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Supplemental information

Divergent outer retinal circuits drive image and non-image visual behaviors

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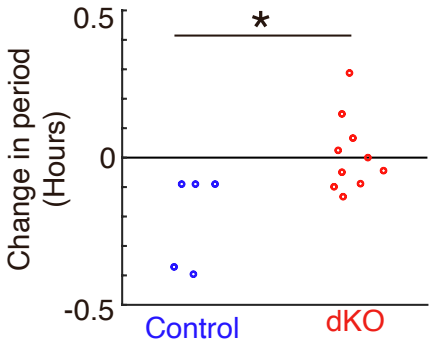
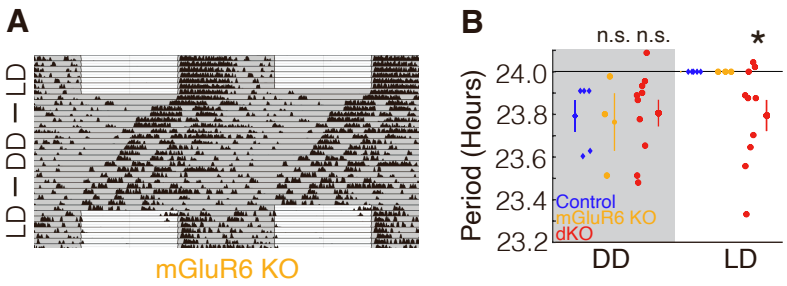


Supplementary Figure 1 (Related to Figure 2). The change in period lengths from LD to DD.

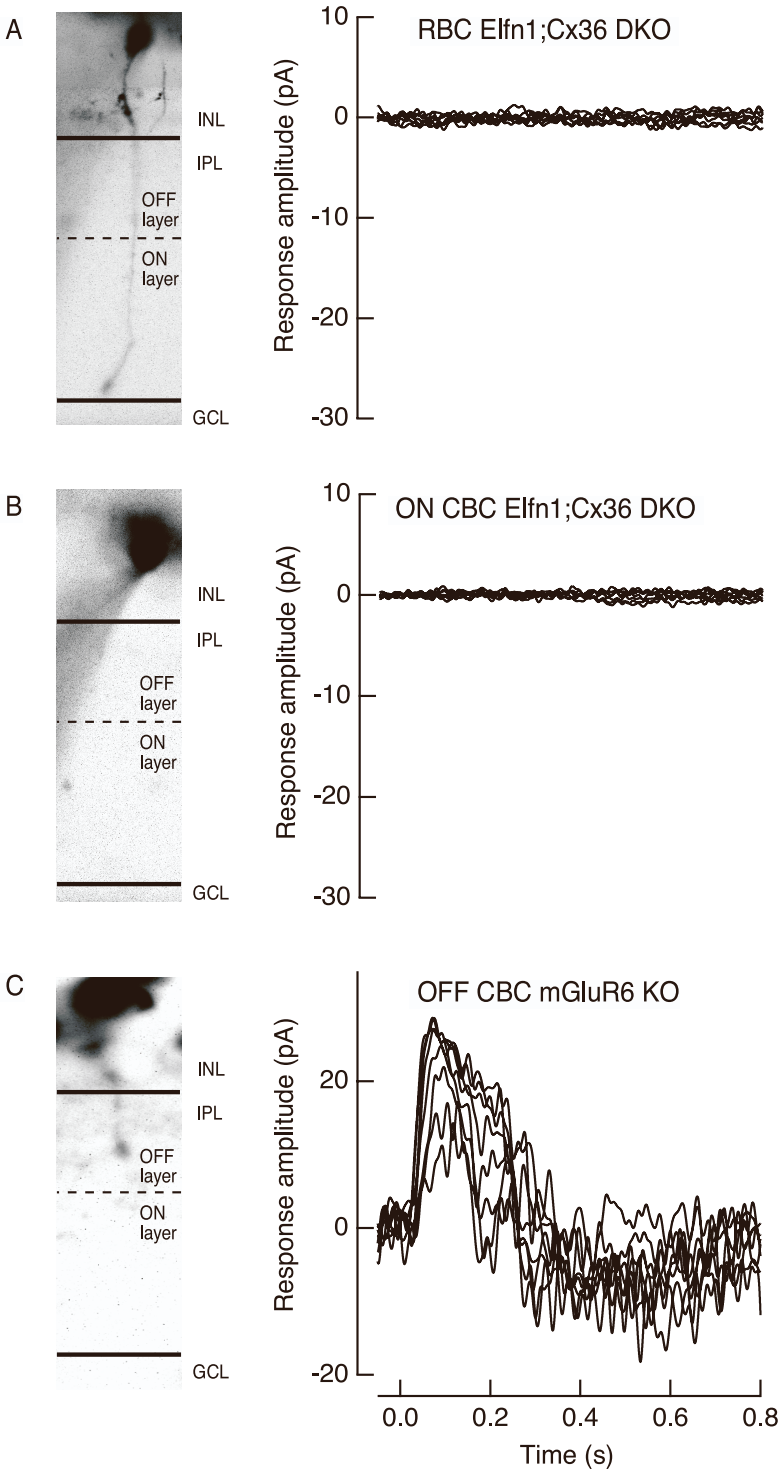
Quantification of the change in period lengths from individual animals transitioning from LD to DD. The periods of littermate control mice (blue) change in DD to be less than 24 hours (spread is below zero). The periods of mGluR6; Opn4 dKO mice (red) do not change (spread is around zero). Littermate control and mGluR6; Opn4 dKO mice change in period lengths are significantly different (Student's t-test, $p = 0.01$).



