

Depletion of primary cilia from mature dentate granule cells impairs hippocampus-dependent contextual memory

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Supplementary Figure 1. Specificity of AAV-CaMKII-driving expression in the dentate gyrus

(a) Representative image of AAV-CAG-eGFP showing co-localization of GFP and parvalbumin (PV).

(b) Representative image of AAV-CaMKII-eGFP showing lack of co-localization between GFP and PV.

Scale bars: 30 μ m.

Supplementary Figure 2. Adult neurogenesis was not significantly affected by removal of primary cilia

(a) The averaged number of DCX positive cells was not significantly different between CTRL and IFT20(-/-)^{mDGCs} (30.28 \pm 1.91 for CTRL and 30.51 \pm 2.34 for IFT20(-/-)^{mDGCs}; two-tailed unpaired t-test p=0.94, n=6,6). n is the number of animals; Field size: 320 μ m \times 320 μ m \times 36 μ m.

(b) Dendritic complexity of DCX+ cells did not differ significantly between CTRL and IFT20(-/-)^{mDGCs} mice (repeated measures ANOVA main effect of condition F(1,17) = 1.512; p = 0.236; n=3,3)

n is the number of animals.

Supplementary Figure 3. Ablation of primary cilia from mature dentate granule cells does not alter pattern encoding

(a) Pattern encoding task paradigm.

(b-c) Both control mice and IFT20(-/-)^{mDGCs} mice learned to discriminate between a a

shock-associated environment (A) and safe environment (B). CTRL: Repeated measures ANOVA main effect of environment: $F(1,17) = 5.935$; $p = 0.026$; interaction between environment and day: $F(7,11) = 36.163$; $p < 0.0001$; $n = 13$. IFT20(-/-)^{mDGCs}: Repeated measures ANOVA main effect of environment: $F(1,15) = 6.568$; $p = 0.022$; interaction between environment and day: $F(7,9) = 47.140$; $p < 0.0001$; $n = 11$.

(d) Average discrimination ratios (DRs) between safe and shock-associated environments did not differ significantly between groups (Repeated measures ANOVA main effect of group: $F(1,15) = 1.161$; $p = 0.298$; interaction between group and day: $F(7,9) = 2.559$; $p = 0.095$; $n = 18,16$).

* $p < 0.05$; n is the number of animals.

Supplementary Figure 4. Ablation of primary cilia from mature dentate granule cells affects spatial novelty recognition memory

(a) Spatial novelty recognition test paradigm.

(b) CTRL mice spent significantly more time exploring a novel object location versus a familiar location, however IFT20(-/-)^{mDGCs} mice did not spend a significantly different amount of time exploring either of the object locations (CTRL: old location 21.0 ± 2.4 sec; new location 28.4 ± 2.5 sec; two-tailed unpaired t-test $p = 0.044$; IFT20(-/-)^{mDGCs}: old location 27.2 ± 3.4 sec; new location 26.6 ± 2.5 sec; two-tailed unpaired t-test $p = 0.895$; $n = 11,11$).

(c) CTRL mice exhibited a trend toward more entries into a novel object location versus a familiar location, however IFT20(-/-)^{mDGCs} mice did not (CTRL: old location 162.0 ± 19.7 entries; new location 214.6 ± 24.7 entries; two-tailed unpaired t-test $p = 0.111$; IFT20(-/-)^{mDGCs}: old location 200.0 ± 28.9 entries; new location 196.8 ± 21.0 sec; two-tailed unpaired t-

test $p = 0.930$; $n=11,11$).

n is the number of animals.

Supplementary Figure 5. Ablation of primary cilia from mature dentate granule cells does not alter anxiety-like behavior on the elevated plus maze

Average time spent at center, open and closed arms during the experiment. No significant difference between CTRL and IFT20(-/-)^{mDGCs} mice ($24.80 \pm 5.14\%$ for CTRL and $32.87 \pm 5.86\%$ for IFT20(-/-)^{mDGCs} mice at the open arm; two-tailed unpaired t-test $p=0.31$; $n=18,20$).

n is the number of animals.

