

Legend for supplemental Figure and Videos

Figure S1: Comparison of CNS Gal^{YFP} reporter expression and galanin mRNA expression.

Immunohistochemistry for Gal^{YFP} (A, C, E, G) and *in situ* hybridization for galanin mRNA expression (B, D, F, H) shows very similar distribution pattern for galanin neurons. Matching expression pattern is shown in the hypothalamus (A, B: preoptic area (POA); C,D: dorsomedial hypothalamus (DMH), lateral hypothalamus (LHA) and arcuate nucleus (ARC); E, F: locus coeruleus (LC); G, H: nucleus of the solitary tract (NTS)). *In situ* hybridization images were kindly provided by the Allen Brain Atlas Institute. Bar size is 1mm.

Gal = galanin; *GFP* = yellow fluorescent protein; *LS*= lateral septum, *ac*=anterior commissur; *AP*=area postrema

Figure S2: Comparison of Gal^{YFP} expression and galanin peptide expression.

A-C: Overview of the hypothalamus with immunohistochemical stain for Gal^{YFP} (green) and galanin peptide (red) shows overlapping distribution. Bar size is 500µm. D-E: High magnification (40x 1.25 oil) confocal image from the lateral hypothalamic area (LHA) shows colocalization (yellow) of Gal^{YFP} (green) and galanin peptide (red) in several bouton like structures.

Gal = galanin; *YFP* = green fluorescent protein; *3V* = 3rd ventricle; *DMH* = dorsomedial hypothalamus; *VMH* = ventromedial hypothalamus; *ARC* = arcuate nucleus; *ME* = median eminence

Figure S3: *Comparison of different galanin reporter lines.*

A. Overview (10x) of GFP/YFP reporter expression in transgenic Gal^{tgGFP} (left), Gal^{YFP} (middle) and $Gal^{(-neo)YFP}$ (right) mice in the hypothalamus. B/C. Immunohistochemical labeling of leptin-induced pSTAT3 (red) and Gal^{YFP} (green) in the LHA (B.) or NTS (C.) of all reporter lines.

Gal = galanin; tg = transgenic; GFP = green fluorescent protein; YFP = yellow fluorescent protein pSTAT3 = phosphorylated signal transducer and activator of transcription-3; LHA = lateral hypothalamic area; VMH = ventromedial hypothalamus; 3V = 3rd ventricle; NTS = nucleus of the solitary tract; cc = central canal; AP = area postrema; fx = fornix

Figure S4: *Deletion of functional LepRb in the NTS*

Representative images of the NTS showing functional LepRb deletion with leptin induced pSTAT3 by immunohistochemistry in WT (left) and KO mice (right).

AP= area postrema, NTS = nucleus of the solitary tract; WT = wildtype ;KO = knock out

Figure S5: *Normal blood glucose, body temperature and body composition in KO mice.*

In 12-week-old WT and KO mice fed (A) and over-night fasting (B) blood glucose levels, rectal temperature (C) and body composition (D) were measured.

KO = knock out; WT = wildtype; FM=fat mass, FFM=fat free mass

Figure S6: *Noradrenergic LC neurons express galanin, but not LepRb.*

Immunohistochemical staining for LepRb^{GFP} (green) in reporter mice shows strong labeling in the hypothalamus (A), but not in the LC (B). C. Immunohistochemical staining for Gal^{YFP} (green) in a reporter mouse and co-labeling with tyrosine hydroxylase (TH, red), indicating noradrenergic LC neurons.

LC = locus coeruleus; LepRb = long form leptin receptor; GFP = green fluorescent protein; YFP = yellow fluorescent protein; DMH = dorsomedial hypothalamus; 4V = 4th ventricle

Figure S7: GAL-LepRb neurons innervate the LC.

A. Representative example of 10nl fluorogold (FG, red) injection into the LC of Gal^{tgGFP} reporter mice. B. FG tracing (green) from the LC into the LHA and co-expression with leptin-induced pSTAT3 (red) and Gal^{tgGFP} (blue).

