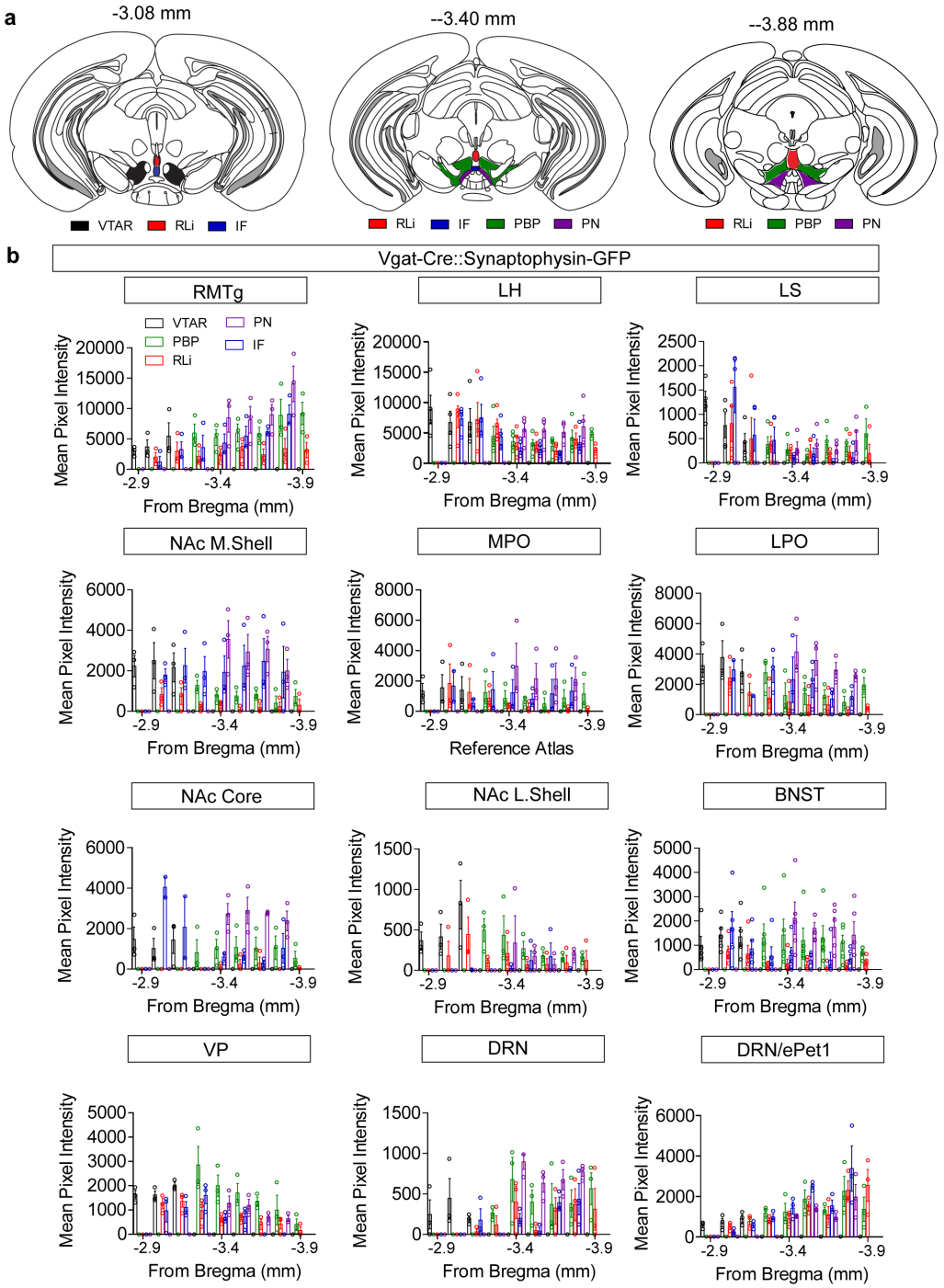
Supplementary Figure 2. Maps illustrating viral spread at injection site for synaptophysin mapping in Vgat cre mice. Each color represents an individual animal and numbers indicate distance from bregma.



