TABLE

REAGENT or RESOURCE	SOURCE	IDENTIFIER
Antibodies		
Anti-vGAT-Oyster 550	Synaptic System	131103C3, RRID:AB_887867
Rat monoclonal anti-HA	Roche	1186742300, RRID:AB_10094468
Qdot® 655 F(ab')2-Goat anti-Rat IgG (H+L)	Thermo Fisher	Q-11621MP, RRID:AB_2556477
Bacterial and Virus Strains		
Biological Samples		
Chemicals, Peptides, and Recombinant Proteins		
BAPTA	Sigma	85233-19-8
L-NAME	Sigma	N5751
Nifedipine	Sigma	N-7634
Bicuculline	Sigma	14343
MDL28170	Sigma	M-6690
KN-93	Millipore Merck	422708
KN-92	Millipore Merck	422709
APV	Tocris	0105/50
CNQX	Tocris	1045/10
ω-conotoxin MVIIC	Tocris	1084/100U
ω-conotoxin GVIA	Tocris	1085/250U
DPNI-caged-GABA	Tocris	2991/10
MNI-caged-L-glutamate	Tocris	1490/10
Rhod-2 tripotassium salt	AAT Bioquest	21067
Critical Commercial Assays		
Effectene Transfection Reagent	Qiagen	301427
Deposited Data		

Experimental Models: Cell Lines		
Experimental Models: Organisms/Strains		
Ai9 (B6.Cg-*Gt(ROSA)26Sortm9(CAGtdTomato) Hze*/J	Jackson Laboratory, USA	JAX:007909, RRID:IMSR_JAX:007909
PVCRE (B6;129P2-Pvalbtm1(cre) Arbr/J	Jackson Laboratory, USA	JAX:017320, RRID:IMSR_JAX:017320
Parvalbumin-tdTomato (PV-tdTomato)	This paper	
Oligonucleotides		
Recombinant DNA		
pEGFP-N1	Clontech	Cat# 632162
pcDNA3 Homer1c::DsRed	Petrini et al., 2009	N/A
pcDNA3 Homer1c::GFP	Petrini et al., 2009	N/A
FingR-Gephyrin-GFP	Gross et al., 2013	N/A
EGFP-Gephyrin	Zita et al., 2007	N/A
Hemagglutinin (HA)-tagged α1 GABAA receptor		
Software and Algorithms		
Metamorph 7.8	Molecular Devices	http://www.moleculardevices.com/Products/Software/Meta-Imaging-Series/MetaMorph.html RRID: SCR_002368
Clampex 10.6	Molecular Devices	http://www.moleculardevices.com/products/software/pclamp.html RRID:SCR_011323
Clampfit 10.7	Molecular Devices	http://www.moleculardevices.com/products/software/pclamp.html RRID:SCR_011323
MATLAB	Mathworks	http://www.mathworks.com/products/matlab/ RRID:SCR_001622

GraphPad Prism 6	GraphPad	http://www.graphpad.com/ RRID: SCR_002798
Custom program written for MATLAB to reconnect QD trajectories	Petrini et al., 2014; from D Choquet and L Cognet	N/A
Custom program for SPT quantifications	Petrini et al., 2014; from D Choquet and A Serge	N/A
Other		