Gal = galanin; LepRb = long form leptin receptor; LC = locus coeruleus; tg = transgenic; GFP = green fluorescent protein; LHA = lateral hypothalamic area; pSTAT3 = phosphorylated signal transducer and activator of transcription-3

Figure S8: LepRb deletion in galanin neurons enhances LHA cFos, while DMH cFos remains unchanged.

A./B. Immunohistochemical staining for cFos in the LHA (boxed area) and DMH (circled area) of WT (A.) and KO (B.) mice. C. Quantification of total cFos in the DMH confirms that cFos is unchanged in the DMH.

WT = wildtype ;KO = knock out; LHA = lateral hypothalamus; DMH = dorsomedial hypothalamus, 3V = 3rd ventricle

Video S1: *WT mouse in an incentive runway trial at session 9.*

Video S2: *KO mouse in an incentive runway trial at session 9.*

Figure S1

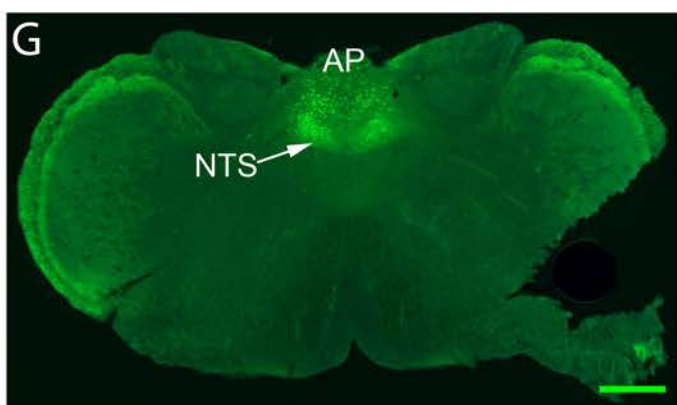
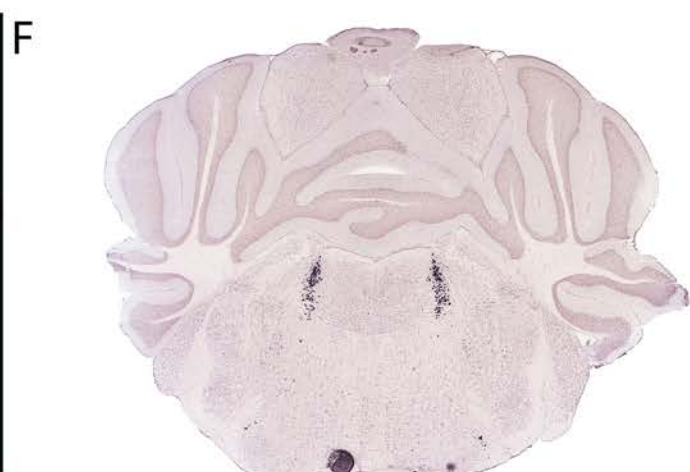
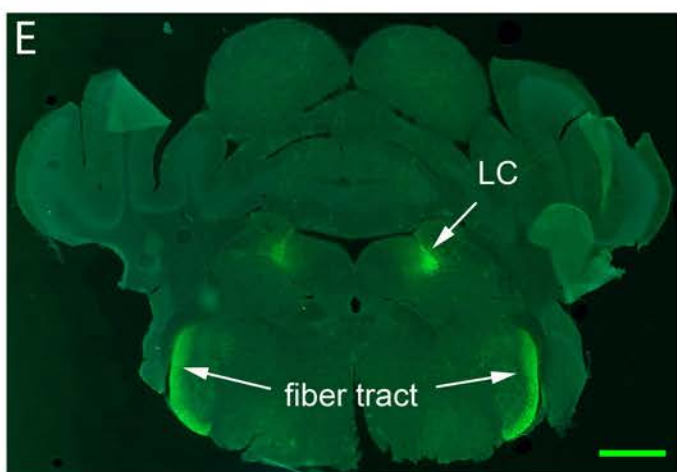
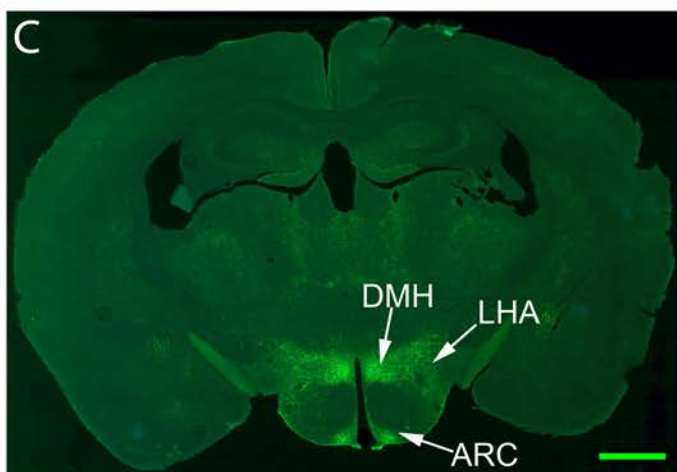
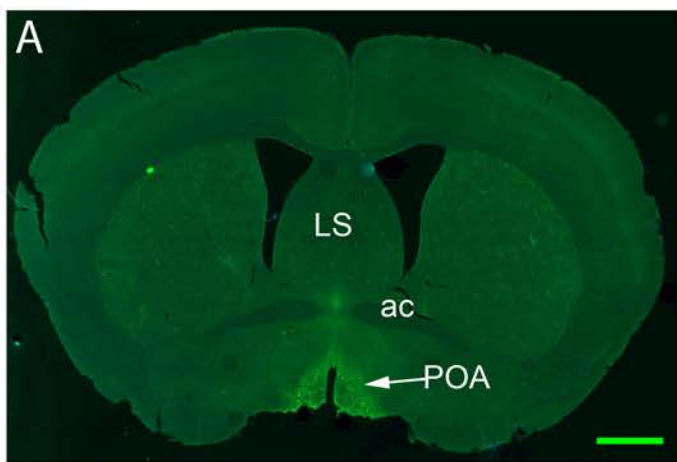


