Supporting Information

Meredith et al. 10.1073/pnas.1018519108

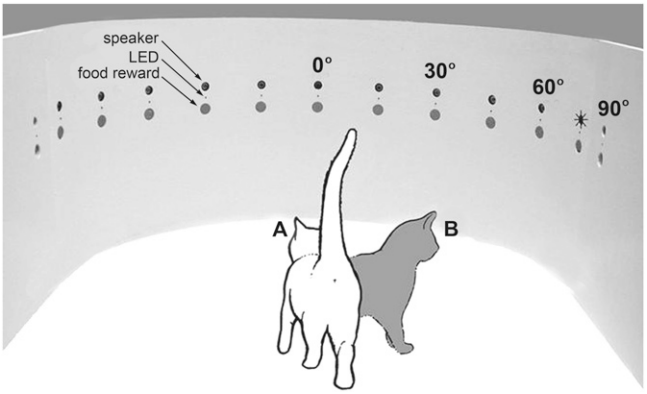

Fig. S1. Orienting arena used for acoustic and visual localization tasks. A loudspeaker (upper circle) and a light-emitting diode (LED, small dot) were located above a food reward locus (lower circle) at each of 13 regularly spaced (15°) intervals (for clarity, only 30° intervals are labeled). (*A*) The animal was first required to fixate on the central (0°) LED. (*B*) It then had to orient to, and approach, a secondary acoustic (100-ms broad-band noise) or visual (flash of an LED) stimulus to receive a food reward. Adapted from Lomber et al. (1).

1. Lomber SG, Malhotra S, Hall AJ (2007) Functional specialization in non-primary auditory cortex of the cat: Areal and laminar contributions to sound localization. *Hear Res* 229:31–45.

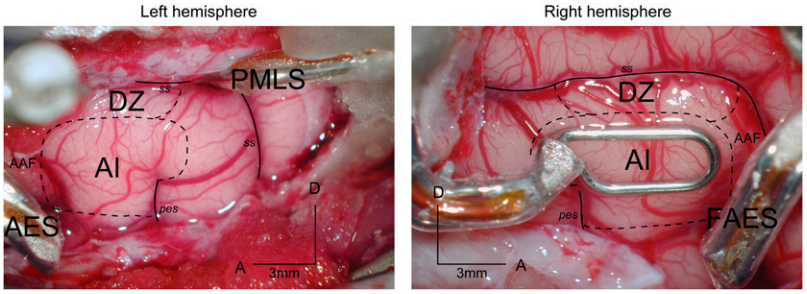

Fig. S2. Lateral views of the left and right hemispheres showing cooling loops in contact with the cerebral cortex of an early-deaf cat at the time of implantation. Left hemisphere: Cooling loops were placed in the anterior ectosylvian sulcus (AES) over the FAES and in the suprasylvian sulcus (ss) in contact with the PMLS and PLLS. Right hemisphere: A cooling loop was placed over the FAES in a mirror symmetric manner (with that in the left hemisphere) and another loop was placed in contact with primary auditory cortex (A1). The areal borders presented are based on the postmortem analysis of SMI-32 processed tissue (1) from the brain shown in this photo. Abbreviations: DZ, dorsal zone of auditory cortex; AAF, anterior auditory field; pes, posterior ectosylvian sulcus; A, anterior; D, dorsal.

1. Mellott JG, et al. (2010) Areas of cat auditory cortex as defined by neurofilament proteins expressing SMI-32. *Hear Res* 267:119–136.

