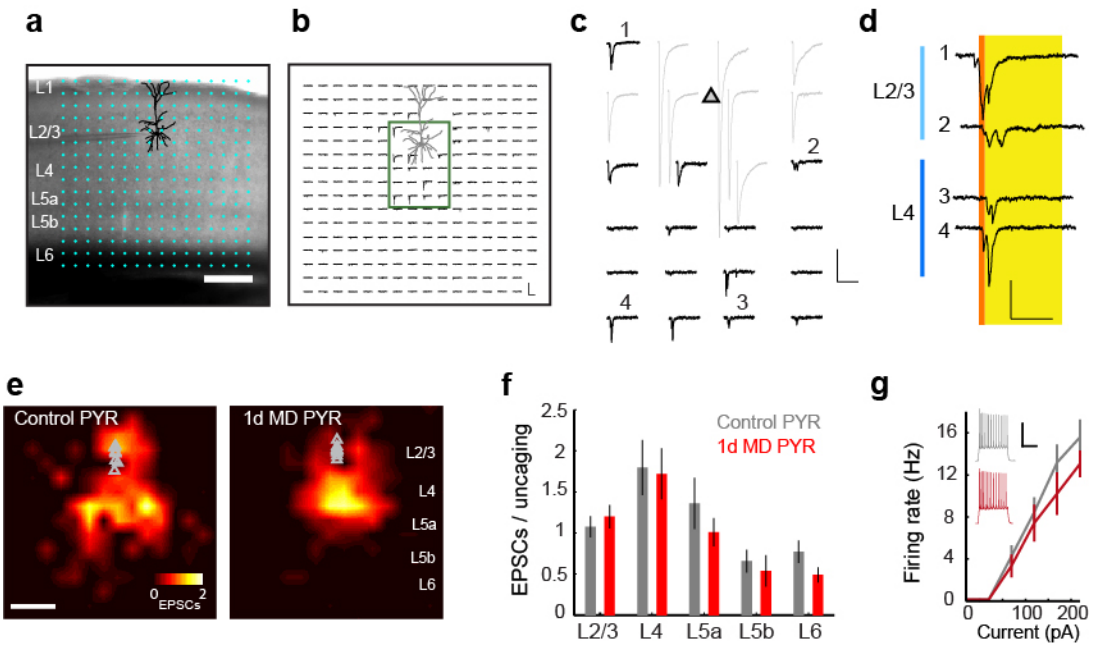
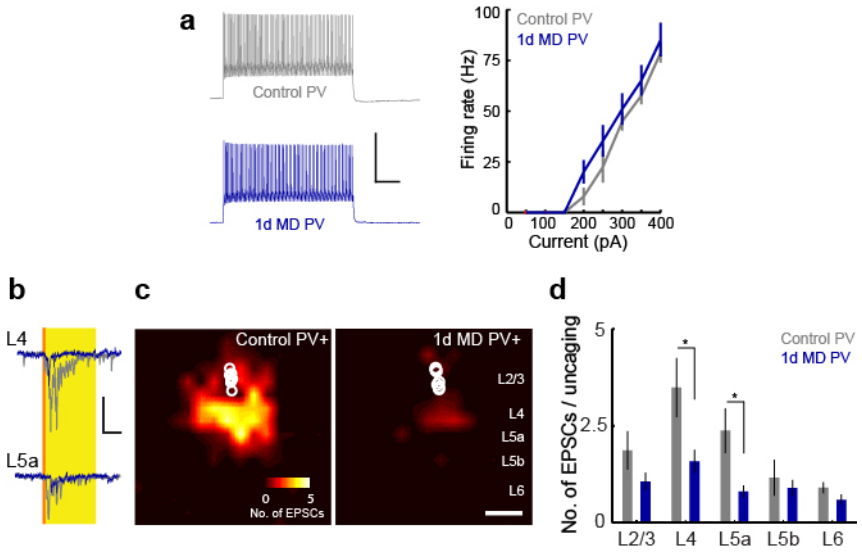
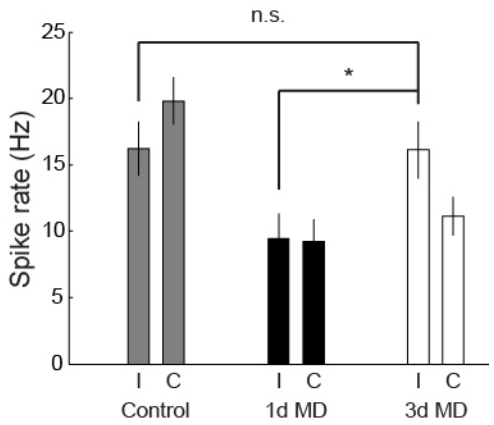


