Supplementary Figures

Adaptation maintains population homeostasis in primary visual cortex

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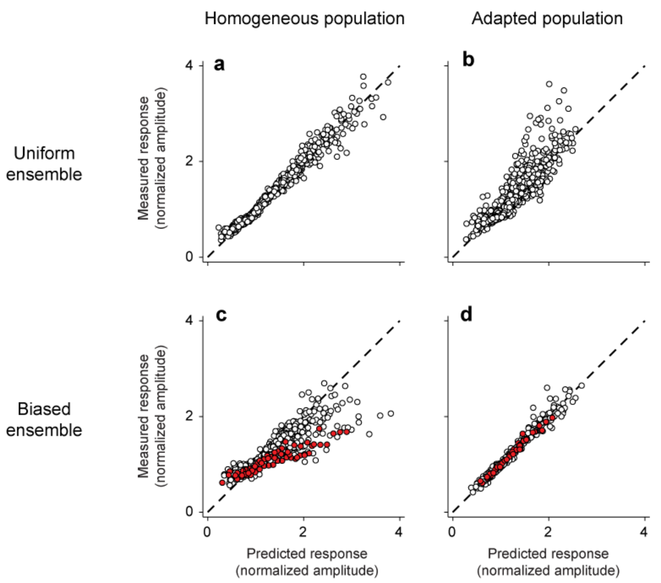
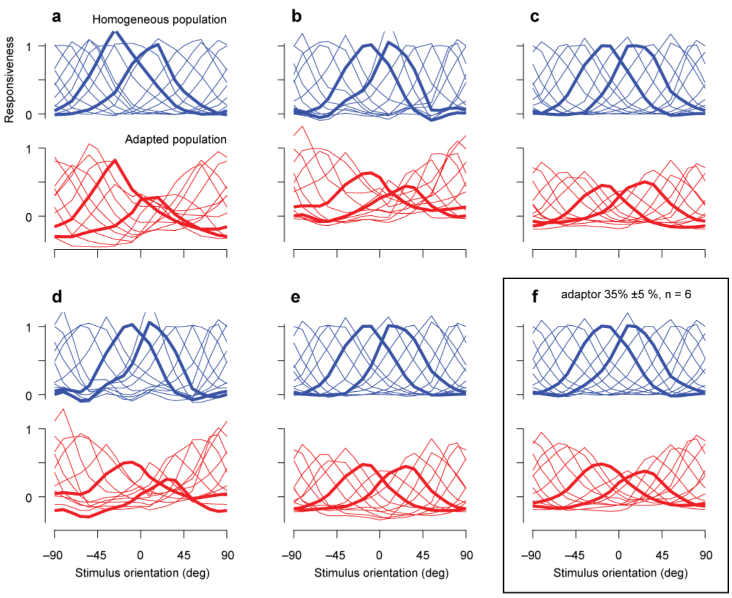


Suppl. Fig. 1. **Predictive power of homogenous and adapted populations**. The accuracy of the prediction depends on the effects of adaptation on the tuning properties of neurons.

a: Comparison between responses to a uniform stimulus ensemble and fits of the model with homogeneous tuning curves (n = 5).

b: Comparison of the same data with simulated responses obtained with the adapted tuning curves.

c-d: Comparison of responses to a biased stimulus ensemble (n=4) and simulations of the model with uniform tuning curves (**c**) or fits of the model with adapted tuning curves (**d**). *Red dots* are responses at the orientation of the adaptor.



Suppl. Fig. 2. **Tuning curves in 5 experiments with adaptor probability 30-40%.**

a: Data from experiments 75-6-2+6 (probability of adaptor: 35%).

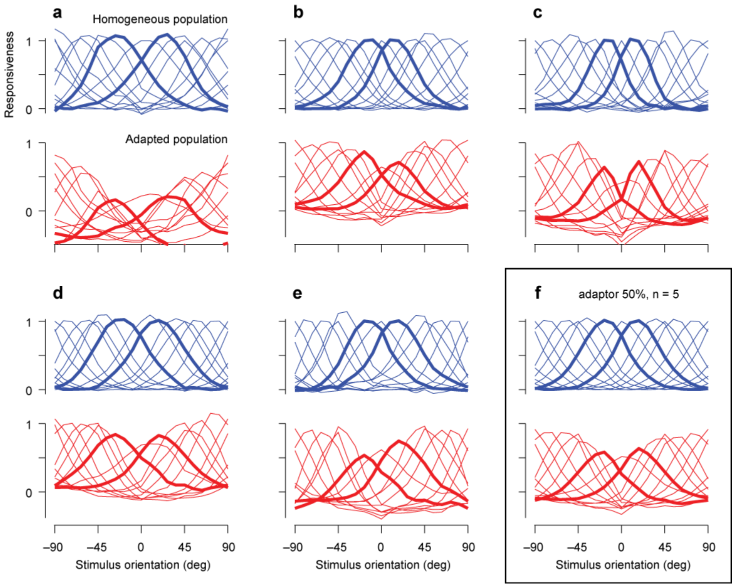
b: Experiments 79-9-9+10, 40%

c: Experiments 83-10-8+10, 30%

d: Experiments 79-9-11+10 , 40%

e: Experiments 83-10-11+10, 30%

f: Average of all 6 data sets, including experiments 75-6-2+3, which are in Figure 1.