Supplementary Figure 2 (Related to Figure 2). mGluR6 KO mice photoentrain.

(A) mGluR6 KO mice confine their activity to the dark portions of the day-night cycle. The wheel running activity of mice exposed to changing light paradigms is recorded in 5-minute bins double plotted. Light and dark exposure is indicated by white and gray shading. Mice are exposed to 12-hour light – 12-hour dark (12:12 LD) for at least 2 weeks, followed by darkness (DD) for 2-3 weeks, then exposed to 12:12 LD for another 2 weeks.

(B) Quantification of the periods of mGluR6 KO mice (orange, n = 3) are shown next to data depicted in Figure 2F in the main text. In constant darkness (DD) littermate control (blue), mGluR6 KO (orange) and mGluR6; Opn4 dKO (red) mice have comparable period lengths (ANOVA post hoc Dunnett's method, all $p > 0.9$). Littermate control and mGluR6 KO mice photoentrain to the light-dark (LD) cycle indicated by their period lengths equaling exactly 24 hours. In 12:12 LD, the mean period lengths of mGluR6; Opn4 dKO mice do not equal 24 hours (Student's one-way t-test, $p = 0.02$).



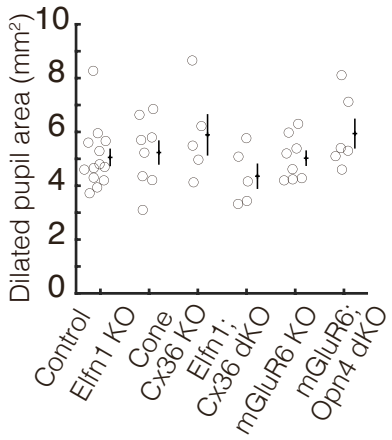
Supplementary Figure 3 (Related to Figure 1). Anatomical confirmation of non-responsive rod and cone bipolar cells in retinal slices.

Cells in retinal slices were filled with Alexa 750 during patch-clamp recordings to confirm their identity. The corresponding recordings of the filled cells are shown to the right. The flash intensities were the same as used in Figure 1 of the main text. Related to Figure 1.

(A) In an Elfn1; Cx36 dKO mouse, a RBC stratifies in the ON layer of the inner plexiform layer (IPL) near the ganglion cell layer. The dashed line delineates the ON and OFF layer of the IPL. Light induced responses were absent in this cell.

(B) An ON CBC recorded in an Elfn1; Cx36 dKO mouse stratifies in the ON layer of the IPL. Light responses were absent in this cell.

(C) An OFF CBC stratifies in the OFF layer of the IPL in a mGluR6 KO mouse. The OFF CBC hyperpolarizes in response to scotopic light flashes.



Supplementary Figure 4 (Related to STAR Methods). Dark-adapted pupil areas of control and mutant mice.

Dark-adapted pupil areas did not differ between control and mutant mice (ANOVA post hoc Dunnett's method, all $p > 0.5$).