Supplementary Figure 1. **1d MD does not change the number of local excitatory synapses onto L2/3 pyramidal cells nor PYR excitability**
(**a**) Example of L2/3 PYR neuron recorded in binocular V1 in an acute slice; overlaid are 16 x16 LSPS stimulation locations spanning pia to white matter. The recorded PYR neuron is traced and superimposed on the image in black. Scale bar = 250 mm. (**b**) Representative traces from LSPS evoked EPSCs measured across 16 x 16 locations from a L2/3 PYR neuron (gray). Note: Direct responses have been removed for clarity. Scale bar is 100 pA, 100 ms. (**c**) Higher magnification traces from the region in (g) delineated by the green rectangle. Here, direct responses are shown in gray and synaptic responses in black. (**d**) Quantification of the synaptic response was restricted to a temporal window of 10-160ms following laser stimulation. Direct responses (orange shading) were excluded. Scale bar is 50pA, 50ms. (**e**) Synaptic events were measured, independent of amplitude, in L2/3 PYR neurons from LSPS guided glutamate uncaging on a 16 x 16 mapping grid as shown in (Fig. 1). Plotted are the number of LSPS evoked EPSCs relative to the targeted cell soma (grey triangles) for both control and MD slices 1d after MD. Scale bar is 250µm. (**f**) Quantification of the number of LSPS evoked EPSCs in L2/3 PYR neurons per UV uncaging pulse. (**g**) PYR cell firing rates as a function of somatic current injection. Control: n= 8 cells from 3 mice. MD: n= 6 cells from 4 mice. Inset, example current-clamp traces in response to a 200 pA current injection step. Scale bar: 50 mV, 250 ms. P values = 100pA: 0.68, 150 pA: 0.80, 200pA: 0.67, 250pA: 0.38.
Values are presented as cell means ± standard error.