Suppl. Fig. 3. **Tuning curves in 5 experiments with adaptor probability 50%**.

a: Data from experiments 75-6-10+11.

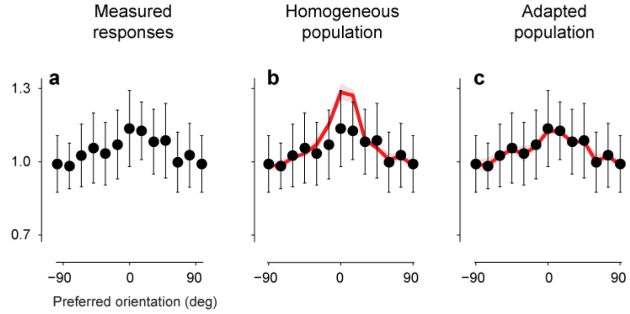
b: Experiments 77-4-36+41.

c: Experiments 77-4-37+42

d: Experiments 77-4-36+38

e: Experiments 77-4-37+39

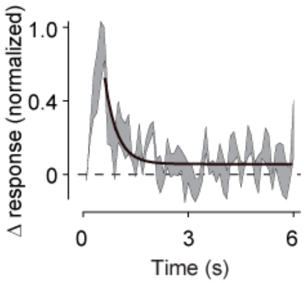
f: Average of these 5 data sets.



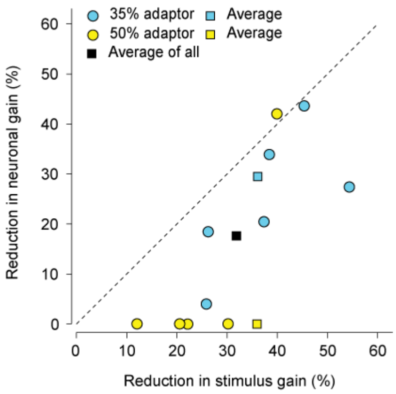
Suppl. Fig. 4. **Incomplete equalization for highly biased ensembles**.

a: Time averages of responses to biased stimulus ensambles having a probability of the adaptor (nominal value of zero) 5 times larger than that of other stimuli (n=5, error bars ± 1 s.e.).

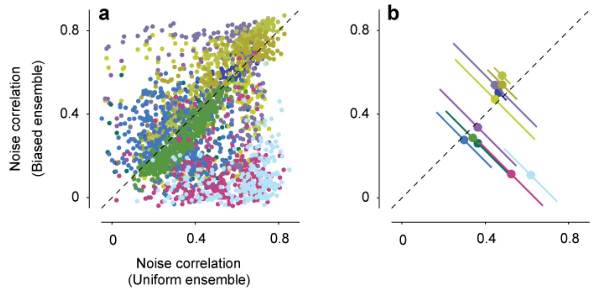
b-c: Time averages of predicted responses when using homogeneous (**b**) or adapted (**c**) tuning curves, red lines.



Suppl. Fig. 5. **Time course of equalization**. To measure the time course of equalization we analyzed population responses during transitions from a 6-s (or 20-s) control segment, measured with a gray screen, to a segment with a biased ensemble of stimuli (n=49 in 4 cats). During such transitions the average response of neurons responding to the adaptor orientation were subtracted from that of neurons differing in preferred orientation by more than 30 deg. Responses were averaged across all transitions and then fitted with an exponential function, solid black line (shaded area ± 1 s.e.).



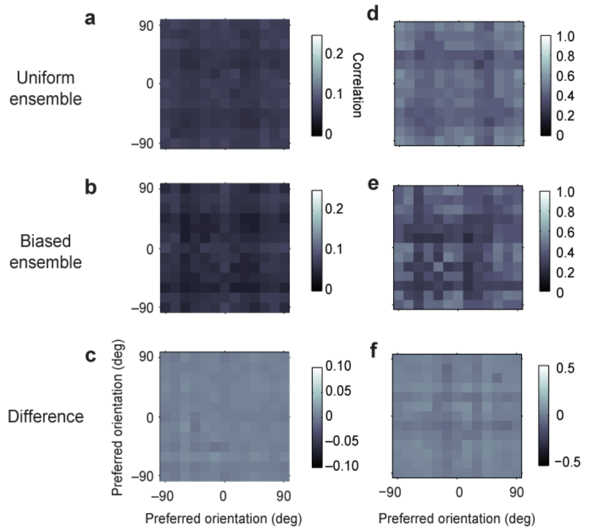
Suppl. Fig. 6. **Stimulus-specific and neuron-specific effects of adaptation**. The reduction in stimulus-specific gain was consistently larger than the reduction in neuron-specific gain, both in individual experimental sessions and in averages across sessions.