Figure S2

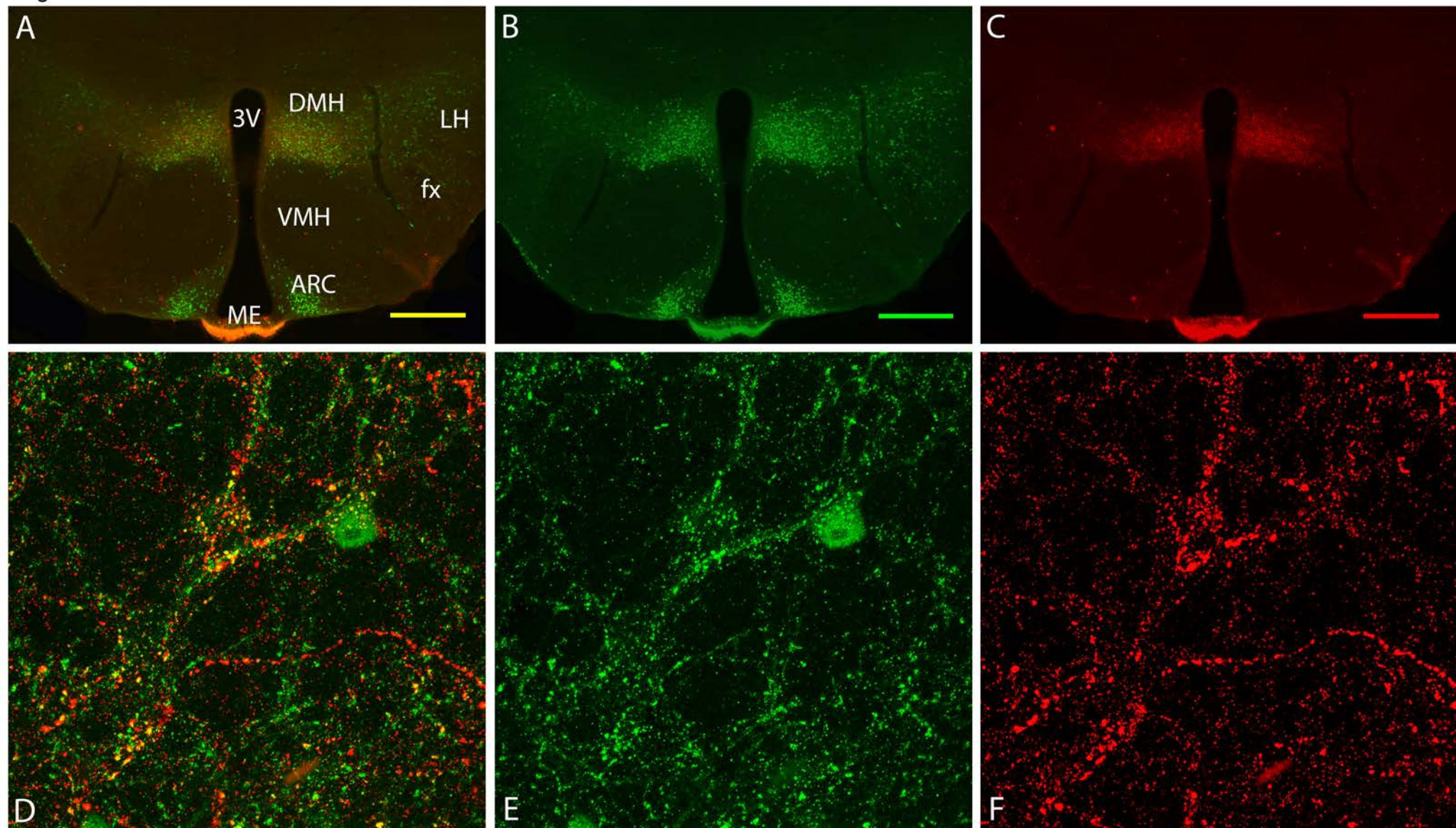


Figure S3

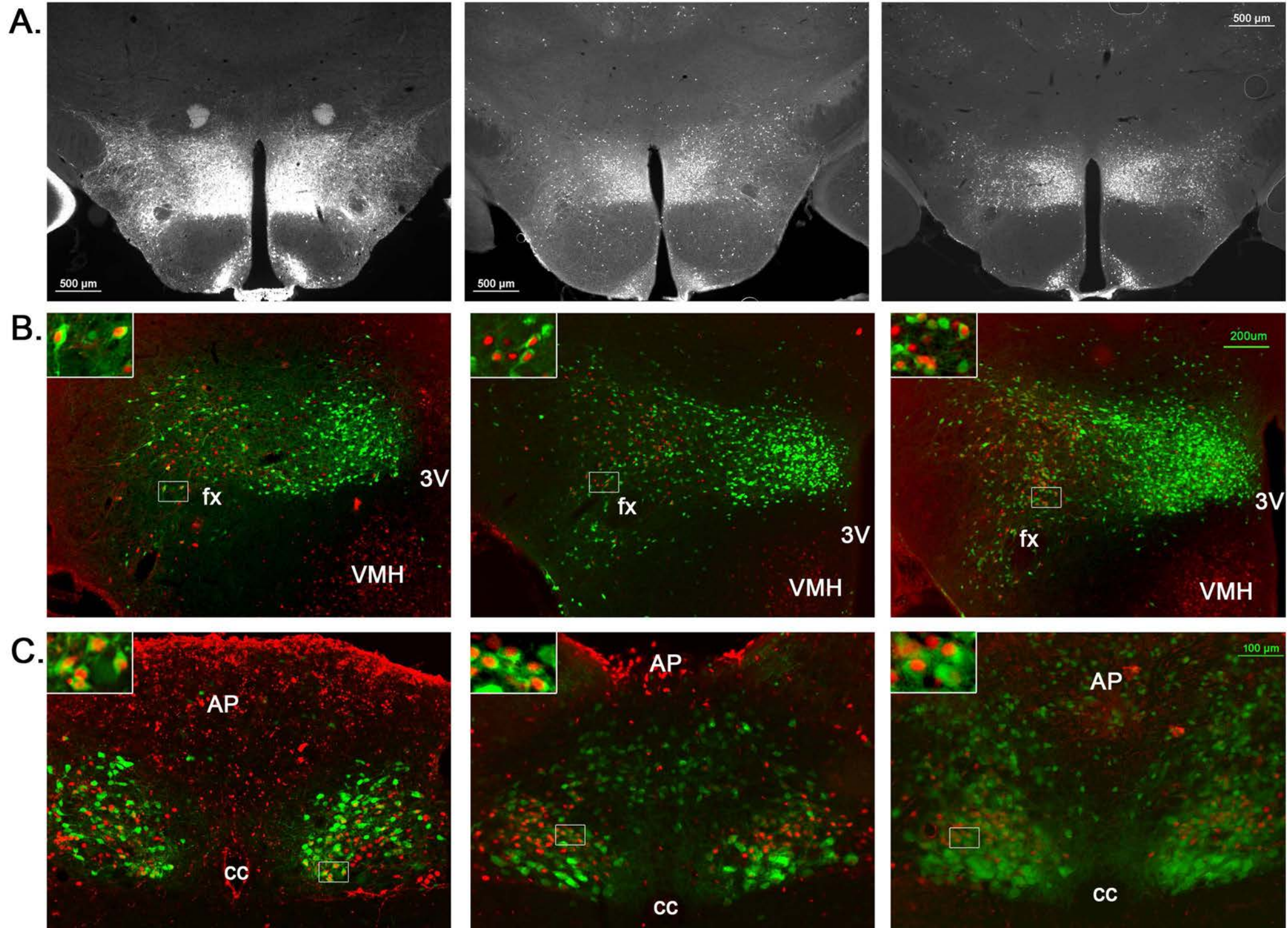