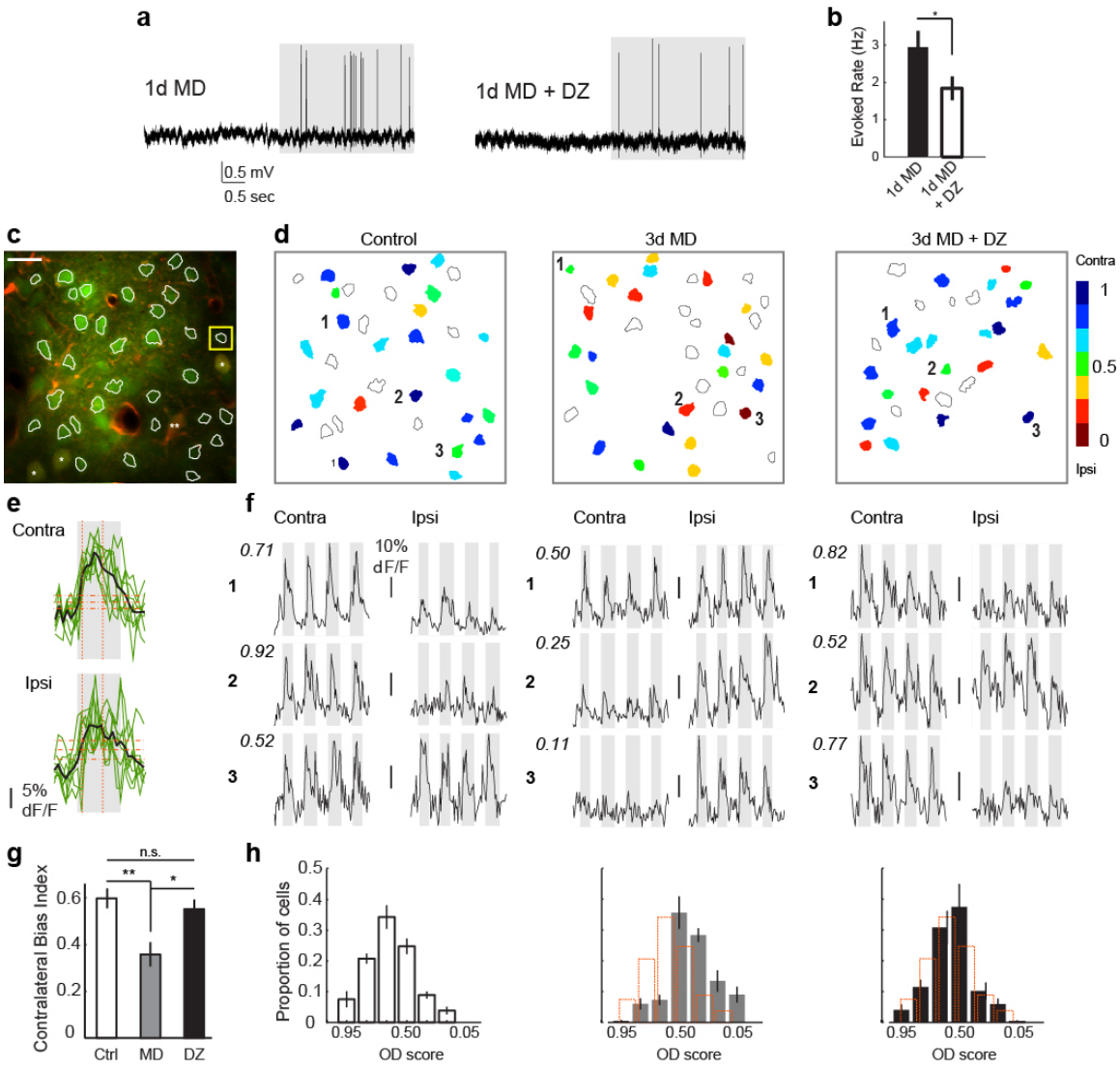


Supplementary Figure 2. 1d MD reduces the number of local excitatory synapses onto L2/3 PV cells but not intrinsic excitability

(**a**) Canonical fast spiking patterns of PV cells measured from suprathreshold somatic current injection in slices from controls and following 1d MD. Scale bar is 50mV, 250ms. Right, PV firing rates are plotted as function of somatic current injection for controls (n= 5 cells from 3 mice) and following 1d MD (n=6 cells from 4 mice). P values = 200pA: 0.15, 250pA: 0.22, 300pA: 0.45, 350pA: 0.82, 400pA: 0.93. (**b**) LSPS evoked EPSCs measured in L2/3 PV cells from glutamate uncaging in L4 (top) and L5a (bottom); control traces shown in grey, 1d MD traces shown in red. Scale bar: 50 pA, 50 ms. (**c**) Synaptic events were measured, independent of amplitude, in L2/3 PV cells. Plotted are the number of LSPS evoked EPSCs relative to the targeted cell soma (white circles); maps from control (n=7 cells from 4 mice) and 1d MD conditions (n=7 cells from 4 mice) are displayed by overlaying 7 average maps per group (4 mice, 7 cells per group). Scale bar = 200μm. (**d**) Quantification of evoked laminar EPSC number in PV cells measured from control (grey) and 1d MD (red) conditions. Values are presented as cell means ± standard error. *P< 0.05.