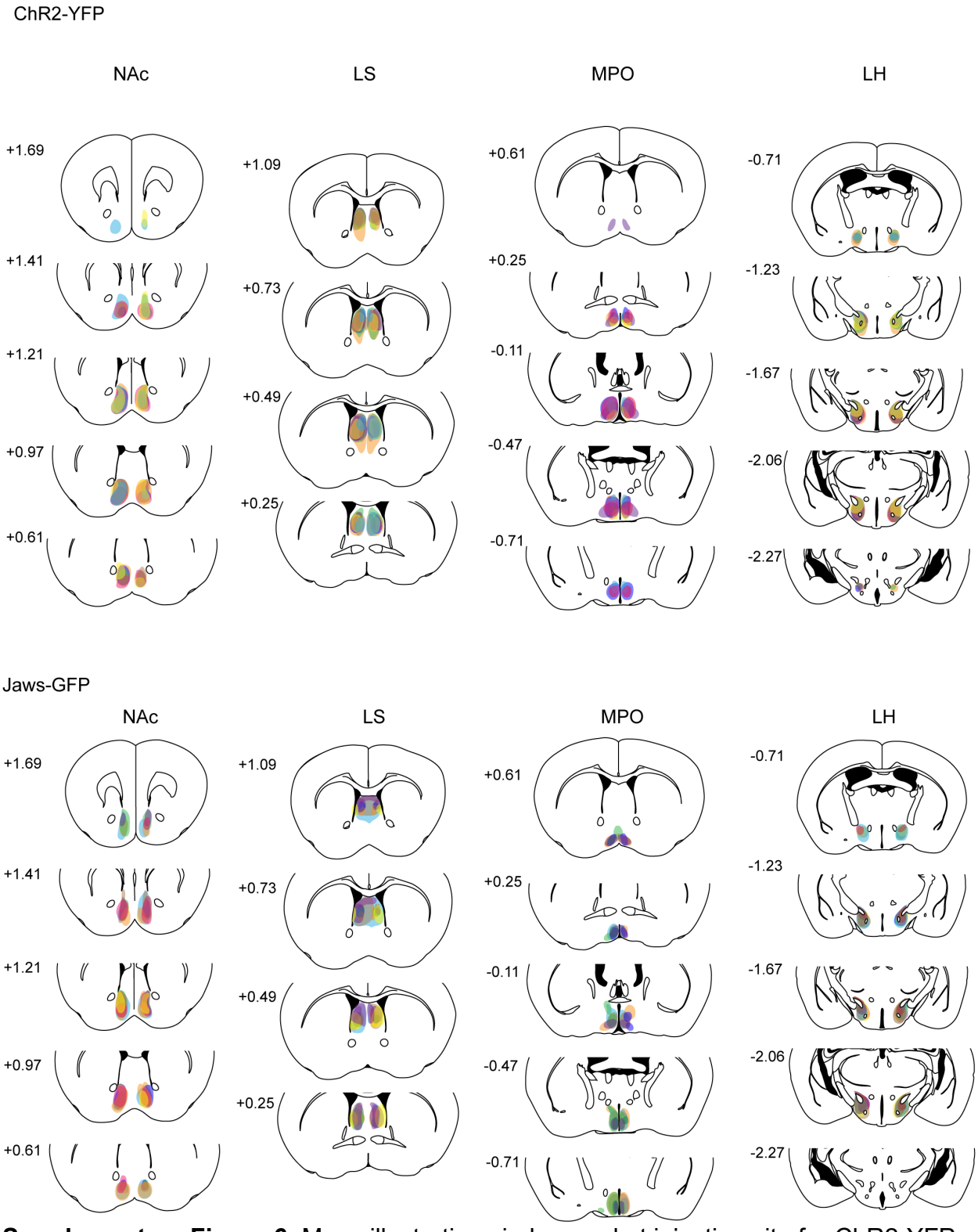
Supplementary Figure 3. Maps illustrating viral spread at injection site for synaptophysin mapping in Vglut cre mice. Each color represents an individual animal and numbers indicate distance from bregma.



