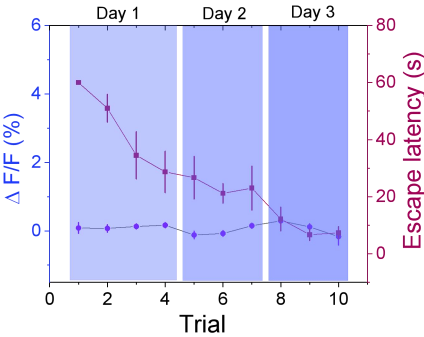
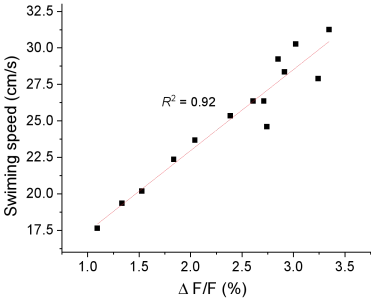


A



B



SFigure 1. Neural dynamics of CA1-projecting CA3 neurons during spatial learning.

A. Double Y curves depict the escape latency and Ca^{2+} responses of GFP-expressing mice during the spatial learning.
B. A positive relationship ($R^2 = 0.92$) is observed between the swimming speed and $\Delta F/F$ (%) during spatial training (trial-1 and trial-10).
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; ns, not significant. Data are reported as mean $\pm$ SEM.

A

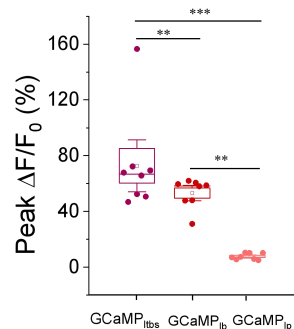
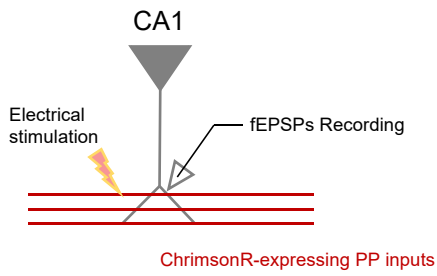


Figure 2. Activation of MEC neurons increases neural responses in CA1-projecting CA3 neurons.

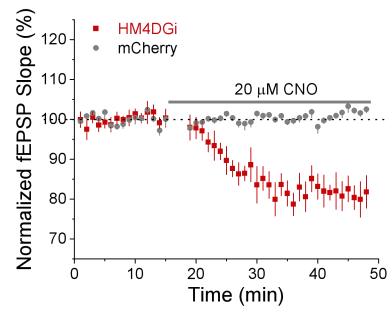
A. Data violated normality (GCaMP_{ltbs}) and variance homogeneity assumptions (Levene's $p < 0.001$). Statistic comparisons of the peak values of Ca^{2+} responses in three groups.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; ns, not significant. Data are reported as mean $\pm$ SEM.