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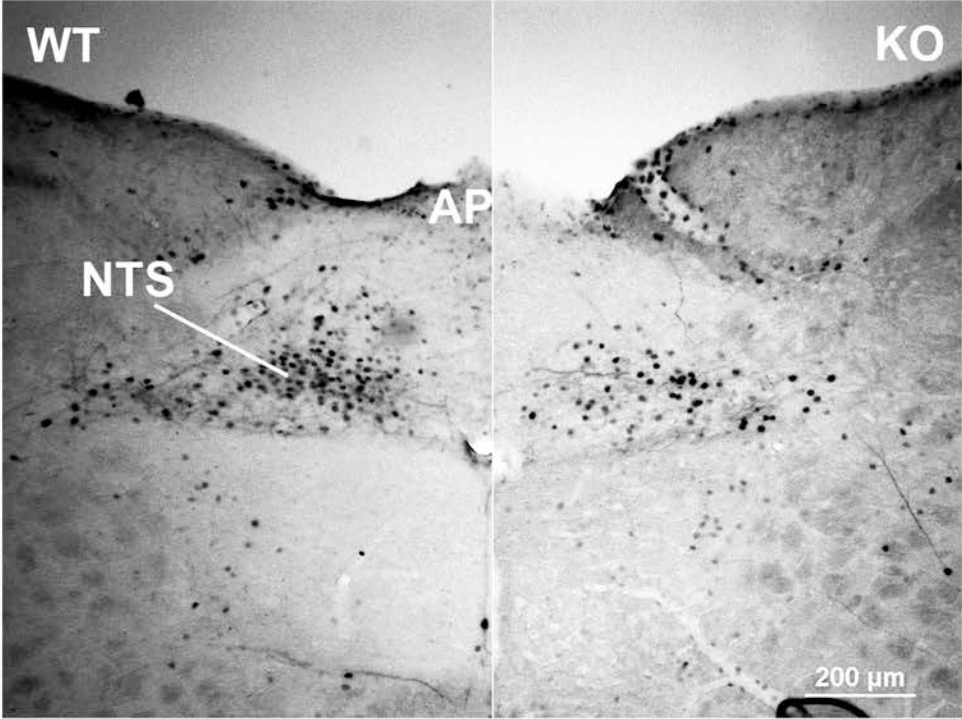


