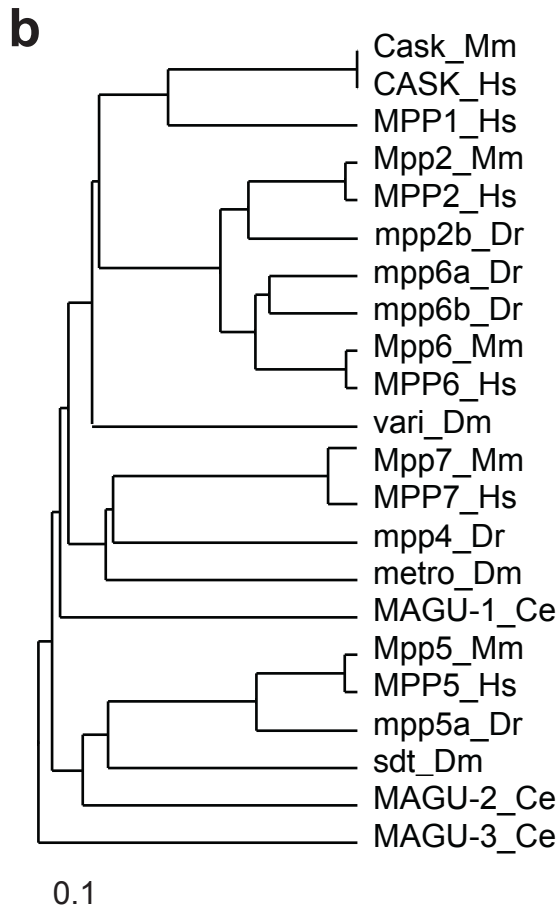
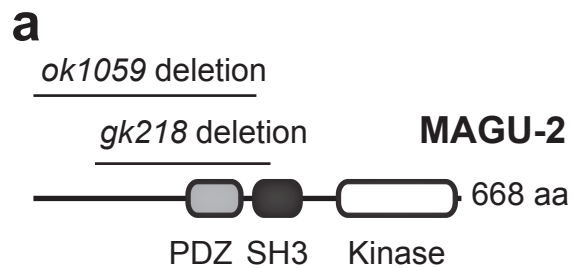