A



B



C

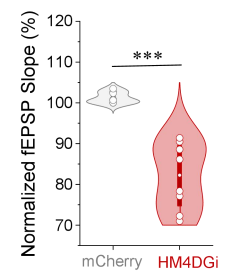


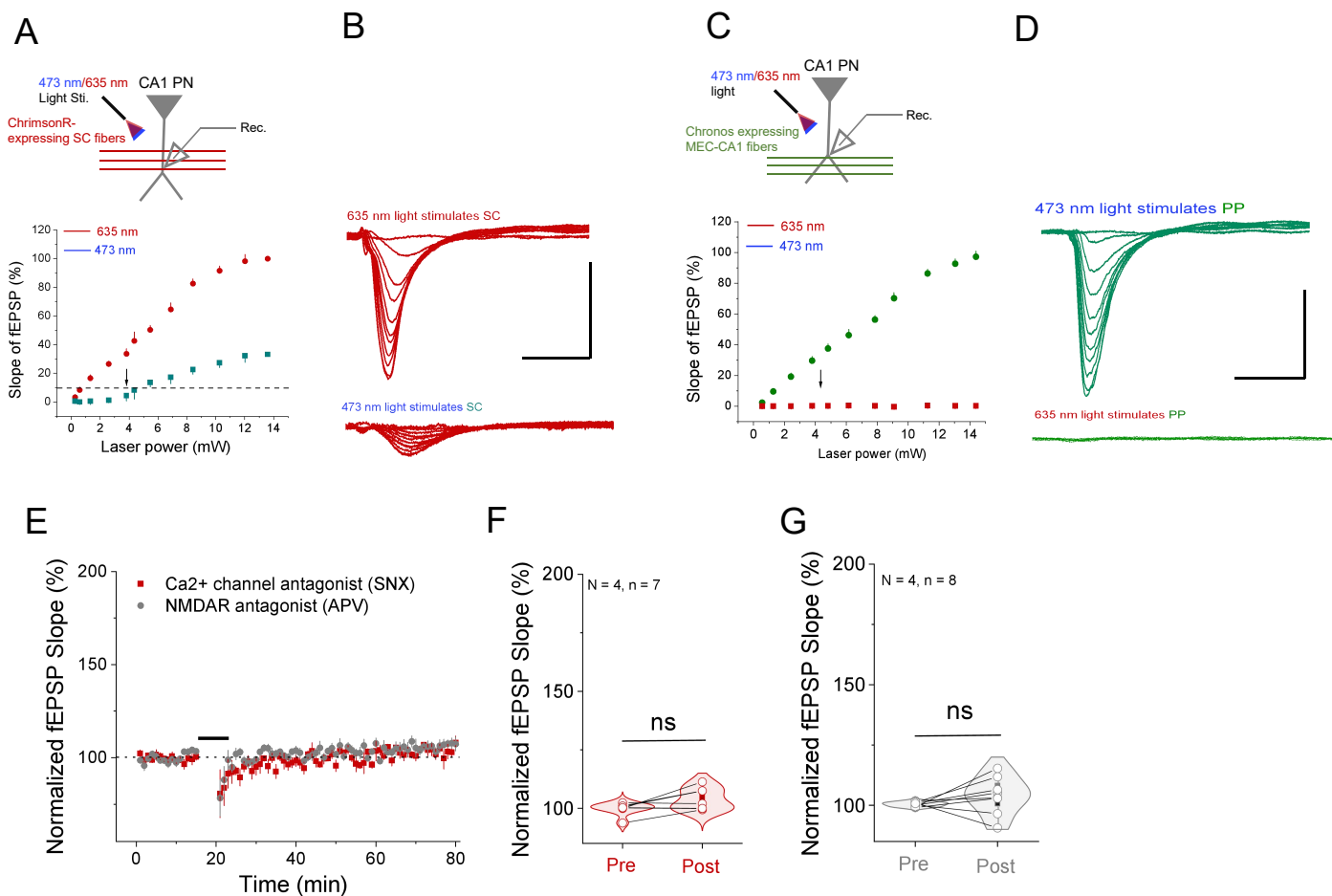
Figure 3. PP input inhibition attenuates CA3-SC afferent responses.

A. Schematic drawing depicts the experimental setup for recording the fEPSPs by electrical stimulation.

B. The fEPSPs was significantly decreased by CNO in HM4DGi group compared to the control.

C. Normality was confirmed via Shapiro-Wilk tests ($p > 0.05$). Statistic comparison of the fEPSPs after perfusing with CNO in two groups.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; ns, not significant. Data are reported as mean $\pm$ SEM.



Sfigure 4. Co-activation of CA3-SC and PP pathways induces heterosynaptic LTP in DHP.

A. Various light intensity of 473 nm (green dots) /635 nm (red dots) light stimulates the ChromsonR-expressing CA3-SC afferents in DHP.

B. Representative L-fEPSPs evoked by 473 nm (lower) /635 nm (upper) light, respectively. Scale bar: 0.5 mV/20 ms.

C. Various light intensity of 473 nm (green dots) /635 nm (red dots) light stimulates the Chronos-expressing PP terminals in DHP.

D. Representative L-fEPSPs evoked by 473 nm (upper) /635 nm (lower) light, respectively. Scale bar: 0.5 mV/20 ms.

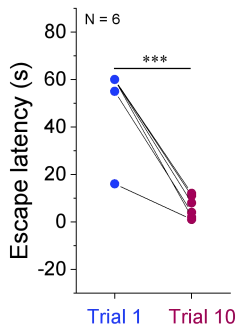
E. Hetero-synaptic LTP was almost blocked by the NMDAR antagonist and Ca^{2+} channel antagonist.

F. Normality Testing (Shapiro-Wilk), parametric paired t-test is appropriate. Statistic comparison of the L-fEPSPs before and after the L-TBS in brain sections with Ca^{2+} channel antagonist (SNX).

G. Normality Check (Shapiro-Wilk Test), parametric paired t-test is appropriate. Statistic comparison of the L-fEPSPs before and after the L-TBS in brain sections with NMDAR antagonist (APV).

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; ns, not significant. Data are reported as mean $\pm$ SEM.

A



SFigure 5. CA1-projecting MEC neurons are involved in spatial learning.

A. Comparison of the escape latency in trial 1 and trial 10 during the spatial learning.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; ns, not significant. Data are reported as mean $\pm$ SEM.