**Supplemental methods:**

Delay fear conditioning methods:

The animal's associative learning in a conditioned fear task was measured by the FreezeFrame monitoring system (Coulbourn; Ohio, USA). The test chamber (26x22x18 cm) consisted of two sides that were acrylic, two sides were metal, and a grid floor bottom was used to deliver a mild foot shock. The testing chamber was housed in a sound attenuated chamber. On the training day, mice were placed in the test chamber and allowed to explore for 2 min. The NS was a 80 dB white noise sound that was presented for 30 s. The FreezeFrame monitoring system then delivered a mild foot shock (2 s, 0.7 mA) that served as the US. There was a 2 min intertrial interval between each CS–US pairing with a total of 2 CS–US pairings. After each testing session the chamber was cleaned with 30% isopropyl alcohol.

The cued fear test was conducted 2 hr later. In this test the freezing behavior was measured during their response to the auditory CS in a new context. For this condition clear acrylic inserts were placed on the floor of the chamber to alter the shape, texture, and color of the conditioning chamber. The odor in the chamber was changed by placing vanilla extract in a weigh boat located under the floor insert and 70% ethanol was used to clean the chamber between test sessions. Transfer cages were altered by replacing the bedding with shredded paper and the lights to the testing room were dimmed to change the entry context. Mice were placed into the new context and freezing was recorded for 3 min during this phase preceding the CS in this new context. The auditory CS was presented for 3 min and freezing was recorded.

**Supplemental Figure 1.** Mutation in PTEN does not result in dysregulation of Fragile X mental retardation protein (FMRP) and phosphorylated FMRP in the cortex of NS-Pten knockout (KO) mice. Western blotting was performed in cortex samples from NS-Pten wildtype (WT), heterozygous (HT), and KO mice. The primary antibodies used were as follows: FMRP, Ribosomal S6 protein, P-S6 (S240/244), AKT, P-AKT (S473), S6K1, and PTEN (1:500; Cell Signaling Technology, Boston, MA, USA), phosphorylated FMRP-S499 (1:500; Abcam, Cambridge, MA, USA) and actin (1:1000; Sigma Chemical Co., USA). Total homogenate samples were used for total and phosphorylated AKT, total and phosphorylated S6, S6K1, and PTEN. We used synaptosomal preparations for total and phosphorylated FMRP. Representative immunoblots from cortex proteins are shown above each graph. (A) Graph shows the mean (± SEM) for total FMRP in wildtype (WT), heterozygous (HT), and knockout mice (KO). (B) Graph shows the mean (± SEM) for phosphorylated levels of FMRP in WT, HT, and KO. (C) Graph shows the mean (± SEM) for total AKT in WT, HT, and KO. (D) Graph shows the mean (± SEM) for phosphorylated AKT in WT, HT, and KO. PTEN KO mice had a significant increase in pAKT levels ($F_{(2,15)}$ – 5.9, $p < 0.05$).(E) Graph shows the mean (± SEM) for total S6 in WT, HT, and KO. (F) Graph shows the mean (± SEM) for phosphorylated S6 in WT, HT, and KO. (G) Graph shows the mean (± SEM) for S6K1 in WT, HT, and KO. The band for each sample was normalized to its actin level. Optical densities of phospho-proteins were normalized to the levels of total protein from the same sample and are depicted as a ratio of phospho to-total protein level. Unless stated above, all analyses did not reveal a significant difference between groups using a one-way ANOVA and a p value < 0.05. n= 6 per group for the Total and phosphorylated FMRP/total western blots, n=6 per

group for total AKT, phosphorylated-AKT, total S6, phosphorylated-S6, and S6K1. The asterisk (*) indicate a significant group difference at respective p values ($p < 0.05$).

**Supplemental Figure 2.** Mutation in PTEN does not result in dysregulation of Fragile X mental retardation protein (FMRP) and phosphorylated FMRP in the amygdala of NS-Pten knockout (KO) mice. Western blotting was performed in amygdala samples from NS-Pten wildtype (WT) and KO mice. Representative immunoblots from amygdala proteins are shown above each graph. (A) Graph shows the mean (± SEM) for total FMRP in WT and KO mice. (B) Graph shows the mean (± SEM) for phosphorylated FMRP in WT and KO. (C) Graph shows the mean (± SEM) for total AKT in WT and KO. (D) Graph shows the mean (± SEM) for phosphorylated AKT in WT and KO. (E) Graph shows the mean (± SEM) for total S6 in WT and KO. (F) Graph shows the mean (± SEM) for phosphorylated S6 in WT and KO. (G) Graph shows the mean (± SEM) for S6K1 in WT and KO. (H) Graph shows the mean (± SEM) for PTEN protein in WT and KO mice. The band for each sample was normalized to its actin level. Optical densities of phospho-proteins were normalized to the levels of total protein from the same sample and are depicted as a ratio of phospho to-total protein level. None of the analyses using independent samples t-tests revealed a significant difference between WT and KO mice with a p value $< 0.05$. n= 5 for WT and 4 for KO for all proteins.