

Supplemental Figure 1. Cre recombinase is not expressed in GFAP-positive cells. a. Immunofluorescence double labeling was performed to detect the Cre (red) and GFAP-positive astrocyte (green). (a). GFAP (green)-positive astrocytes in the hippocampal dentate gyrus of POMC-Cre mice at P15. (b). Cre (red)-positive newborn neurons in the dentate gyrus. (c). Merged image of (a) and (b). (d). An amplified view of c to show that Cre-positive cells and GFAP-positive astrocytes are located in adjacent layers, and Cre is not expressed in astrocytes.

Supplemental figure 2. Cre is only expressed in newborn granule neurons, not in neural progenitor cells. (a, b) Confocal analysis confirms that Cre (red) and Dcx (green) are colocalized in newborn granule neurons in postnatal dentate gyrus of POMC-Cre transgenic mice at P15. Single focal sections of laser-scanning images collected using a 20x objective (a) or 63x objective (b) confirm the expression of Cre (red) in Dcx (green) positive cells. (c) Laser-scanning confocal images were combined to produce 3D reconstructions of the images collected from double immunostaining for Nestin (green) and Cre (red). Viewing the Cre-positive cells along the x, y, and z axes demonstrate that there are Nestin-positive signals around the Cre positive cell body. (d) Pulse labeling of neural progenitor cells with BrdU (green) shows that most BrdU signals are not localized within Cre expressing cells. In very rare cases, we observed partial overlap of the BrdU signal with the Cre signal (eg, in the center of white box). (e) Laser-scanning confocal images were combined to generate 3D reconstructed images of the cells that displayed weak overlap of BrdU and Cre staining. Viewing these cells from the z axis demonstrates that, in every case, a BrdU positive cell is superposed on top of the Cre positive cells, suggesting that proliferating neural progenitor cells do not express Cre. Scale bars, in panel a, d are 50 $\mu$ m and b, c, e are 10 $\mu$ m.

Supplemental figure 3. Interruption of  $\beta$ -catenin expression specifically in Cre-positive cells in the dentate gyrus of postnatal hippocampus. Immunohistochemistry of hippocampal sections from  $\beta$ -catenin conditional knockout mice, generated by crossing POMC-Cre mice with  $\beta$ -catenin<sup>flox/flox</sup>. Laser-scanning confocal microscopy images were taken to show the expression of Cre (red) and  $\beta$ -catenin (green) in postnatal dentate gyrus. (a-d) Double-immunofluorescence staining to show Cre (red) and  $\beta$ -catenin (green) expression in the POMC-Cre transgenic mouse at P25. (a). Cre (red) is highly expressed in the inner granular cell layer of dentate gyrus. (b).  $\beta$ -catenin (green) is highly expressed in Cre-expressing cells and in the cells below the Cre-expressing cell layer, which is the subgranular zone where the neural progenitor cells are located. (c). Merged image of (a) and (b). (d). Amplified image from (c) within the white box. (e-h) Double-immunofluorescence staining to show Cre recombinase (red) and  $\beta$ -catenin (green) expression in the POMC-Cre;  $\beta$ -catenin<sup>flox/flox</sup> conditional knockout mouse. (e) Cre (red) is highly expressed in the inner granule cell layer (GL) of the dentate gyrus, as seen in the POMC-Cre transgenic control mice. (f). The expression of  $\beta$ -catenin (green) is dramatically decreased in the Cre-expressing cells, while the expression of  $\beta$ -catenin in the cells below the Cre positive cell layer is not affected, suggesting a specific interruption of  $\beta$ -catenin expression in Cre positive-migrating newborn neurons in the postnatal dentate gyrus. (g). Merged image of (e) and (f). (h). Amplified image from (g) within the white box. Scale bar is 10 $\mu$ m.

Supplemental figure 4. Lacking  $\beta$ -catenin expression in newborn neurons labeled by retroviral mediated EGFP expression in conditional knockout mice. Immunostaining to show  $\beta$ -catenin expression in EGFP-labeled newborn neurons in dentate gyrus of  $\beta$ -catenin in cKO mice (a-d) or in control mice (e-h) at P45. (a, e) DAPI staining (blue) showing the anatomical structure of dentate gyrus including granular neuronal layer (GL) and hilus in the hippocampus. (b, f) Newborn neurons labeled by retrovirus-mediated EGFP (green) in the hippocampal dentate gyrus. (c, g)  $\beta$ -Catenin expression (red) in the hippocampal dentate gyrus. Newborn neurons at developmental stage A were pointed out with white arrows, whereas, at developmental stage b were pointed out with white arrowhead. (d, h) Merged images from (a) to (c) or from (e) to (g), respectively.