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Supplementary Information for

Environmental noise degrades hippocampus-related learning and memory

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This PDF file includes: Figures S1 to S6 with legends

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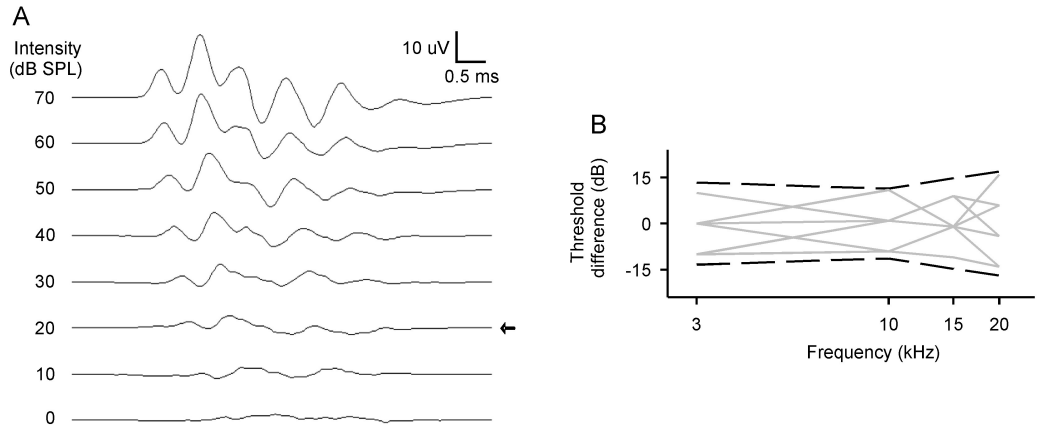

Fig. S1. The thresholds of the auditory brainstem response (ABR). (A) ABR patterns of a naïve rat determined with tone pips of 10 kHz. The ABR threshold (arrow) was defined as the lowest stimulus intensity capable of eliciting a response pattern characteristic of that seen at higher intensities. (B) ABR thresholds obtained from the NE rats (n=14) relative to normative ABR thresholds of the naïve rats (n=10). Positive or negative values indicate higher or lower ABR thresholds compared to the naïve controls. Note that all ABR data recorded from the NE rats were within the normal ± 2 s.d. boundaries (dashed lines). Statistical analysis showed that no significant differences were found between the NE and naïve rats at any frequency tested (two-way ANOVA, p=0.834).

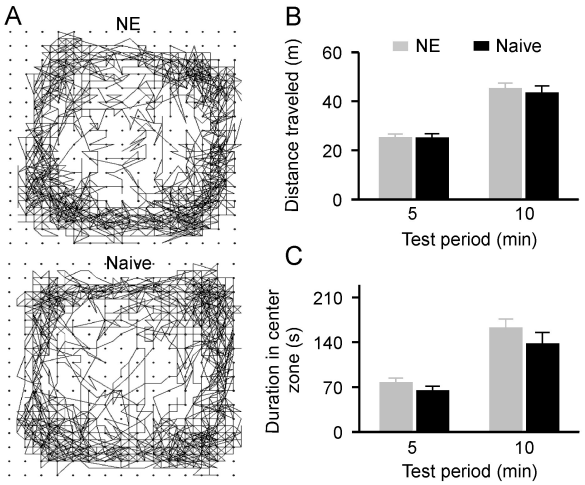

Fig. S2. Activity in the open field test. (A) Sample movement traces of a NE rat (top) and a naïve rat (bottom) in the open field test. (B) Average distances traveled of locomotor activities. Note that no significant differences in the distance traveled were found between the NE (n=12) and naïve (n=11) rats (two-way ANOVA, p=0.59). Error bars represent SEM. (C) Average time spent in the center zone was also comparable between the NE and naïve rats (two-way ANOVA, p=0.10).

