Science Advances
AAAS

advances.sciencemag.org/cgi/content/full/6/22/eaba3742/DC1

Supplementary Materials for

Unsupervised experience with temporal continuity of the visual environment is causally involved in the development of V1 complex cells

Giulio Matteucci and Davide Zoccolan*

*Corresponding author. Email: zoccolan@sissa.it

Published 29 May 2020, *Sci. Adv.* **6**, eaba3742 (2020)
DOI: 10.1126/sciadv.aba3742

This PDF file includes:

Figs. S1 to S5

Figure S1

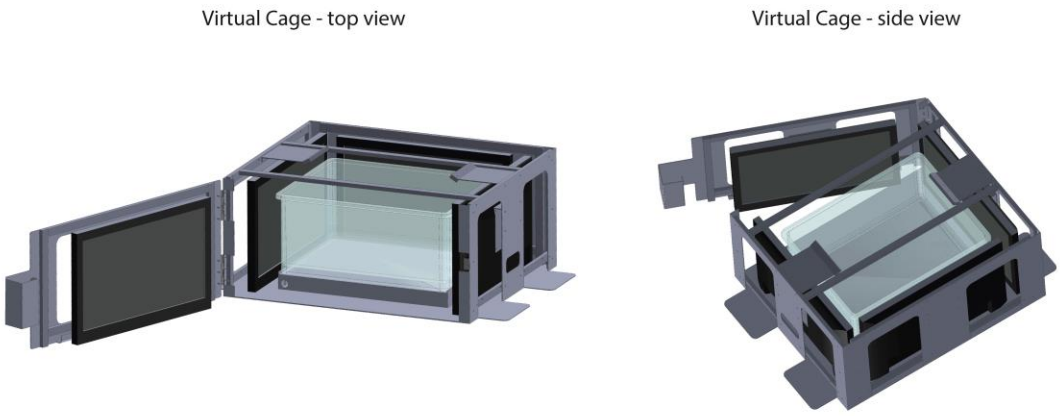

Fig. S1. The *virtual cage* system. CAD drawing of a *virtual cage* – the custom apparatus used to rear newborn rats in visually controlled environments. The cage consists of a metal, box-like structure (light gray) holding 4 computer monitors (black/dark gray) that fully surround a transparent basin (light blue), where a newborn rat can be placed for immersive exposure to the visual scenes/movies displayed on the monitors.

Figure S2

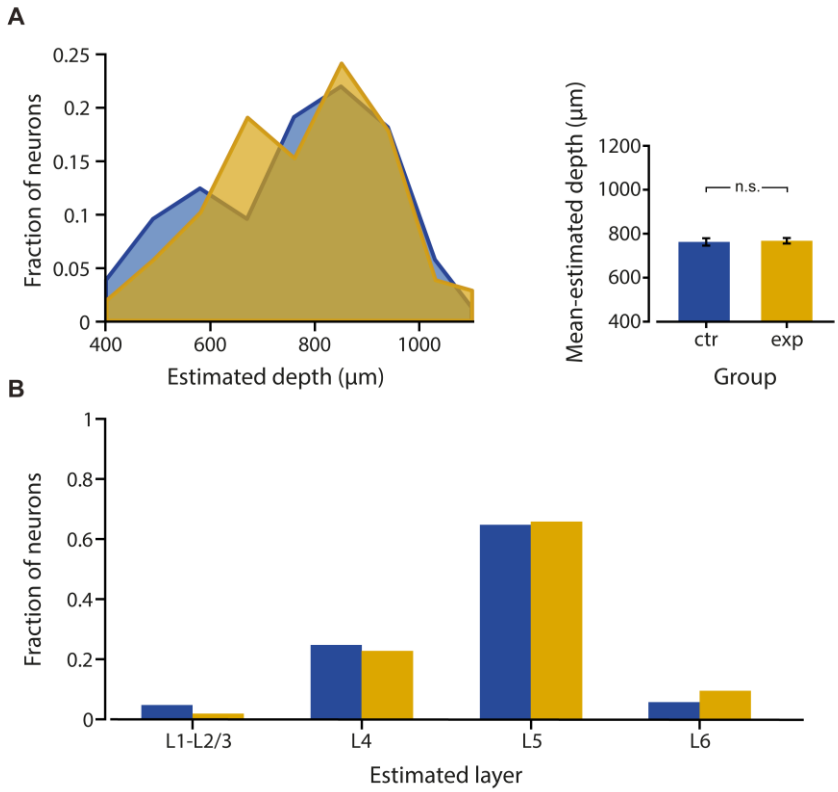

Fig. S2. The distributions of cortical depths and laminar locations did not differ between the populations of control and experimental units. (**A**) The distributions of cortical depths (left) and their means (right) did not significantly differ between the populations of control (blue; $n = 105$) and experimental (orange; $n = 158$) units ($p > 0.05$, Kolmogorov-Smirnov test; $p > 0.05$, two-tailed, unpaired t-test). Error bars are SEMs. (**B**) The distributions of laminar locations were also not significantly different between control (blue) and experimental (orange) units ($p > 0.05$, χ^2 test). Both the cortical depths and laminar locations were estimated from the patterns of visually evoked potentials recorded along the silicon probes (see Materials and Methods).