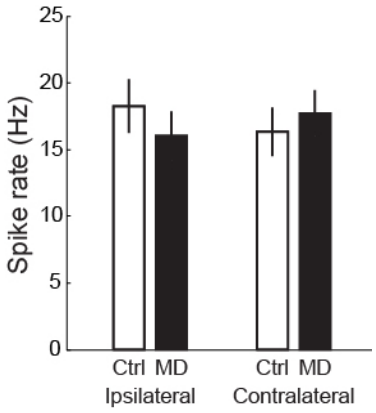
Supplementary Figure 3. PV cell evoked responses following 3d MD
Bar plot of the mean evoked firing rates of PV cells to visual stimuli presented to the ipsilateral (I) or (formerly closed) contralateral (C) eye in mice with normal vision, mice subjected to 1d contralateral MD, or 3d contralateral MD. Error bars plot standard error of the mean. Note that after 3d MD ipsilateral (open) eye responses return to normal while contralateral (deprived) eye responses remain depressed. Values for control and 1d MD are from Fig 2. For 3d MD, n= 28 PV cells from 11 mice. Stats: ANOVA, P=0.041, followed by post-hoc comparisons, Tamhane corrected P value for 3d MD vs. 1d MD = 0.021, and for 3d MD vs. control P>0.99. *P<0.05, n.s P> 0.99.



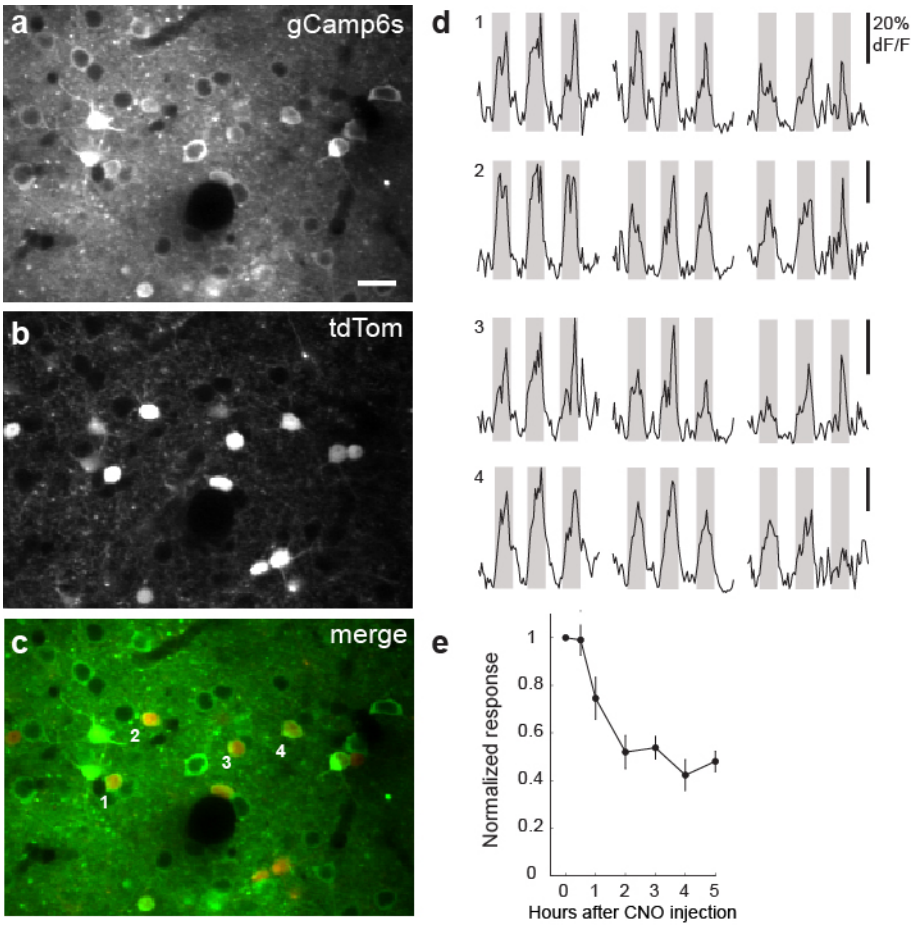
Supplementary Figure 4. Enhancing inhibition prevents competitive ocular dominance plasticity.