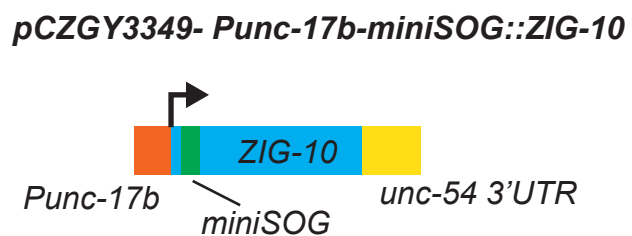
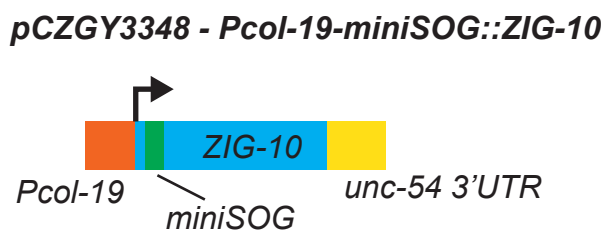
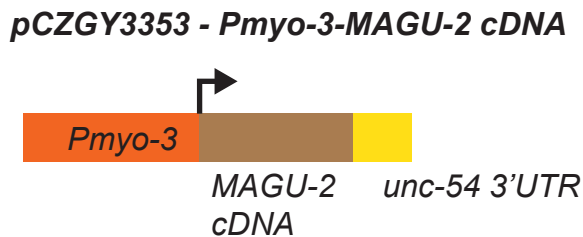
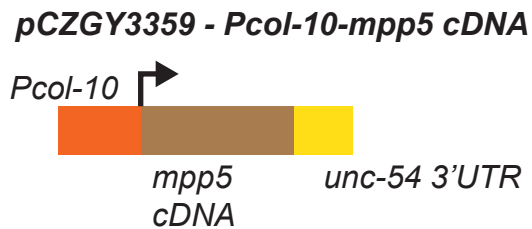
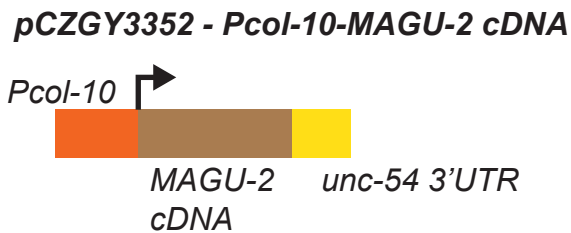
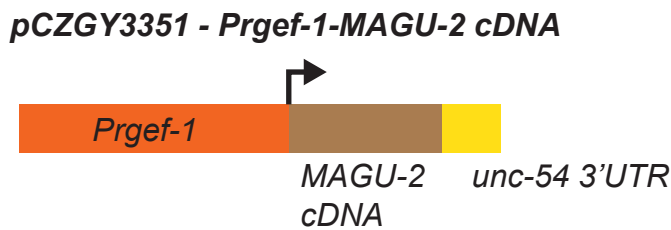
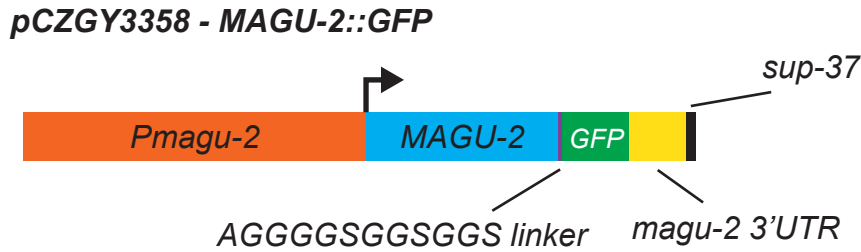
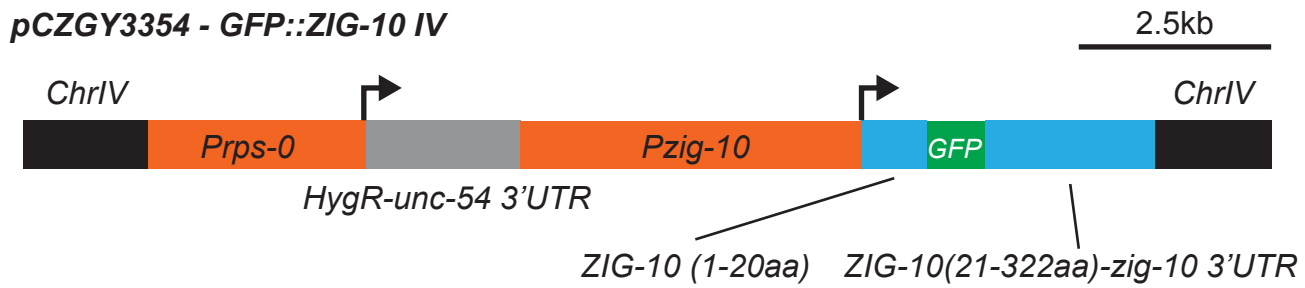
**Supplementary Figure 1. Loss of *magu-2* reduces motor deficits in *acr-2(gf)* animals expressing ZIG-10 in GABA neurons and epidermis.**

(a) Quantification of convulsions per minute in *acr-2(n2420)* animals harboring the additional genetic modifications listed. Mutant *magu-2* suppresses the enhanced convulsions caused by ectopic expression of ZIG-10 in the *zig-10(tm6127); acr-2(n2420)* background. Gray dots represent individual non-transgenic animals; black dots represent animals expressing ZIG-10 in GABAergic neurons and the epidermis. The black lines indicate the means; \*\*\* $p < 0.001$ . (b-c) Representative images and quantification of GABAergic synapses labeled by SNB-1::GFP in wild type and *magu-2(gk218)* animals in the presence or absence of exogenous ZIG-10 expression. Scale bars are 5 µm. In (c), each dot represents an individual animal, black bars indicate the mean. \* $p < 0.05$ ; \*\*\* $p < 0.001$ .



**Supplementary Figure 2. Diagrams of MAGU-2 protein domains and phylogenetic tree.**

**(a)** Illustration of the domains contained in MAGU-2. PDZ indicates PSD95/Dlg/ZO-1 domain, SH3 indicates Src homology 3 domain, and kinase indicates the guanylate kinase domain. **(b)** MPP family members were organized based on amino acid identity and arranged in a phylogenetic tree. Family members from human (Hs), mouse (Mm), zebrafish (Dr), fruit flies (Dm), and worms (Ce) were included in the analysis.



### Supplementary Figure 3. Diagrams of transgenes used in this study.

Transgenes were cloned into expression plasmids. The resulting plasmids were then injected into animals as described in the Materials and Methods. For all transgenes, promoters are labeled in orange, genomic DNA is blue, cDNA is brown, GFP or miniSOG is green, and 3'UTRs are yellow. The black arrow illustrates the position of the start codon. For pCZGY3354, the chromosome IV homology arms are indicated in black, and the gray box denotes the hygromycin resistance gene.