Supplementary Figure 6. Ablation of primary cilia from mature dentate granule cells does not alter anxiety-like behavior on the light/dark transition test

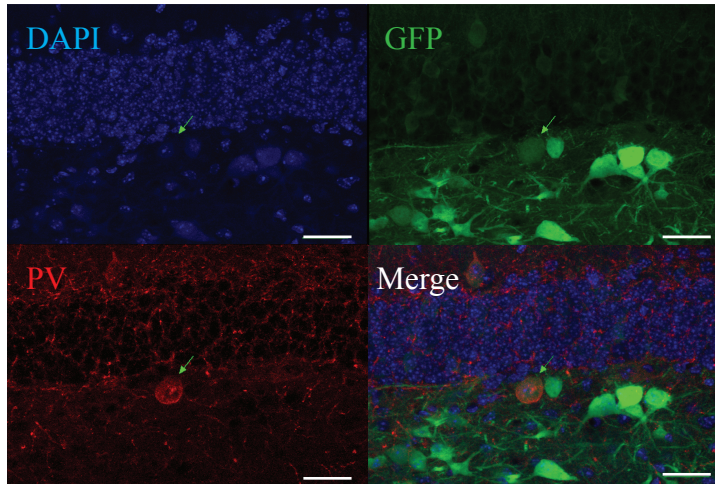
Average time spent in light and dark compartment during 10 minutes. The time spent in dark compartment differ significantly between CTRL and IFT20(-/-)^{mDGCs} mice ($80.48 \pm 2.39\%$ for CTRL and 78.40 ± 1.88 for IFT20(-/-)^{mDGCs}; two-tailed unpaired t-test $p=0.50$; $n=18,20$; n is the number of animals).

Supplementary Figure 7. I-O curve for CTRL and IFT20(-/-)^{mDGCs}

Input and output curve obtained from CTRL and IFT20(-/-)^{mDGCs} mice. Synaptic transmission was not altered in IFT20(-/-)^{mDGCs} from 10 to 35mA of stimulation intensity ($n=5,6$; n is the number of brain slices).

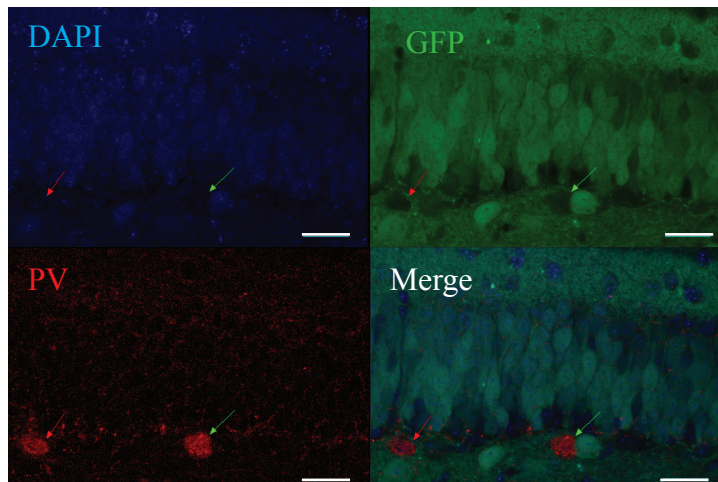
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AAV-CAG-eGFP



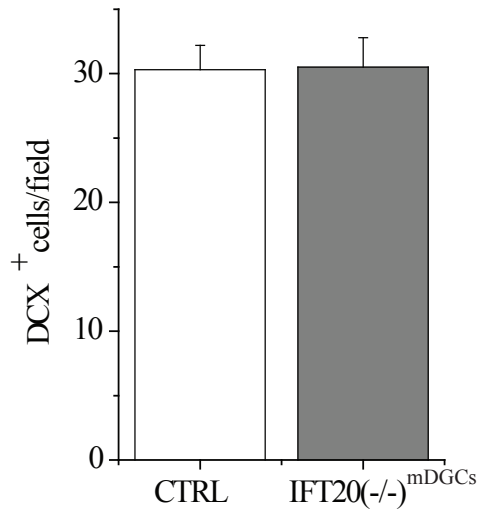
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AAV-CaMKII-eGFP