(**a**) Examples of responses evoked by ipsilateral eye stimulation recorded from a L2/3 pyramidal neuron in binocular visual cortex of alert mice exposed to 1d MD (upper trace) or 1d MD and intraventricular DZ (lower trace). Gray shaded region is 5 seconds long. (**b**) Plot of average evoked firing rates across all recorded L2/3 pyramidal neurons in both conditions. Note that the addition of DZ prevents the increase in pyramidal spike rates that are typical after 1d MD, but does not prevent evoked firing. 1d MD replotted from Fig. 1. MD+DZ: n=12 cells from 4 mice. (**c**) In-vivo 2-photon image of neurons (green) and astrocytes (red) in L2/3 (220 microns below pia surface) showing the labeling of 34 neurons, outlined in white, with Oregon Green BAPTA-1. PV neurons indicated by single asterisk, and a sulforhodamine-positive astrocyte (red) indicated by double asterisks. Scale bar is 20μm. (**d**) Representative ocular dominance (OD) scores calculated for individual neurons by imaging fluorescent changes during visual stimulation through the contralateral and ipsilateral eyes for the three experimental

conditions as indicated. Cooler colors identify neurons with strong contralateral eye dominance whereas warmer colors indicate ipsilateral eye dominance. (**e**) Visually evoked calcium transients for the neuron highlighted by the box in panel (d). Responses across stimulus repetitions (green traces) are aligned to stimulus onset and the average of 8 repetitions shown in black, standard deviation of baseline (1-3x) indicted by horizontal dashed lines; vertical dashed lines delineate the response values used to compute the OD score. (**f**) Example calcium transients showing the change in fluorescence of OGB-1 as a function of visual stimulation. Gray bars delineate 5 second periods of visual stimulation; white bars delineate 6 seconds of no stimulation. The numbers to the left of each trace pair identify the neuron in panel (b) from which the traces were derived. Each trace pair shows the raw response to stimulation through the contralateral eye (left) and ipsilateral eye (right). The OD score for each trace pair is reported in the upper left corner. (**g**) Plot of the mean CBI across animals imaged in control (n=5 mice, 461 cells), 3d MD (n=5 mice, 380 cells), and 3d MD + DZ mice (n=5 mice, 427 cells). One way ANOVA $P = 0.006$. Bonferroni corrected p - values for all possible comparisons: control vs 3 d MD, $P = 0.008$; 3 d MD versus 3 d MD+DZ, $P = 0.03$; control versus 3 d MD+DZ, $P > 0.99$. (**h**) Average distribution of OD scores for all significantly responding neurons in control, 3d MD, and 3d MD + DZ mice. Error bars are standard error of the mean. *P < 0.05.



Supplementary Figure 5. 1d MD does not alter PV cell responses in P45 mice.
Bar plot of the mean evoked firing rates of PV cells to visual stimuli presented to the ipsilateral or (formerly closed) contralateral eye in P45 mice with normal vision or in P45 mice subjected to 1d contralateral MD. Error bars plot standard error of the mean. Note the absence of any change following MD. For controls, n= 20 PV cells from 4 mice. For 1d MD, n= 21 PV cells from 6 mice. Stats: 2-way repeated measures ANOVA taking into account the pairwise relationship between ipsilateral and contralateral responses recorded for the same cell, P= 0.899.



Supplementary Figure 6. Effect of CNO on visually-evoked responses of PV neurons expressing hM4Di-DREADD receptors.
(**a**) Single focal plane image of neurons expressing GCaMP6 in binocular cortex. Scale bar is 20μm. (**b**) Same focal plane as in (a), but showing the location of PV cells, here identified by their expression of tdTomato. (**c**) Merge of the images in panels (a) and (b). (**d**) Example traces showing change in fluorescence as a function of time and visual stimulation (gray bars). Cells numbered 1-4 are the same cells numbered in panel (c). Gray bars are each 5 seconds and white bars are each 6 seconds duration. (**e**) Normalized plot of mean fluorescence change evoked by visual stimulation for n=17 PV neurons imaged in 2 mice. Note that the 40%-50% drop in response is maintained for at least 5 hours (as long as we imaged). Error bars are standard error of the mean.