Figure S5

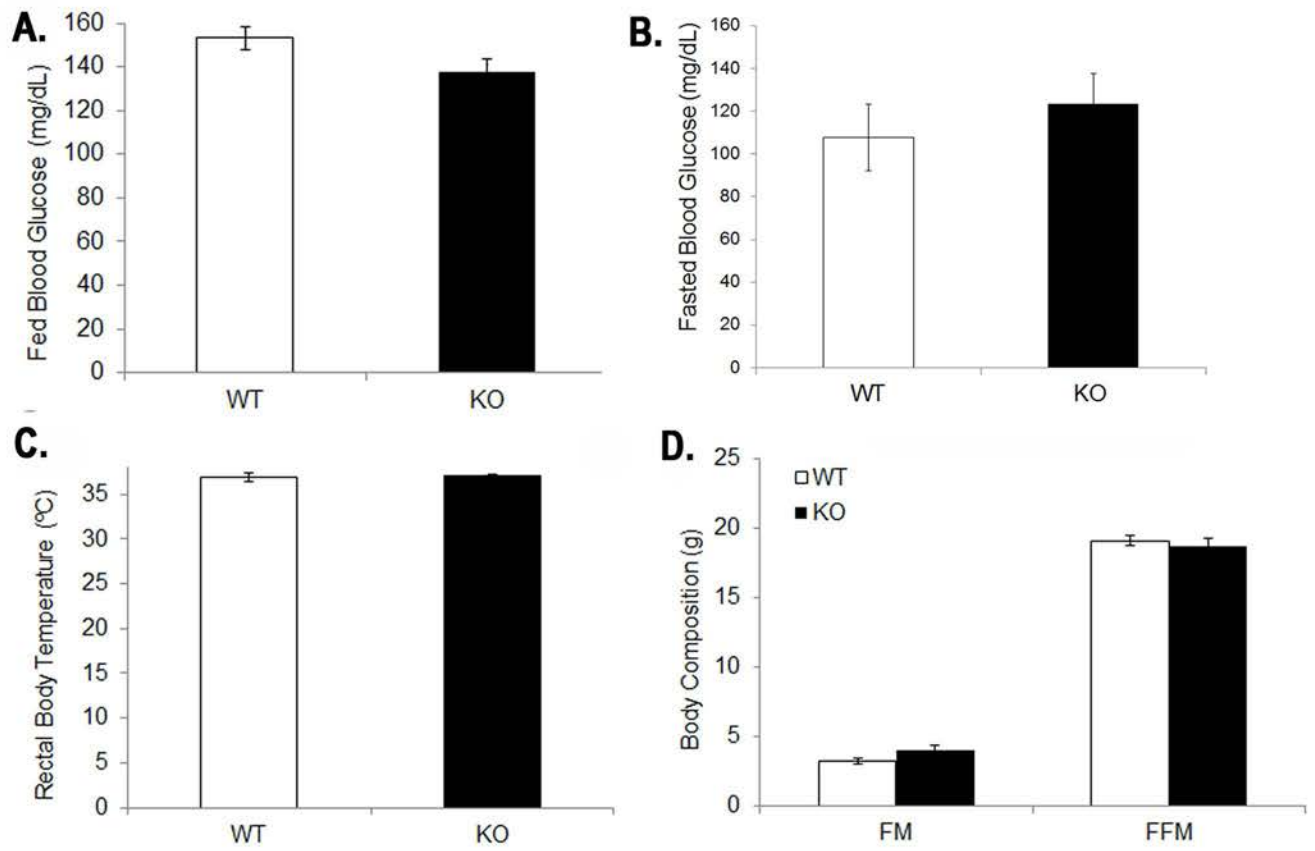


Figure S6

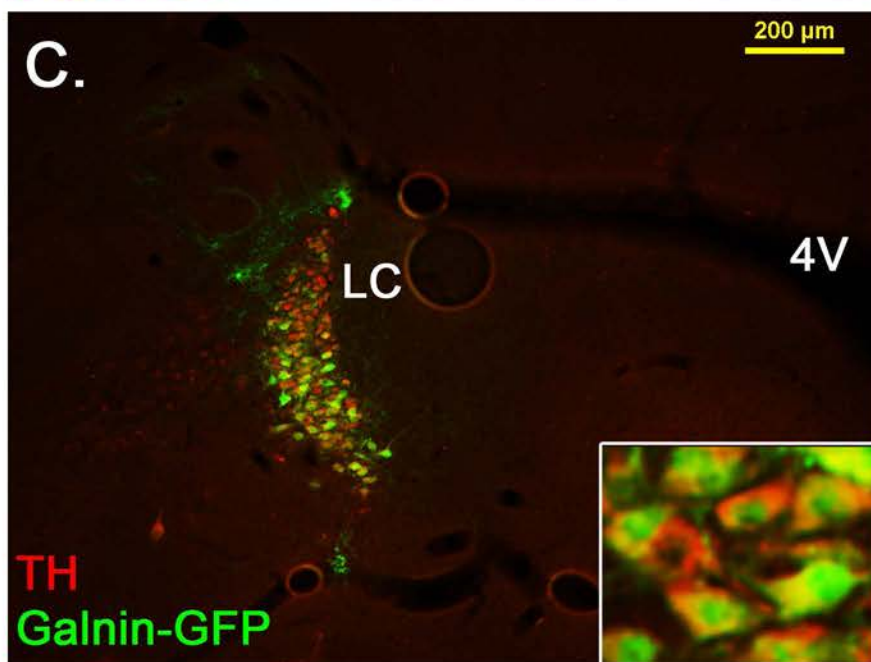