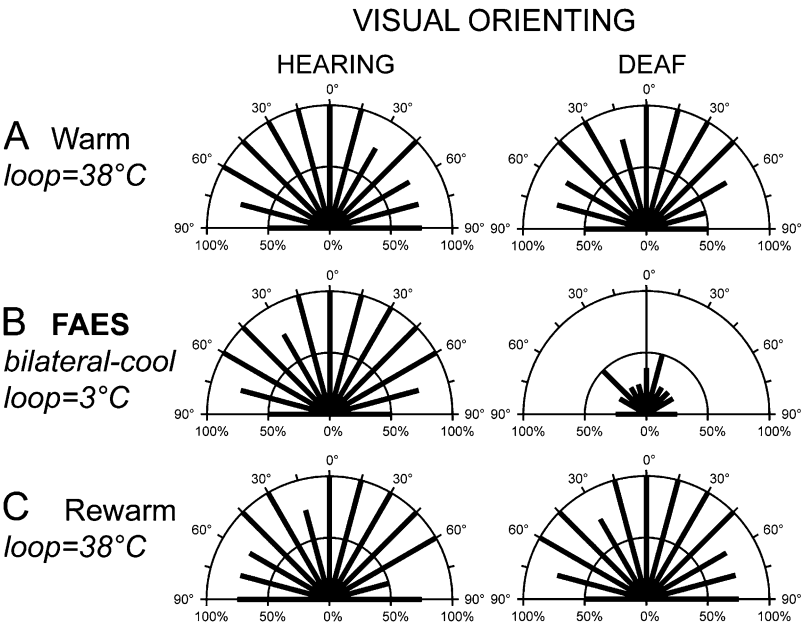

Fig. S3. Orienting responses to visual stimuli during bilateral cooling of FAES in one hearing (*Left* column) and one deaf (*Right* column) animal. Data presented are from one cooling deactivation session. In these polar plot graphs, the two concentric semicircles represent 50% and 100% correct response levels and the length of each thick line corresponds to the percentage of correct responses at each location tested. (*A*) Both the hearing and the deaf cat performed the visual orienting task with similar levels of proficiency when the loop was warm and at 38 °C. Ten minutes later, following cooling of the FAES loops to 3 °C, *B* illustrates that bilateral cooling of the FAES results in visual orienting deficits across the entire field in deaf, but not hearing, cats. Following the termination of cooling and the natural rewarming of cortex to 38 °C, *C* illustrates orienting performance of both the hearing and the deaf animal. Note the similarities in performance between the warm and rewarm conditions.

