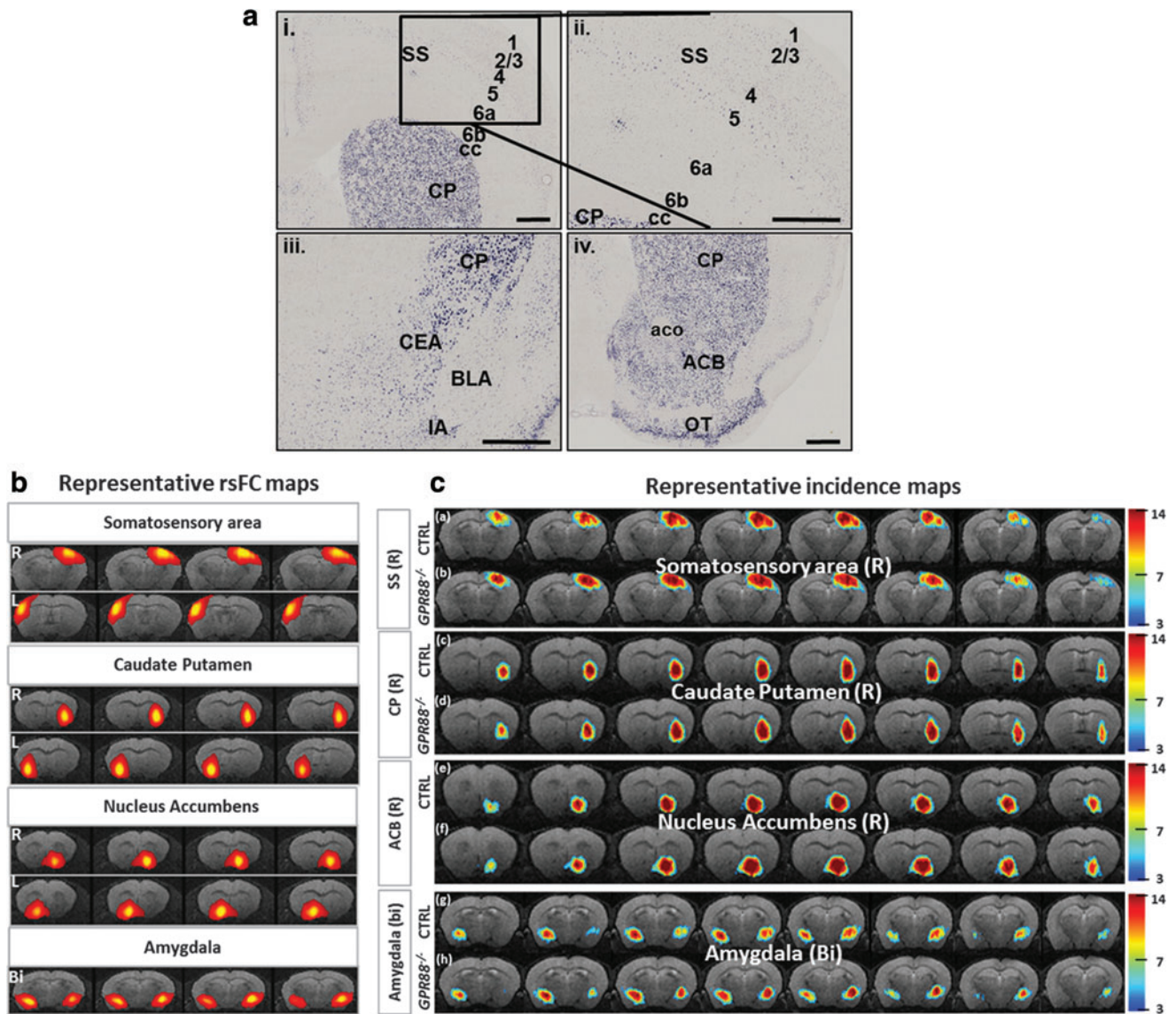
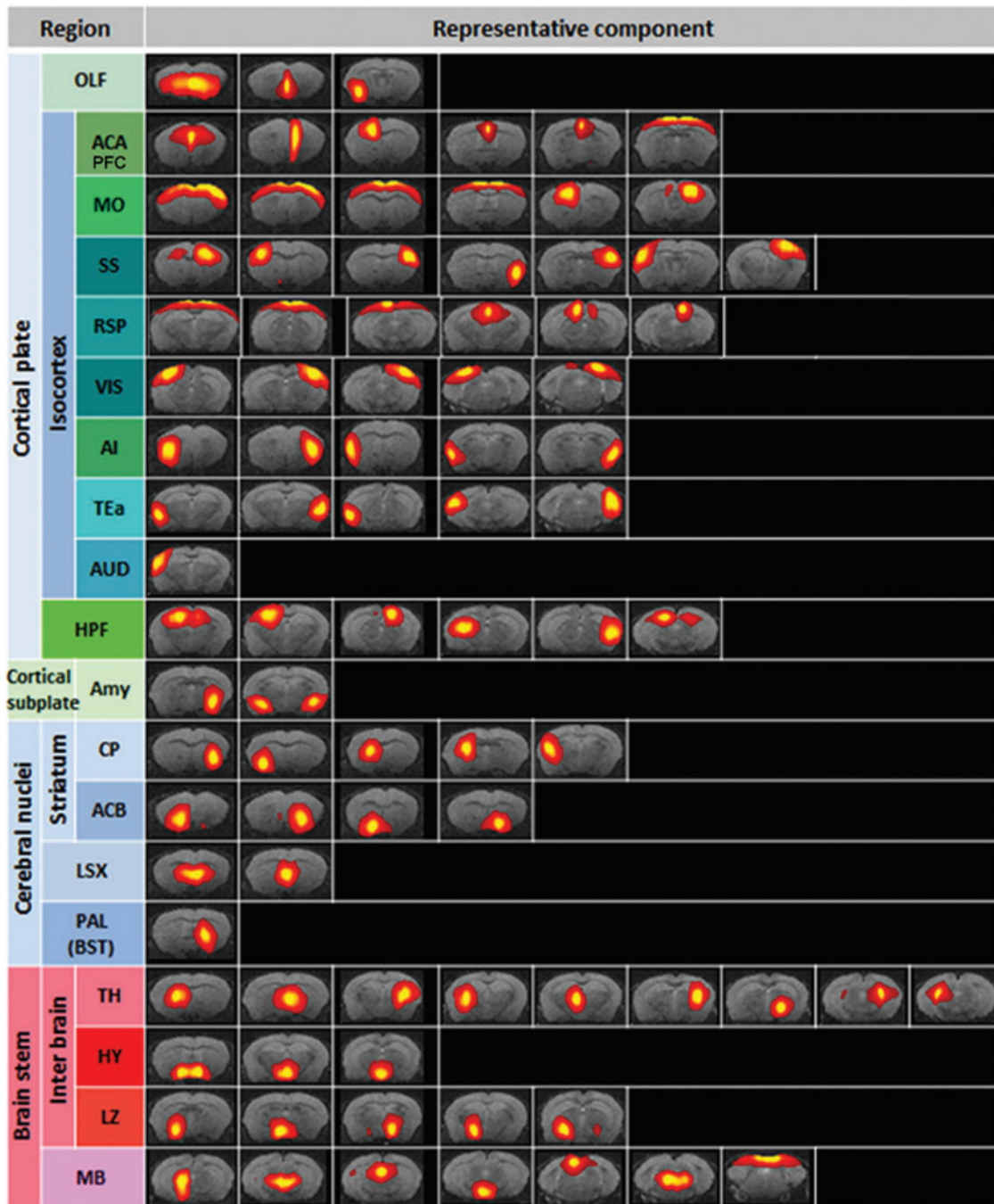