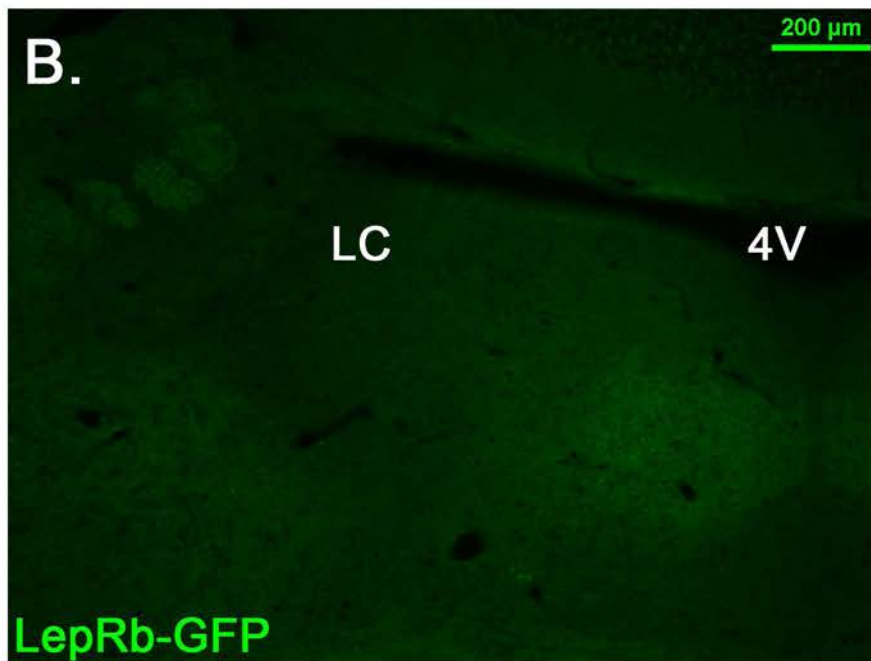
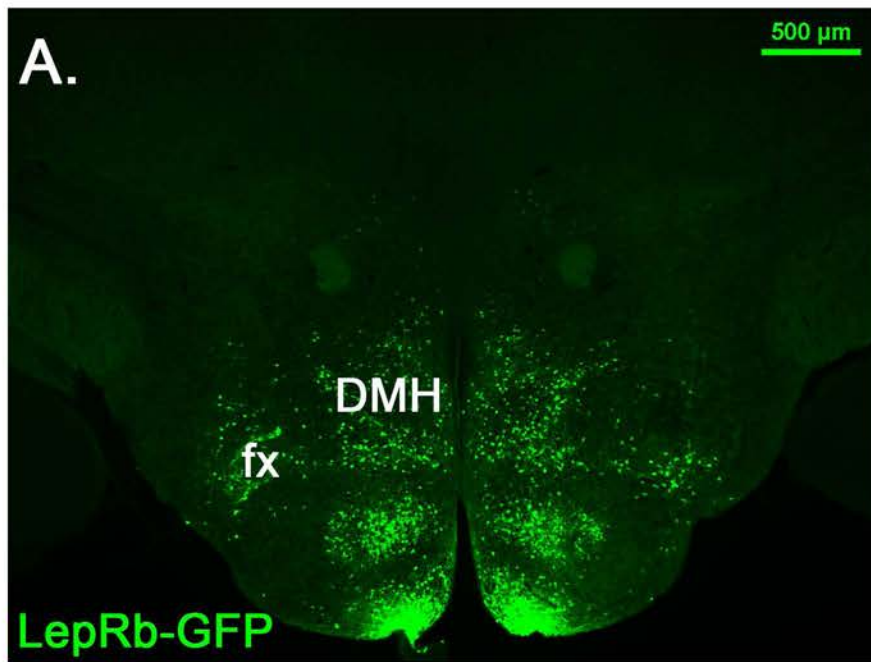