Suppl. Fig. 7. **Adaptation to biased ensembles does not affect pairwise noise correlations on long timescales**.

a: Noise correlations between pairs of units in response to a uniform and biased ensemble calculated over 2 s time bins. Colors denote different data sets (n=11). For graphical purposes, only a randomly selected 5% of the 69,596 pairs are displayed.

b: The same data, averaged within each data set (n = 11 data sets, each with 1,892-9,120 pairs). Error bars indicate ± 1 s.d. of the difference in noise correlations in responses to the uniform and biased ensembles.



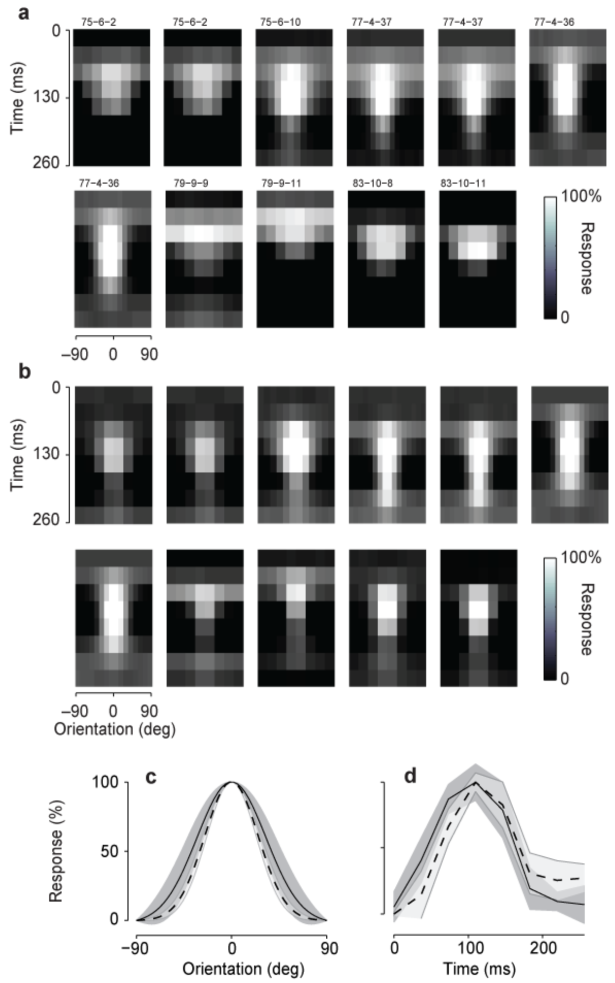
Suppl. Fig. 8. **Effects of adaptation on noise correlations do not depend on orientation preference.**

a: Mean noise correlations between pairs of units for a uniform ensemble as a function of preferred orientation in a pair (relative the orientation of the adaptor). Data are from n = 69,596 pairs.

b: Same as in **a**, but measured with a biased stimulus ensemble

c: Mean increase in noise correlations between biased and uniform ensembles. Results are expressed as a function of the difference in preferred orientation and adaptor orientation.

d-f: Same as **a-c**, but noise correlations are calculated over 2 s bins.



Suppl. Fig. 9. **Deriving orientation-time filters.**

a: Filters obtained by linear regression (the method used in our study). Filters are the optimal solution R = F*S, where R are the responses, F the filter, and S a lag matrix built from the stimulus sequences. Each panel is the average filter for an experiment involving stimuli with uniform distributions. The abscissa is the difference between a bin's preferred orientation and the stimulus orientation. The ordinate is time from the presentation of each flashed stimulus.

b: Filters obtained with reverse correlation (the traditional method [27,50]). Filters are computed by reverse correlating the stimulus sequence with the responses. Each panel is the average filter for an experiment, averaging across different orientations.

c: Orientation tuning profiles averaged across all experiments using linear regression (solid line, shaded area ± 1 s.d., n = 11) and using reverse correlation (dashed line). Gaussian fits are shown to facilitate the comparison.

d: Same as in **c**, but for the temporal profiles. Temporal profiles are obtained as a time-slice at zero orientation.