Supplemental Figure 1: Comparison of KA and Glu responses as well as NASP (naphtyl acetyl spermine) block of GluR1(Q)flip and resGluR1(Q)flip. Data are given ± S.E.M. Upper traces: Representative kainate-evoked currents of Xenopus oocytes injected with 8 ng GluR1(Q)i (= GluR1(Q)flip, left) or GluR1(Q)i-si cRNA (= resGluR1(Q)flip, right). Recordings were done 4-7 days after injection at a holding potential of -70 mV in normal frog Ringer (NFR). Agonist (150 µM) was applied for 20 sec. Lower traces: *I-V* relationships of GluR1(Q)i (left) and GluR1(Q)i-si (right) measured at membrane potentials between -150 mV and +50 mV with kainate as the agonist.

Supplemental Figure 2 Characterization of HB9-Cre x ROSA26 mice. Representative images of X-gal stained tissue sections (P23) from HB9-Cre x ROSA26 mice. There were no stained cells in the motor cortex or basal ganglia (panel A, calibration bar = 700 µm) but a small cluster of blue cells were found in the medullary tegmentum (panel B and C, calibration bars = 600 and 300 µm, respectively). Stained cells were found in the cervical (panel D), thoracic (panel E) and lumbar spinal cord (panel F, calibration bar = 200 µm). The chart below displays the number of animals with stained cells in the spinal cord at the cervical, thoracic and lumbar levels. Two ages were examined (P23 and 3 months) and there were a total of 8 animals in each

group. Motor neurons are tabulated separately from interneurons.

Supplemental Figure 3: Comparison of dendrites from mice genetically altered at a single locus. The dendrite morphology of spinal motor neurons from *GluR1*$^{+/+}$, Hb9-Cre and *GluR1*$^{LoxP/LoxP}$ mice at P23. There are no statistically significant changes of dendrite morphology of spinal motor neurons among these three group mice.

Supplemental Figure 4 Comparison of motor behavior of mice genetically altered at a single locus (P23). Locomotor performance on 3 tasks was evaluated in *GluR1*$^{+/+}$ (n=10), Hb9-CRE (n=16) and GluR1$^{LoxP/LoxP}$ mice (n=11). There are no statistically significant differences in motor behavior among these three group mice.