Figure S7

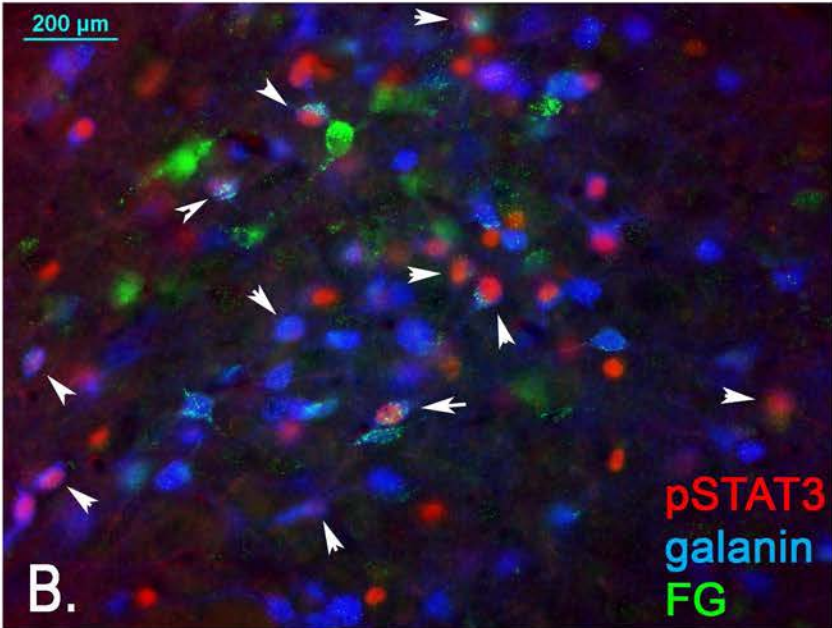
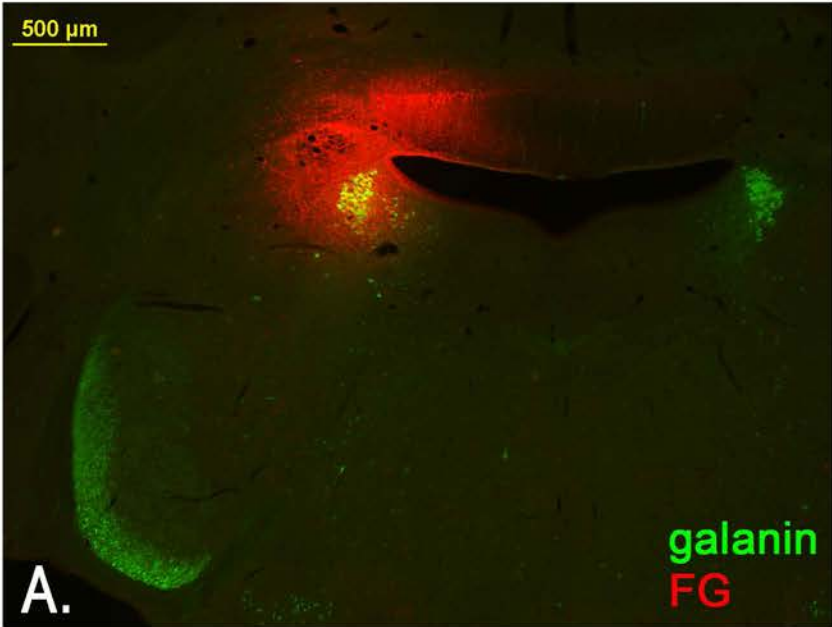


Figure S8