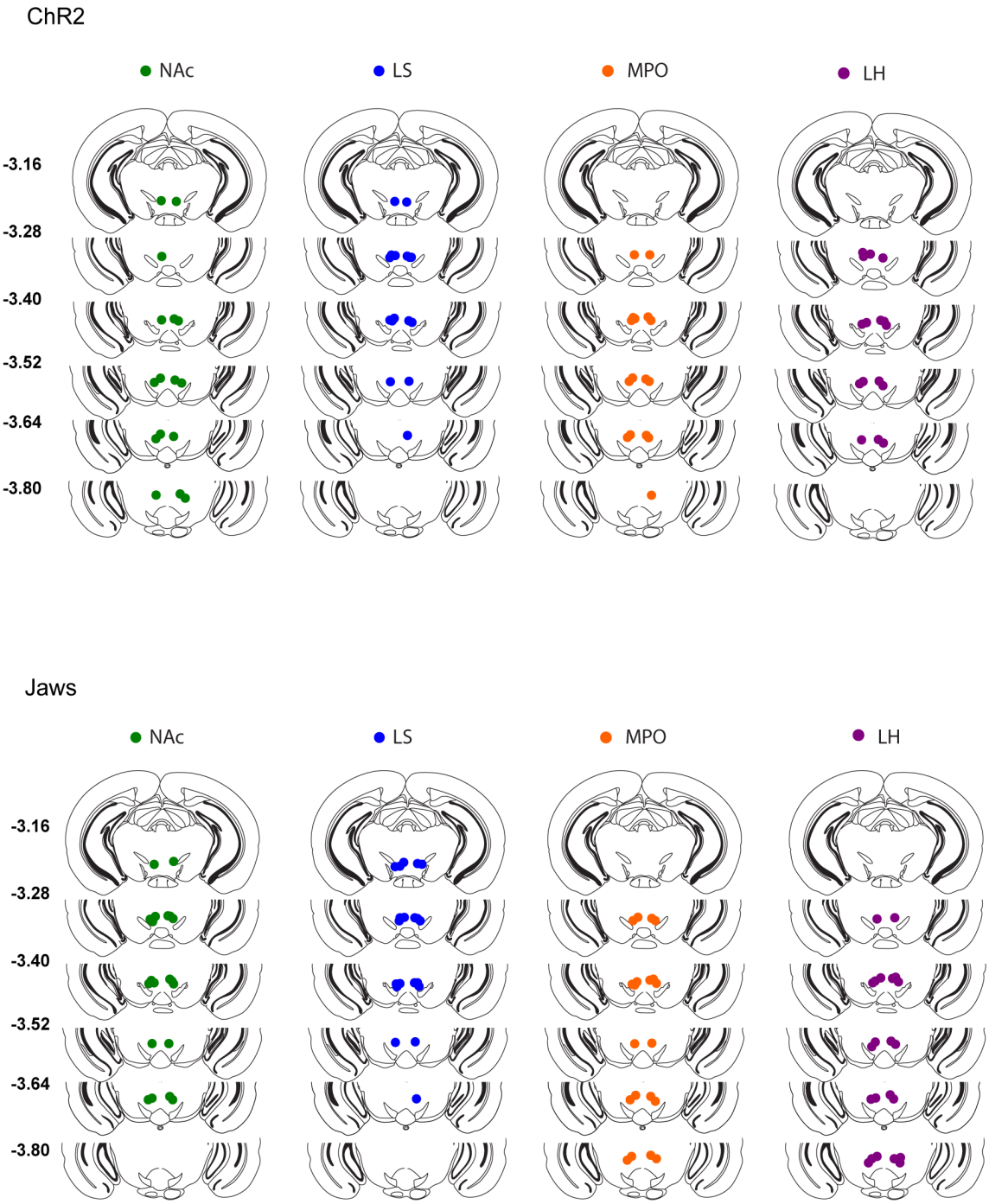
Supplementary Figure 4 (a) Atlas images (adapted from[25]) defining the rostral VTA (VTAR), rostrolinear nucleus (Rli), interfasicular nulceus (IF), parabrachial pigmented nucleus (PBP) and paranigral (PN) subdivisions of the VTA. **(b)** Mean pixel intensity (arbitrary units) of GFP fluoresence in each subdivision following injection of synaptophysinGFP into the indicated region in Vglut1 or Vglut2 Cre mice. N=3 mice/group. Error bars represent s.e.m.



Supplementary Figure 5. (a) Atlas images (adapted from[25]) defining the rostral VTA (VTAR), rostrolinear nucleus (Rli), interfasicular nulceus (IF), parabrachial pigmented nucleus (PBP) and paranigral (PN) subdivisions of the VTA. **(b)** Mean pixel intensity (arbitrary units) of GFP fluoresence in each subdivision following injection of synaptophysinGFP into the indicated region in Vgat-Cre mice or ePet1-Cre mice (last panel). N=3 mice/group for all regions except n=4 for LS, NAc Core, and BNST. Error bars represent s.e.m



Supplementary Figure 6. Maps illustrating viral spread at injection site for ChR2-YFP and Jaws-GFP in Vgat cre mice. Each color represents an individual animal and numbers indicate distance from bregma.



Supplementary Figure 7. Maps indicating fiber optic placement in mice injected with ChR2 or Jaws.