SUPPLEMENTARY FIGURES

Figure S1

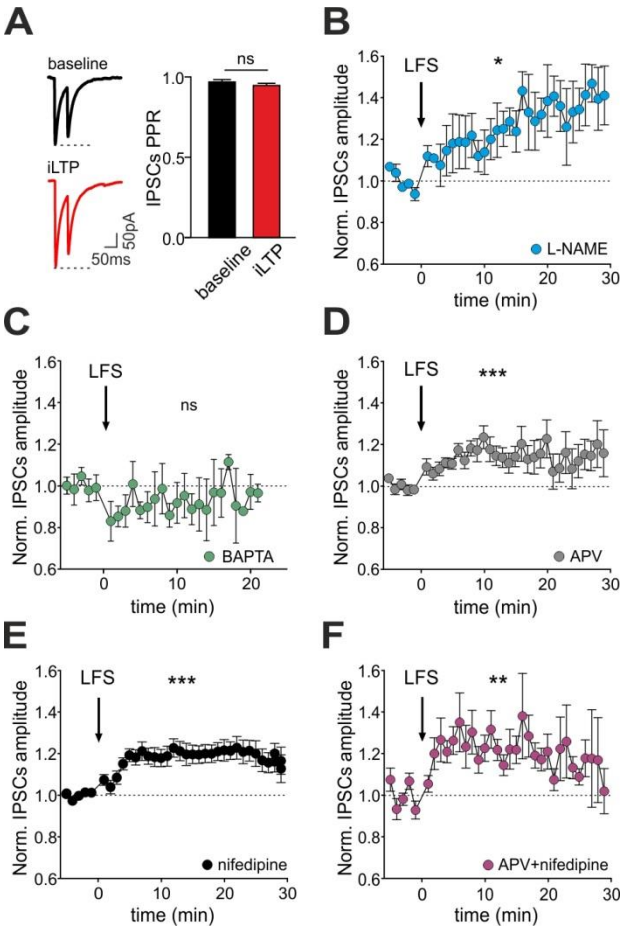

Figure S1 (related to Figure 1): Postsynaptic mechanism and Ca^{2+} dependence of LFS-induced iLTP

A-B. Unlikely presynaptic mechanisms of iLTP. **A.** Left: Representative IPSC paired pulses traces recorded before (baseline) and after (iLTP) the delivery of the LFS. Right: Quantification of the paired pulse ratio (PPR) (n = 25; p = 0.14, paired Student's t-test). **B.** The nitric oxide synthase blocker L-NAME does not prevent LFS-induced iLTP (n = 5, $F_{33,136}$= 1.6, p = 0.03; one-way ANOVA followed by Turkey's multiple comparison test). **C-E.** Time course of relative IPSC amplitude increase before and after the delivery of the LFS protocol (arrow), in the presence of the fast Ca^{2+} chelator BAPTA (**C**; n = 4, $F_{25,69}$ = 0.4, p = 0.99), APV (**D**; n = 11, $F_{33,241}$ = 2.2, p < 0.001), nifedipine (**E**; n = 21, $F_{33,640}$ = 3.6, p < 0.001), and APV + nifedipine (**F**; n = 6, $F_{33,162}$ = 2.1, p = 0.002). One-way ANOVA followed by Turkey's multiple comparison test. Values are expressed as mean ± SEM. *p < 0.05, **p < 0.01, ****p < 0.001, ns = not significant.