Figure S3

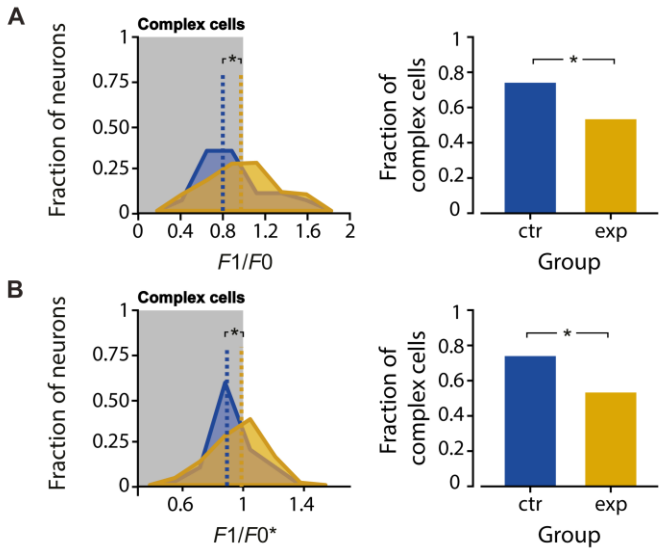

Fig. S3. Characterization of the response modulation of the control and experimental units using the *F*1/*F*0 ratio. (**A**) Left: distributions of the *F*1/*F*0 ratio used, as an alternative to the MI index of Fig. 2B, to quantify the level of response modulation of the control (blue; $n = 50$) and experimental (orange; $n = 75$) V1 populations (only units with OSI > 0.4 included). Following the convention in the literature, the *F*1/*F*0 = 1 threshold was used to distinguish complex (gray-shaded area) from simple cells. The medians of the distributions (dashed lines) were significantly different ($p < 0.05$, Wilcoxon test). Right: the fraction of units that were classified as complex cells (i.e., with *F*1/*F*0 < 1) was significantly larger for the control than for the experimental group ($p < 0.05$, Fisher exact-test). (**B**) Same analysis as in A, but applied to a modified version of the *F*1/*F*0 ratio (referred to as *F*1/*F*0* ratio; see Materials and Methods for a definition). Same significance levels/tests as in A.

Figure S4

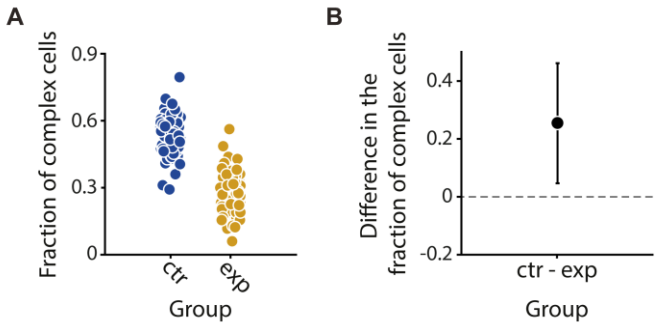

Fig. S4. Bootstrap analysis to verify the across-session consistency of the difference of complex cells found in the control and experimental rats. (**A**) Distributions of the fraction of complex cells found in the control (blue) and experimental (orange) groups, as obtained by sampling (with replacement) 100 times the available sessions for the two groups (see Results for details). The differences between the pairs of complex cells' fractions (i.e., control minus experimental) obtained across the 100 bootstrap samplings were used to compute the confidence interval shown in B. (**B**) The difference between the fractions of complex cells found in the control and experimental groups (dot) is shown along the 95% confidence interval of such difference (bar), as obtained by the bootstrap analysis described in A.

Figure S5

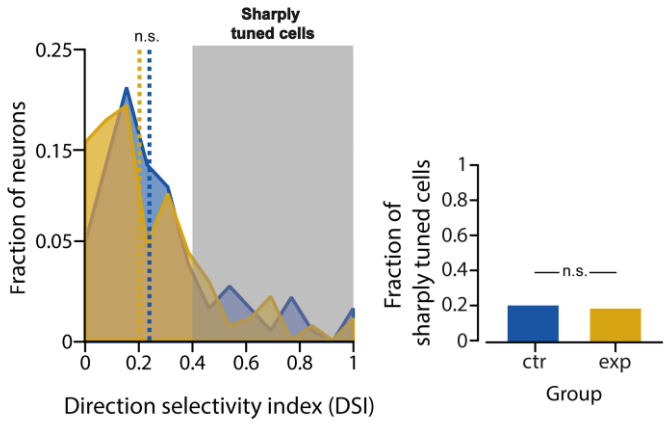

Fig. S5. Postnatal rearing in temporally discontinuous visual environments leaves direction tuning of V1 neurons unaltered. Left: distributions of the direction selectivity index (DSI) used to measure the sharpness of orientation tuning, as obtained for the control (blue; n = 105) and experimental (orange; n = 158) V1 populations. No significant difference was found between the two distributions and their medians ($p > 0.05$, Kolmogorov-Smirnov test; $p > 0.05$, Wilcoxon test). Right: the fraction of sharply orientation-tuned units (i.e., units with DSI > 0.6) did not differ between the two groups ($p > 0.05$, Fisher exact-test).