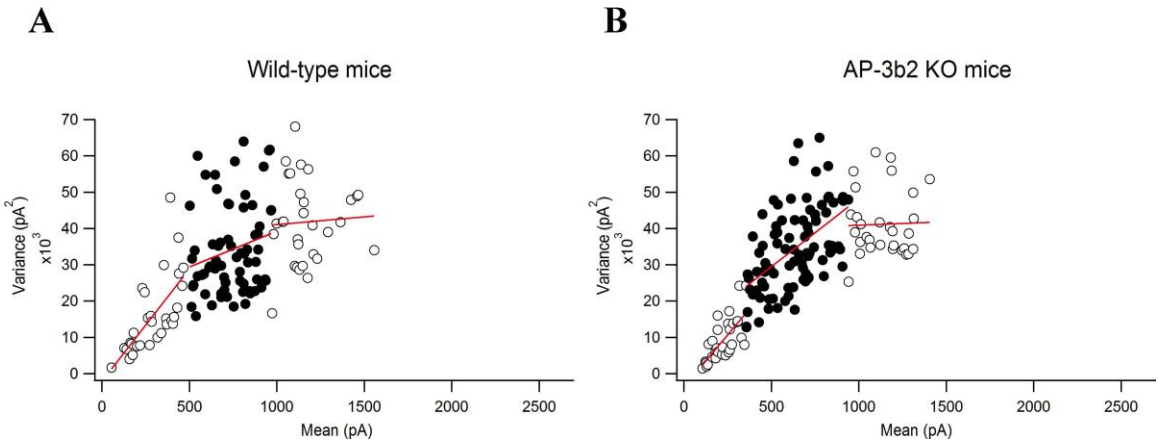
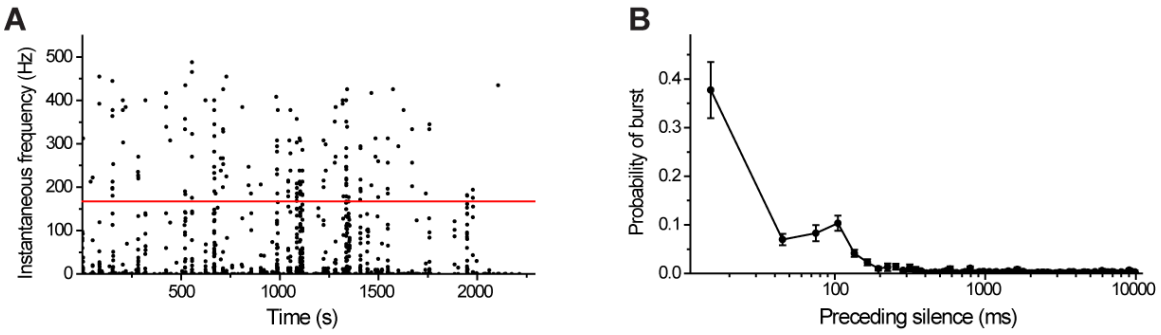
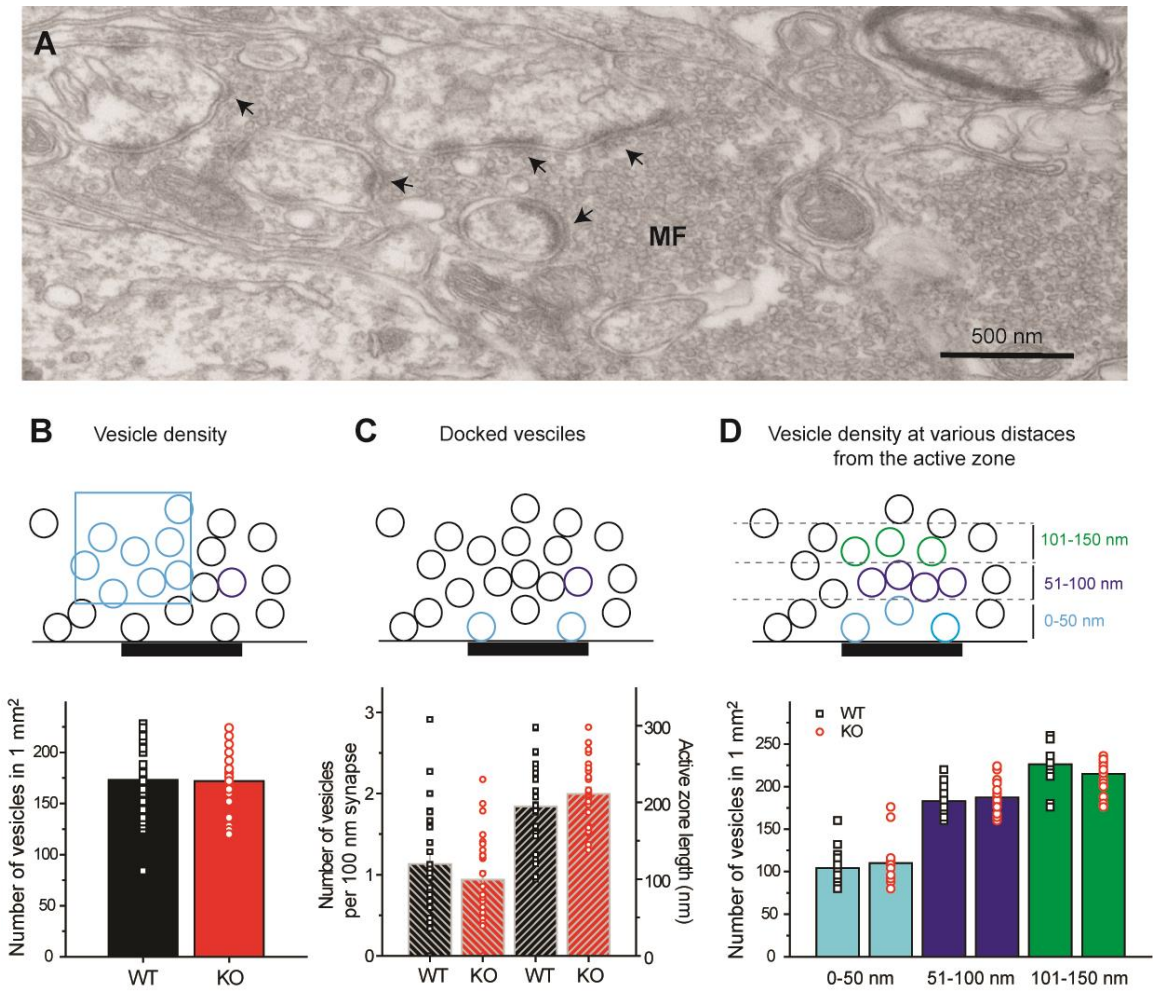


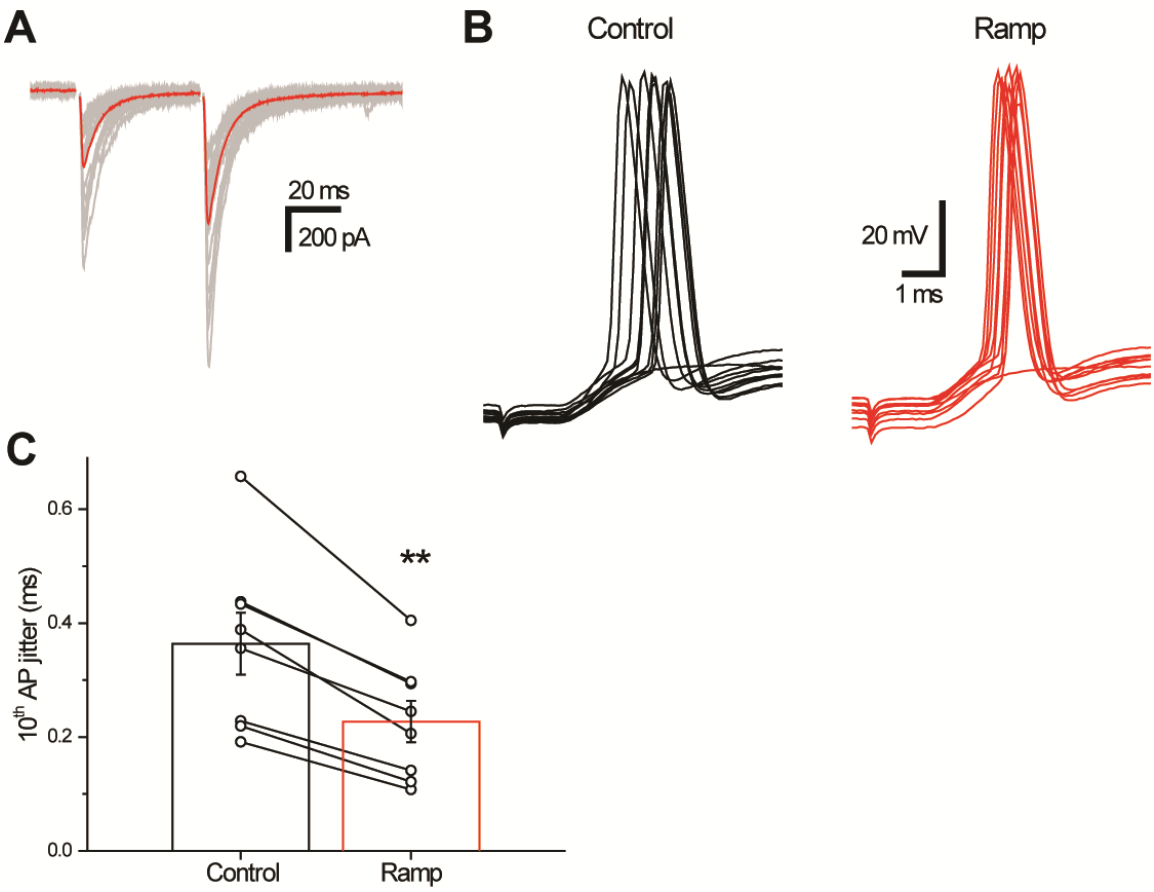
Supplementary Figure 1. Validation of conditions required for a parabolic fit for variance-mean analysis. VM data as shown in **Figure 5C** obtained in WT (**A**) and KO (**B**) mice. The first and last 30 points (open circles) and all points in between (filled circles) were fitted with a straight line to show that the data reaches a plateau and, therefore, this dataset is suitable to be fitted with a compound binomial function.



Supplementary Figure 2. Analysis of in vivo granule cell firing patterns. **A**) An example of instantaneous frequencies of granule