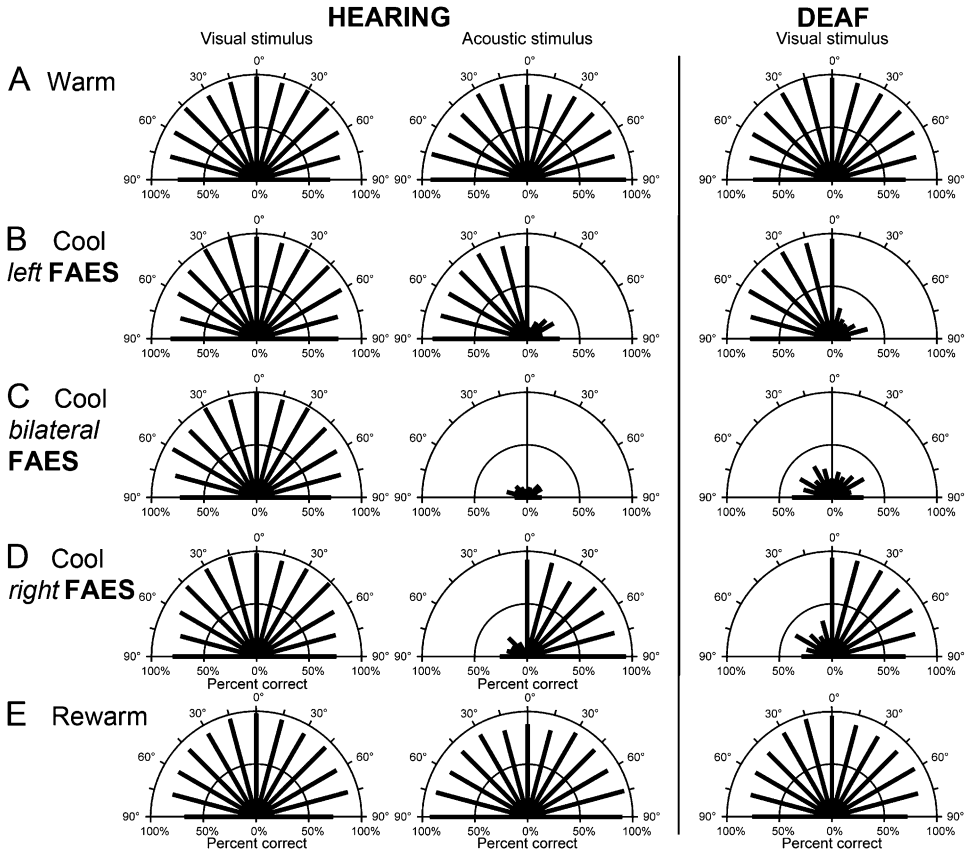

Fig. S4. Orienting responses to visual or acoustic stimuli during unilateral or bilateral cooling of the FAES from all hearing and deaf animals tested. In these polar plot graphs, the two concentric semicircles represent 50% and 100% correct response levels and the length of each thick line corresponds to the average percentage of correct responses at each location tested. In hearing animals (*Left*/*Center*), responses were measured to either visual or acoustic stimuli. For deafened animals (*Right*), only responses to visual stimuli were tested. Each row represents the averaged results comparing orienting during a given deactivation condition. (*A*) Hearing and deaf cats performed the orienting tasks with similar levels of proficiency. (*B*) Unilateral (*Left*) cooling of the FAES results in contralateral hearing, but not visual, deficits in hearing cats, but induces contralateral visual localization deficits in early-deafened subjects. (*C*) Bilateral deactivation of the FAES results in hearing, but not visual, deficits across the entire field in hearing cats, but induces visual orienting deficits across the entire tested field in early-deafened subjects. (*D*) Unilateral (*Right*) deactivation of the FAES results in mirror-symmetric contralateral deficits to those identified during unilateral cooling of left FAES (*B*). (*E*) Behavioral performance of both the hearing and the deaf animals shortly after the termination of cooling, when cortex had rewarmed.

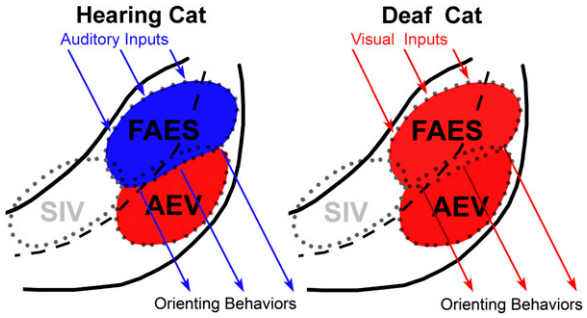

Fig. S5. Summary of FAES crossmodal reorganization in early-deaf cats. (*Left*) In hearing cats, the banks of the anterior ectosylvian sulcus contain auditory (FAES, blue), visual (AEV, red), and somatosensory (SIV, white) representations. The FAES receives projections largely from auditory structures (blue input arrows), responds primarily to acoustic stimulation, and controls auditory orienting behavior (output arrows). (*Right*) In early-deaf cats, inputs carry visual activity to the FAES (red input arrows), the FAES (now colored red) is largely visually responsive, and outputs still control orienting behaviors now mediated by the visual modality (output arrows). These diagrams summarize the hypothesis that crossmodal plasticity can substitute an input sensory modality for one that has been lost or damaged while the functional repertoire of the reorganized region is maintained.