## Supplementary Data



**SUPPLEMENTARY FIG. S1.** Localization of Gpr88 receptor through *in situ* hybridization (ISH) can be associated with spatial pattern of representative functional clusters obtained through the spatial group ICA (100-ICASSO): **(a)** ISH expression of GPR88 in cortical and subcortical regions: i. cortical regions of GPR88 expression in layers 4 and 5 of somatosensory cortex (SS) and caudate-putamen (CP); ii. the SS layer 4 and 5 enrichment of Gpr88; iii. amygdalar GPR88 expression is predominantly localized to the central extended amygdala areas (CEA) and intercalated amygdalar nucleus (IA) compared with the lack of expression in basolateral amygdala (BLA); and iv. GPR88 is expressed in the nucleus accumbens (ACB) and olfactory tubercle (OT). Corpus callosum (cc) and anterior commissure (aco) are included for anatomical reference of the regions. Scale bar is 500  $\mu\text{m}$ . **(b)** Representative functional cluster obtained through 100-ICASSO, spatially overlaying mouse brain areas expressing GPR88 receptor in normal animals. Four consecutive slices (rostrocaudal axis)—representative of the anatomical areas that they overlay—are provided. From top to bottom, these areas are associated with right and left lateral somatosensory cortex, right and left lateral caudate-putamen, right and left lateral nucleus accumbens, and bilateral amygdala. **(c)** Incidence maps showing the spatial distribution and reproducibility of corresponding brain regions shown in Figure 2b. Functional clusters revealed through ICASSO are reconstructed for each group separately (i, iii, v, and vii corresponding to the CTRL group and ii, iv, vi, and viii corresponding to the *Gpr88*<sup>-/-</sup> group). The color map codes the number of animals in which the spatial map overlays the indicated anatomical area. In this study, we only show the patterns replicated more than 3 times. GPR88, G protein-coupled receptor 88; ICA, independent component analysis.



**SUPPLEMENTARY FIG. S2.** Open-ended high-dimensional spatial ICA reveals anatomically well-defined brain components or nodes. Unique representative slices are provided. Spatial ICA using ICASSO (Gift—group ICA of fMRI toolbox—v.1.3i, [www.nitrc.org/projects/gift](http://www.nitrc.org/projects/gift)) was performed on 28 combined control and *Gpr88*<sup>-/-</sup> datasets. The analysis revealed 88 components or nodes displayed as spatial color-coded z-maps (threshold 3.0) onto T<sub>2</sub> image and are arranged according to their affiliation to broader brain areas: isocortex, hippocampal formation (HPF), amygdala (Amy), caudate-putamen (CP), nucleus accumbens (ACB), lateral septal complex (LSX), pallidum (PAL), thalamus (TH), hypothalamus (HY), lateral hypothalamus (LZ), and midbrain (MB). fMRI, functional magnetic resonance imaging.