Figure S2

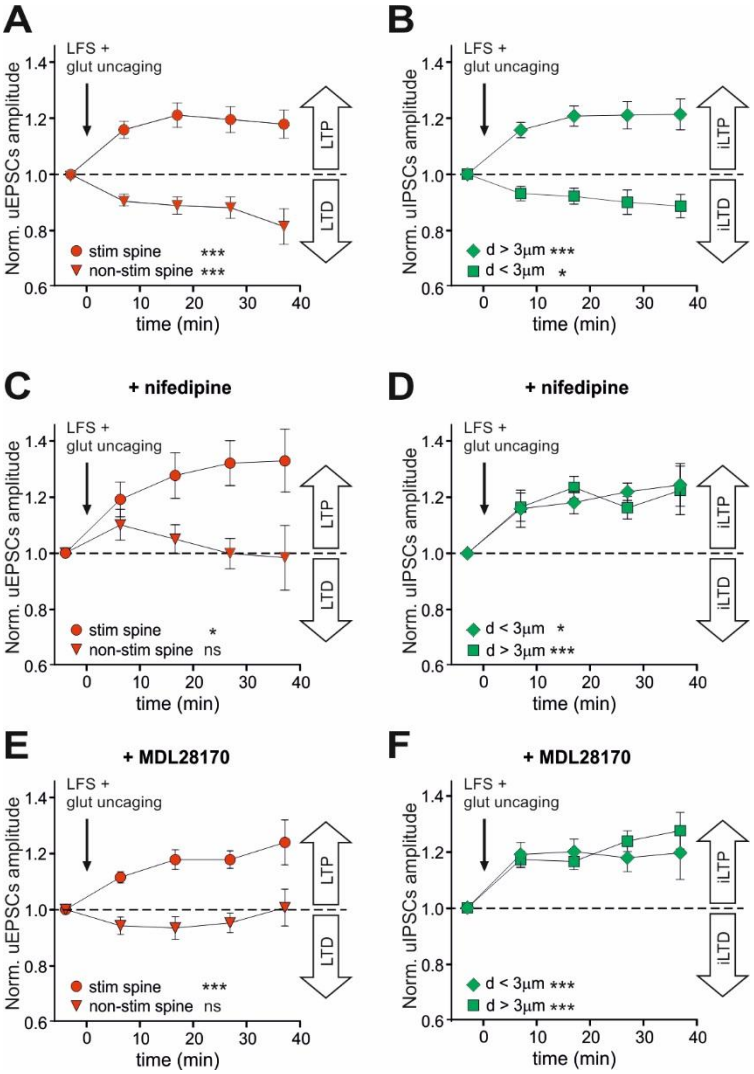

Figure S2 (related to Figure 4): Spatial coordination of the plasticity of excitatory and inhibitory synapses upon single spine LTP

A. After the "LFS+glut uncaging" protocol, the stimulated spine is selectively potentiated (circle, n = 7-20 synapses from 20 neurons, $F_{4,61}$ = 9.3, p< 0.001) and the non-photostimulated ("non-stim") spines (putatively exposed only to LFS) are depressed (triangle, n = 6-16 from 20 neurons, $F_{4,51}$ = 6.3, p< 0.001). All the statistical comparison shown here are performed with one-way ANOVA followed by Dunnett's post-test. **B.** After the "LFS+glut uncaging protocol", GABAergic synapses located at d > 3 µm from the stimulated spine are potentiated (diamond, n = 7-41 synapses from 20 neurons, $F_{4,127}$ = 11.4, p< 0.001) and those located at d < 3 µm are depressed (square, n = 11-30 20 neurons, $F_{4,103}$ = 3.0, p = 0.02). **C.** Same as in A in presence of nifedipine. Stimulated spine, n = 4-7 synapses from 7 neurons, $F_{4,26}$ = 3.9, p = 0.01; non-photostimulated spine, n = 3-6 synapses from 7 neurons, $F_{4,20}$ = 0.8, p = 0.51. **D.** Same as in B, in presence of nifedipine. d < 3 µm, n = 3-9 synapses from 7 neurons, $F_{4,27}$ = 4.0, p = 0.01; d > 3 µm, n = 4-14 synapses from 7 neurons, $F_{4,45}$ = 6.1, p <0.001. **E.** Same as in A in presence of MDL28170. Stimulated spine, n = 3-24 synapses from

24 neurons, $F_{4,78}$ = 11.9, p <0.001; non-photostimulated spine, n = 3-25 synapses from 24 neurons, $F_{4,70}$ = 1.2, p = 0.31. **F.** Same as in B, in presence of MDL28170. d < 3 µm, n = 5-24 synapses from 24 neurons, $F_{4,71}$ = 7.1, p <0.001; d > 3, n = 6-68 synapses from 24 neurons, $F_{4,174}$ = 20.0, p <0.001. Values are expressed as mean ± SEM. *p < 0.05, ***p < 0.001, ns = not significant.