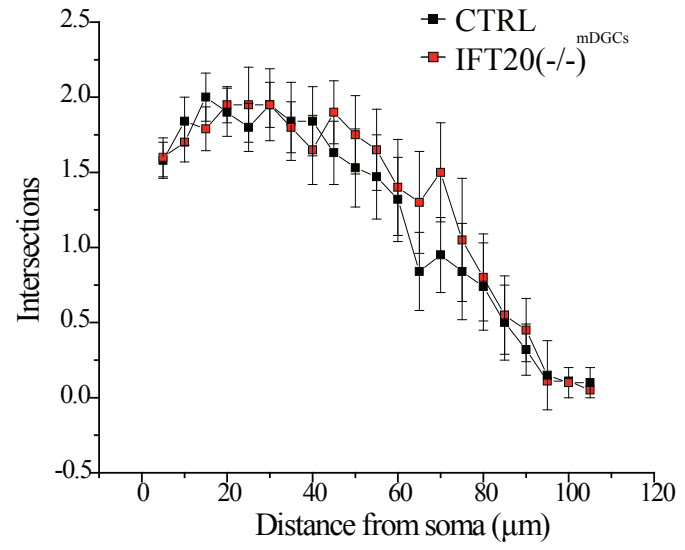


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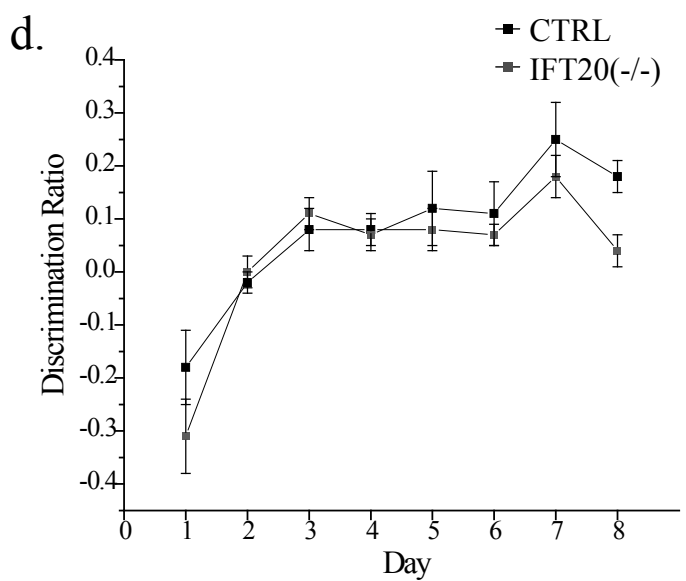
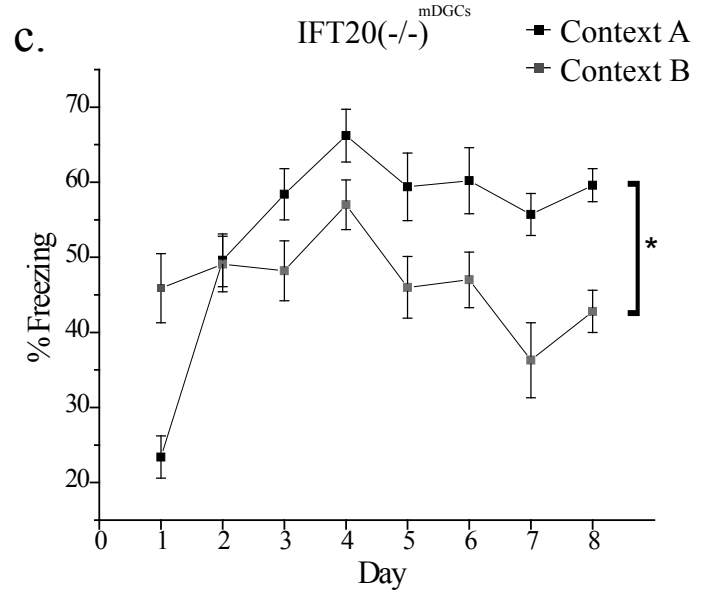
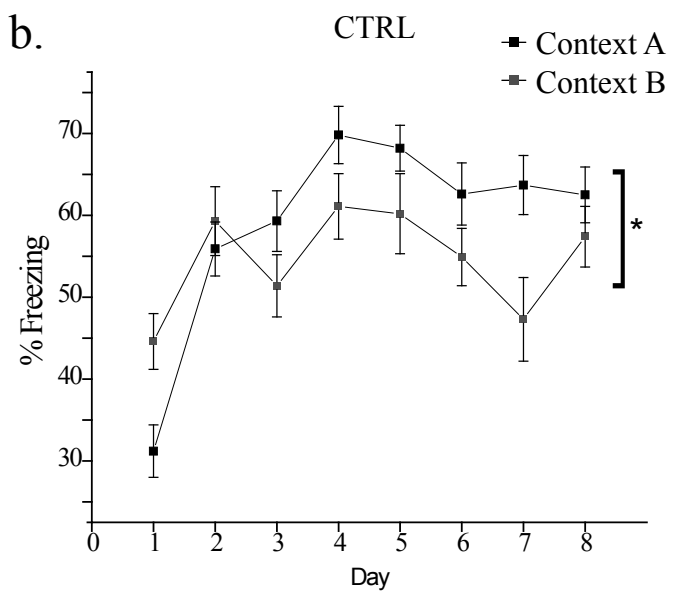
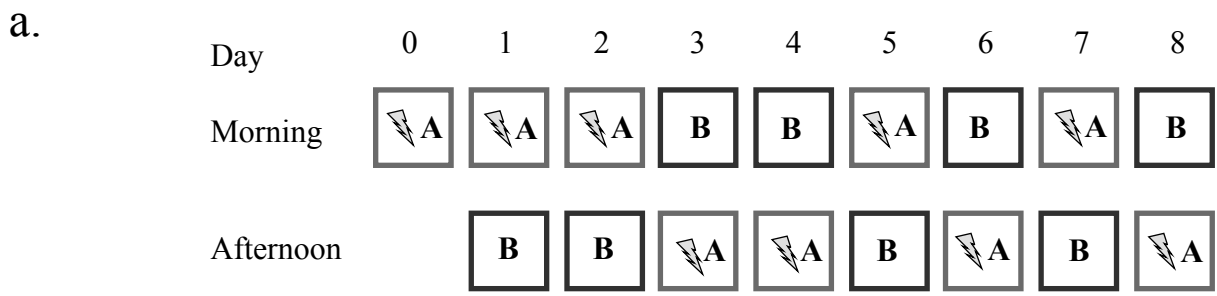