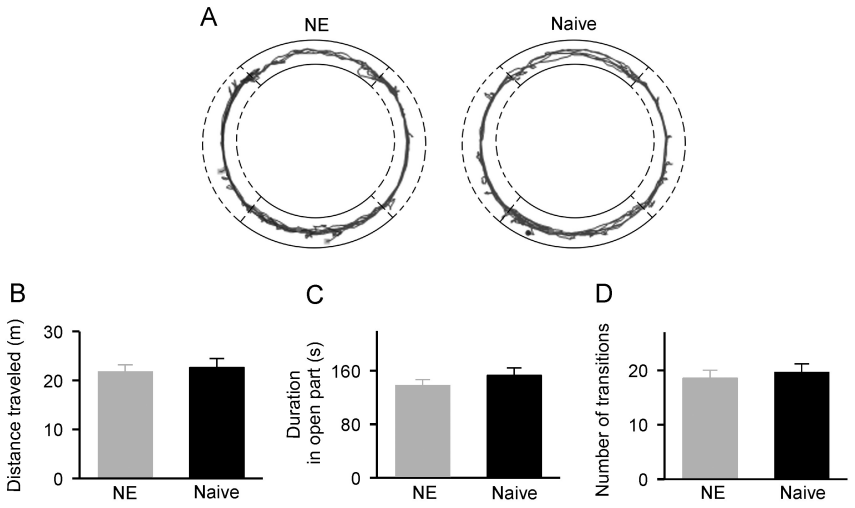

Fig. S3. Behavior in the elevated-zero maze test. (A) Sample movement traces of a NE rat (left) and a naïve rat (right) in the elevated-zero maze test. The open parts are marked with dashed lines and the closed parts are marked with solid lines. (B) Average distances traveled for the NE (n=12) and naïve (n=12) rats. Error bars represent SEM. (C) Average time spend in the open parts. (D) Average numbers of transitions between the open and closed parts. Note that no significant differences in total distance traveled, time spend in the open part, and numbers of transition between the open and closed parts were found between the NE and naïve rats (unpaired Student's t-test, all $p>0.27$).

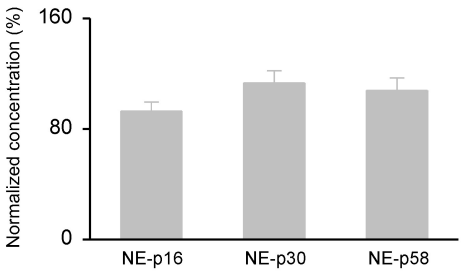

Fig. S4. Concentrations of serum corticosterone. Note that average concentrations of corticosterone for the NE rats measured during noise exposure (i.e., on p16 and p30) and 2 days after noise exposure (i.e., on p58) were all comparable to those of the age-matched naïve rats (n=6-10 in each group; unpaired Student's t-test, all p>0.31). The values (mean ± SEM) shown are normalized to that of the age-matched naïve rats.

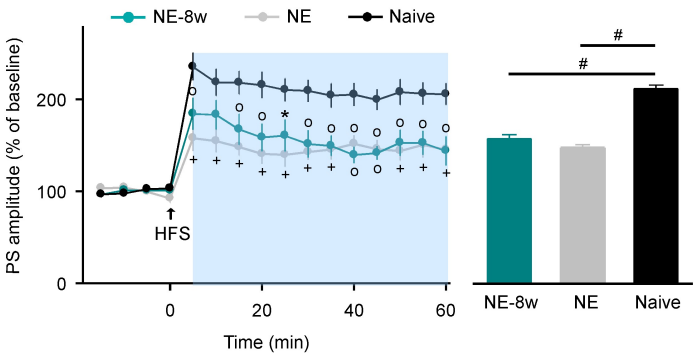

Fig. S5. Time courses of PS amplitudes (left) and average LTP amplitudes (right) of the NE rats recorded eight weeks after noise exposure (these rats were referred to as the NE-8w rats), illustrating with those of the NE and naïve rats. Note that average PS amplitudes of the NE-8w rats (n=8) following HFS were significantly lower than those of the naïve rats (left; two-way ANOVA with Student-Newman-Keuls post hoc test, $p<0.05$-0.01). The summarized data were also lower for the NE-8w rats than for the naïve controls (right; one-way ANOVA with Student-Newman-Keuls post hoc test, $p<0.0001$). These results indicate enduring effects of noise exposure on hippocampal LTP. See Fig. 1A for experimental timelines of the NE and naïve rats. Error bars present SEM. *, $p<0.05$; o, $p<0.01$; +, $p<0.001$; #, $p<0.0001$.

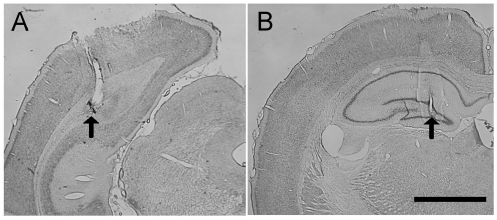

Fig. S6. Examples of electrically induced lesions illustrating stimulating position (A) and recording position (B) in the hippocampus of a naïve rat. During the recording, a concentric bipolar stimulating electrode was placed in the PP (arrow in A), and a glass micropipette recording electrode was lowered into the granule cell layer in the DG (arrow in B). Scale bar=2 mm.