Figure S3

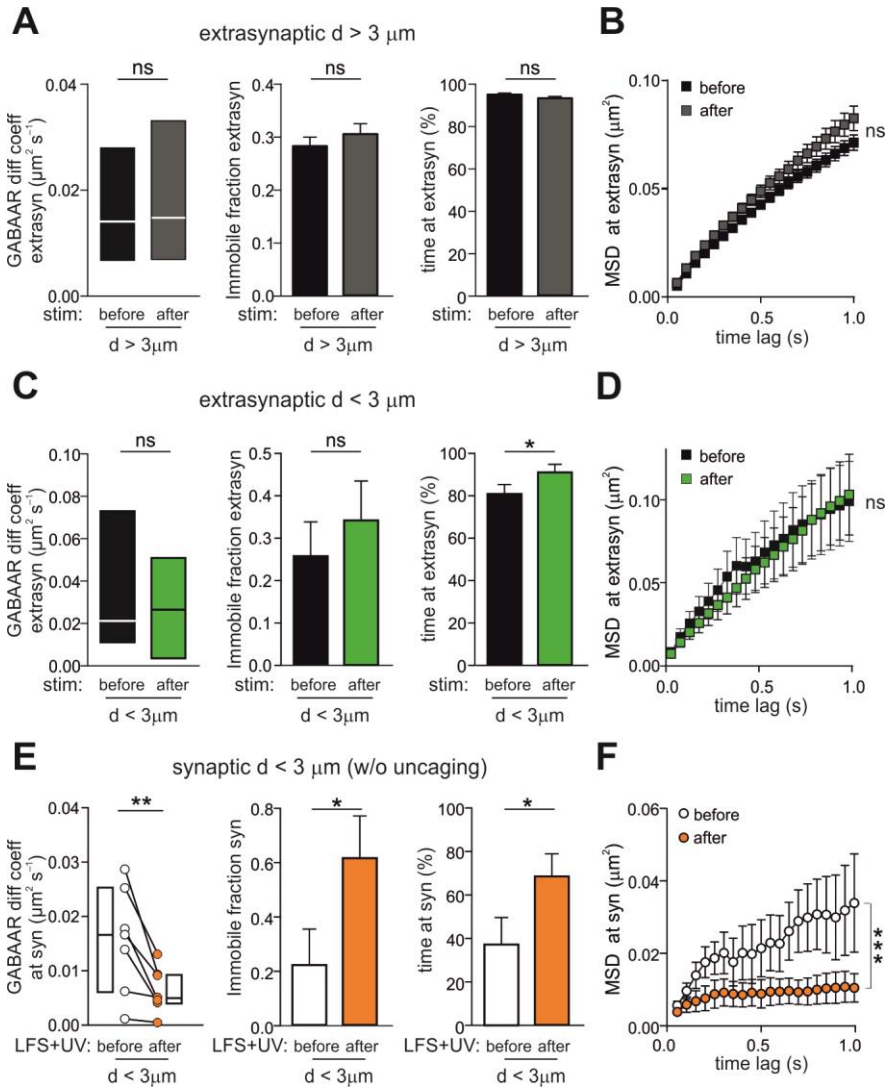

Figure S3 (related to Figure 7): Supplementary data on the modulation of GABAAR lateral mobility upon single spine LTP

A-B. Characterization of the lateral mobility of extrasynaptic GABAARs located at d > 3 µm from the potentiated spine, before (black) and after (grey) the single spine LTP protocol. **A**. Left: Median diffusion coefficient and interquartile range (IQR; n = 526-620 trajectories from 22 neurons; p = 0.63, Mann-Whitney test). Middle: Immobile fraction (n = 526-620 trajectories from 22 neurons; p = 0.40, Mann-Whitney test). Right: Percentage of time spent by GABAA receptors in the extrasynaptic compartment (n = 526-638

trajectories; p = 0.16, Mann-Whitney test). **B.** MSD versus time plot (n= 526-617 from 22 neurons; ns, ordinary two-way ANOVA followed by Bonferroni's post hoc test). **C-D.** Characterization of the lateral mobility of extrasynaptic GABAARs located at d < 3 μm from the stimulated spine, before (black) and after (green) the single spine LTP protocol. **C**. Left: Paired median diffusion coefficient (n = 25 trajectories from 14 neurons; p = 0.34, paired Wilcoxon test). Middle: Paired IF (n = 25 trajectories from 14 neurons; p = 0.24, paired Wilcoxon test). Right: Paired values of percentage time spent by GABAA receptors in the extrasynaptic compartments at d < 3 μm from the stimulated spine (n = 25 trajectories from 14 neurons; p = 0.01, paired Wilcoxon test). **D.** MSD versus time plot of paired extrasynaptic GABAA receptors close to the potentiated spine (d < 3 μm), n = 18 from 14 neurons, ns, RM two-way ANOVA followed by Bonferroni's post hoc test. **E-F**. Same as in C-D, except for the uncaging. Please note that in this set of experiments the stimulating protocol was LFS + 4Hz UV-light pulses train on a spine (ctrl spine) in absence of MNI-glutamate. Only synaptic GABAAR trajectories localized in the range of 3μm from the ctrl spine were considered. **E**. Left: Paired median diffusion coefficient (n = 7 from 4 neurons; p = 0.01, paired Wilcoxon test). Middle: Paired IF (n = 7 from 4 neurons; p = 0.03, paired Wilcoxon test). Right: Paired values of percentage of time spent by GABAA receptors at synapses close to the control spine (n = 7 from 4 neurons; p = 0.01, paired Wilcoxon test). **F.** Paired MSD values of synaptic GABAA receptors close to the control spine (d < 3 μm; n = 4 from 4 neurons, p < 0.001, RM two-way ANOVA). Unless stated otherwise, values are expressed as mean ± SEM. *p < 0.05, **p < 0.01, ns = not significant.