Table S1. Means and SE of mean depicted in Fig. 3

	L90	L75	L60	L45	L30	L15	0	R15	R30	R45	R60	R75	R90
Hearing cats visual stimulus													
Control	75.3 ± 4.3	85.1 ± 3.7	90.7 ± 2.0	96.8 ± 1.6	92.9 ± 2.0	96.9 ± 2.1	98.7 ± 1.0	95.3 ± 2.9	98.8 ± 1.2	96.3 ± 0.9	90.8 ± 1.7	82.9 ± 2.6	70.7 ± 4.2
FAES (left cool)	82.6 ± 3.5	75.7 ± 4.9	86.2 ± 3.8	91.7 ± 2.8	98.5 ± 1.5	99.8 ± 0.2	97.5 ± 1.6	94.2 ± 2.5	98.7 ± 1.2	97.0 ± 2.1	93.9 ± 3.3	80.7 ± 4.3	78.2 ± 4.8
A1 (left cool)	75.3 ± 5.0	78.9 ± 3.8	83.9 ± 1.7	96.5 ± 2.2	88.9 ± 2.7	94.7 ± 1.1	96.9 ± 1.6	90.0 ± 2.7	88.5 ± 2.9	88.9 ± 3.6	85.5 ± 1.7	85.0 ± 3.3	75.4 ± 2.9
PMLS (left cool)	98.6 ± 1.2	100	96.4 ± 2.8	100	98.2 ± 1.3	99.3 ± 0.5	95.9 ± 2.5	10.3 ± 3.6	6.9 ± 2.6	7.9 ± 3.9	10.2 ± 3.0	4.9 ± 2.6	8.9 ± 3.7
Hearing cats acoustic stimulus													
Control	92.9 ± 0.9	94.3 ± 1.4	86.5 ± 2.3	88.7 ± 1.8	94.9 ± 1.1	94.5 ± 2.0	90.9 ± 2.1	84.8 ± 4.4	91.5 ± 2.2	89.9 ± 1.3	92.1 ± 1.9	86.8 ± 3.2	94.5 ± 2.0
FAES (left cool)	90.7 ± 2.4	85.8 ± 2.4	86.7 ± 1.7	90.0 ± 2.1	93.4 ± 1.7	91.3 ± 1.7	88.0 ± 2.1	11.4 ± 3.8	18.2 ± 5.7	25.9 ± 7.8	29.3 ± 6.9	15.7 ± 5.6	31.2 ± 7.7
A1 (left cool)	80.4 ± 4.7	92.7 ± 3.0	90.2 ± 2.5	90.2 ± 2.4	86.8 ± 1.4	94.2 ± 1.7	90.9 ± 1.6	25.7 ± 7.6	17.8 ± 6.3	15.3 ± 4.6	10.5 ± 4.8	12.9 ± 4.0	23.7 ± 5.2
PMLS (left cool)	82.7 ± 3.2	84.2 ± 4.4	90.9 ± 2.7	94.8 ± 1.2	92.4 ± 2.0	86.8 ± 1.8	92.7 ± 2.5	96.7 ± 1.0	90.4 ± 1.9	92.9 ± 2.4	94.3 ± 1.4	82.9 ± 3.8	88.3 ± 3.8
Deaf cats visual stimulus													
Control	75.4 ± 4.2	81.2 ± 1.9	87.5 ± 1.6	90.2 ± 1.2	95.4 ± 1.5	99.5 ± 0.5	97.9 ± 1.9	95.8 ± 1.7	94.5 ± 2.0	92.7 ± 2.9	90.9 ± 2.4	83.9 ± 6.0	70.3 ± 6.8
FAES (left cool)	78.0 ± 3.8	80.0 ± 2.4	91.9 ± 0.9	93.8 ± 0.7	95.7 ± 1.1	94.2 ± 1.6	95.4 ± 0.8	30.7 ± 6.9	21.4 ± 5.7	19.0 ± 6.3	25.5 ± 5.0	35.7 ± 7.2	18.9 ± 5.4
A1 (left cool)	78.7 ± 4.9	80.9 ± 2.7	80.3 ± 2.7	96.7 ± 0.5	92.0 ± 2.3	90.5 ± 2.5	94.6 ± 2.2	96.2 ± 1.7	98.9 ± 1.1	94.3 ± 2.1	88.8 ± 2.2	74.8 ± 4.8	70.8 ± 5.9
PMLS (left cool)	100	98.8 ± 1.2	97.2 ± 1.6	98.0 ± 2.0	100	98.4 ± 1.6	96.9 ± 1.3	10.3 ± 4.3	17.4 ± 4.6	4.9 ± 3.7	8.5 ± 3.3	15.2 ± 4.1	12.8 ± 3.7