cell firing recorded in vivo. Red line corresponds to 167 Hz. **B**) Plot showing increase in the probability of burst (ISI $\leq$ 6 ms) associated with preceding silence around 100 ms. Data analysed from Mizuseki et al. 2009.



Supplementary Figure 3. Electron microscopic comparison of vesicle distribution at MF synapses in WT and KO mice. **A**) Electron microscopic picture of a representative MF terminal. **(B-D)** Top, cartoons depicting three different types of analysis: vesicle density **(B)**, number of docked vesicles and the size of the active zone **(C)** and vesicle density at three various distances from active zone and the size of the active zone **(D).** Bottom, corresponding bar graphs showing average and individual data from WTs (n=25) and KOs (n=25). No significant difference was observed between the two genetic backgrounds. $p > 0.05$; Student's *t*-test



Supplementary Figure 4. Compensation of impaired slow voltage change significantly dejitters APs in AP-3b2 KOs. **A**) Example of EPSCs evoked by MF stimulation in KOs. **B**) Current clamp response evoked by repetitive stimulation of the same input (10 stimuli, 20 Hz), only the 10^{th} response is shown in control condition (left) and after addition of 4 mV ramp depolarization (right). **C**) Summary plot showing that compensation with 4 mV ramp depolarization significantly decreases AP jitter by the end of stimulation train (n=8). **p < 0.05; Student's *t*-test