## **Supporting Information**

## Kim et al. 10.1073/pnas.1213903109



**Fig. S1.** Anterior cingulate cortex (ACC) stimulation alone does not evoke freezing behavior. (*A* and *B*) Electrical stimulation in left (n = 7) or right (n = 5) ACC evoked no freezing behavior in mice without the presence of demonstrator mice during observational fear conditioning ( $F_{1,10} = 0$ , P = 1; *A*) and on the next day during the 24-h contextual memory test ( $F_{1,10} = 0.108$ , P = 0.749; *B*). (*C* and *D*) Electrical stimulation in left (n = 4) or right (n = 4) ACC evoked no freezing behavior in mice when the demonstrator mice received no foot shocks during the conditioning phase ( $F_{1,6} = 2.603$ , P = 0.158; *C*) and 24-h later during the memory recall test ( $F_{1,6} = 1.152$ , P = 0.324; *D*). Error bars represent SEM.





Left Right Left Right Ba Br. -1.3 Bb Ah Bh VL VM Br .0.8 Br. -1.4 Bi Bc MD/IL VM Br. -1.5 Bd В MD/IL vм Br. -1.6 Be Bk VM D.в B

Distribution of Phal-labelled corticothalamic axons from ACC

**Fig. S2.** No difference in the corticothalamic projections of the left and right ACC. The anterograde tracer *Phaseolus vulgaris leucoagglutinin* (Phal) was injected into the left (*A*, green) and right (*B*, red) ACC at the same anteroposterior level. The anterior thalamic regions receiving ACC fibers are shown on coronal sections with 100- $\mu$ m intervals. No difference can be observed in the thalamic innervation patterns between the left and right sides. The cortico-thalamic fibers are distributed in the anteromedial (AM; *A*, *a*-*e* and *B*, *a*-*e*) and mediodorsal/intralaminar (MD/IL; *A*, *d*-*I* and *B*, *d*-*I*) thalamic nuclei (respectively). Corticothalamic axons from both left and right ACC target the contralateral AM (*A*, *b*-*e* and *B*, *b*-*e*) to a lesser extent. AV, anteroventral thalamic nucleus; CPu, caudate putamen (striatum); Po, posterior thalamic nucleus; Re, reuniens thalamic nucleus; VL, ventrolateral thalamic nucleus; VM, ventromedial thalamic nucleus. (Scale bars, 500 µm.)



**Fig. S3.** Total extent of three left (blue) and three right (red) thalamic lesions presented in Fig. 3. (*A* and *B*) Neurochemical lesions affected the anterior quarter of the thalamus. The maximal (anteroposterior  $\times$  mediolateral  $\times$  dorsovetral) extent of a lesion was 500  $\mu$ m  $\times$  500  $\mu$ m  $\times$  1,000  $\mu$ m. The lesions involved the anteroventral (AV), AM, and MD/LL thalamic nuclei in all cases. All of these lesions were unilateral. Lesions spreading to the contralateral side were discarded from the analysis. mt, mammillothalamic tract; VA, ventral anterior thalamic nucleus. Other abbreviations as in Fig. S2. (Scale bars, 500  $\mu$ m.)



**Fig. S4.** Thalamic (THAL)-lesioned mice showed similar levels of anxiety and locomotor activity as in control mice. (*A* and *B*) Thalamic lesion and saline-injected mice showed similar locomotor activity (right thalamic ibotenic acid injection vs. right thalamic saline injection,  $F_{1,15} = 0.3$ , P = 0.592; left thalamic ibotenic acid injection vs. left thalamic saline injection,  $F_{1,14} = 1.931$ , P = 0.186) (*A*) and spent similar time in the center (right thalamic ibotenic acid injection vs. right thalamic saline injection, P = 0.574; left thalamic ibotenic acid injection vs. left thalamic saline injection, P = 0.574; left thalamic ibotenic acid injection vs. left thalamic saline injection, P = 0.574; left thalamic ibotenic acid injection vs. left thalamic saline injection, P = 0.574; left thalamic ibotenic acid injection vs. left thalamic saline injection, P = 0.574; left thalamic ibotenic acid injection vs. left thalamic saline injection, P = 0.574; left thalamic ibotenic acid injection vs. left thalamic saline injection, P = 0.574; left thalamic ibotenic acid injection vs. left thalamic saline injection, P = 0.574; left thalamic ibotenic acid injection vs. left thalamic saline injection, P = 0.574; left thalamic ibotenic acid injection vs. left thalamic saline injection, P = 0.574; left thalamic ibotenic acid injection vs. left thalamic saline injection, P = 0.574; left thalamic ibotenic acid injection vs. left thalamic saline injection, P = 0.574; left thalamic ibotenic acid injection vs. left thalamic saline injection, P = 0.574; left thalamic ibotenic acid injection vs. left thalamic saline injection, P = 0.574; left thalamic saline injection vs. left thalamic saline injection, P = 0.574; left thalamic saline injection vs. left thalamic saline injection vs.