SUPPLEMENTAL FIGURE 1. Area CA1 of hippocampal slices from symptomatic *Mecp2* mutant mice shows enhanced 4-AP-induced epileptiform activity.

A. Representative examples of the spatiotemporal pattern of VSD signals evoked in area CA1 by stimulation of afferent Schaffer collaterals in slices from a symptomatic *Mecp2* mutant mouse and a wildtype littermate before and after the application of 4-AP (125µM). The arrow points to the location of the stimulation electrode.

B. Amplitude and spatiotemporal pattern of VSD signals evoked in area CA1 by stimulation of afferent Schaffer collaterals in the presence of 4-AP in slices from symptomatic *Mecp2* mutant and wildtype littermate controls. Data expressed as mean±SD. # $p<0.05$ aCSF *vs.* 4-AP; * $p<0.05$ *Mecp2* mutant *vs.* wildtype in aCSF; ** $p<0.05$ *Mecp2* mutant *vs.* wildtype in 4-AP.

SUPPLEMENTAL FIGURE 2. Schaffer stimulation in 4-AP causes delayed VSD signals in CA1 and secondary VSD signals in the dentate gyrus of either *Mecp2* mutant or wildtype slices.

A. Representative examples of the spatiotemporal pattern of VSD signals evoked by single pulse stimulation of Schaffer collaterals in slices from a wildtype showing brief and highly localized signals (top), a 4-AP-treated wildtype slice showing delayed CA1 signals and secondary dentate signals (middle), which were similar to those in a *Mecp2* mutant slice (bottom). The asterisk marks the location of the stimulating electrode, the red arrow points to CA1, and the white arrow to the dentate gyrus.

B. Amplitude and spatiotemporal pattern of delayed VSD signals evoked in area CA1 by stimulation of afferent Schaffer collaterals in the presence of 4-AP in slices from symptomatic *Mecp2* mutant and wildtype littermate controls.

C. Amplitude and spatiotemporal pattern of secondary VSD signals evoked in the dentate gyrus by stimulation of afferent Schaffer collaterals in the presence of 4-AP in slices from symptomatic *Mecp2* mutant and wildtype littermate controls.

Data expressed as mean±SD.

SUPPLEMENTAL FIGURE 3. Quantitative analysis of synapse ultrastructure in hippocampal area CA1.

A. Lengths of active zones (defined as the length of the opposing PSDs), and areas of presynaptic terminals of asymmetric synapses on dendritic spines within CA1 *stratum radiatum*.

B. Lengths of active zones (defined as the length of the opposing PSDs), and areas of presynaptic terminals of symmetric synapses on dendritic shafts within CA1 *stratum radiatum*.

Data are expressed as mean±SD.