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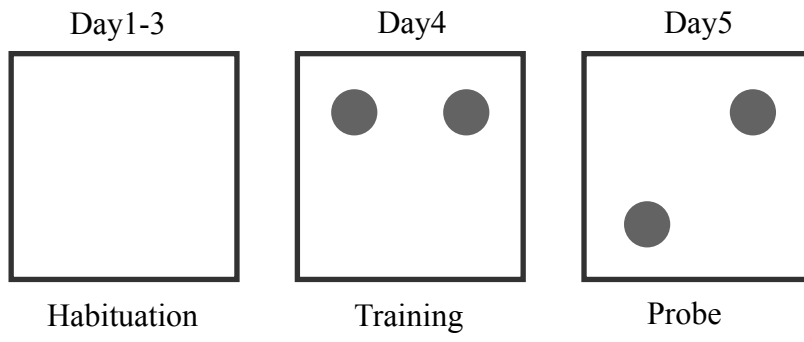


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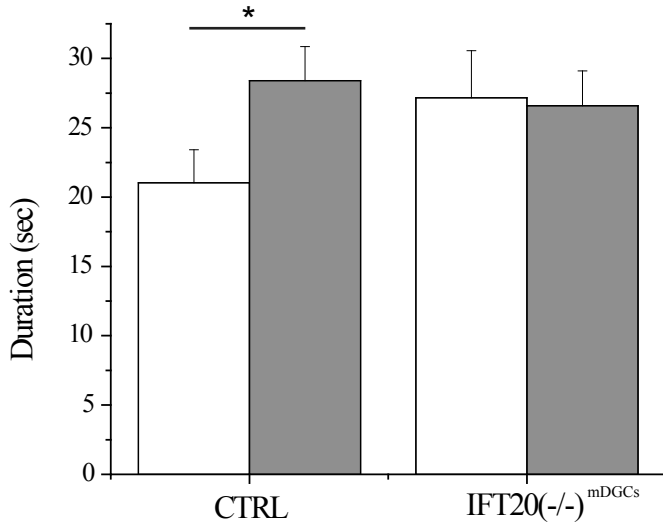


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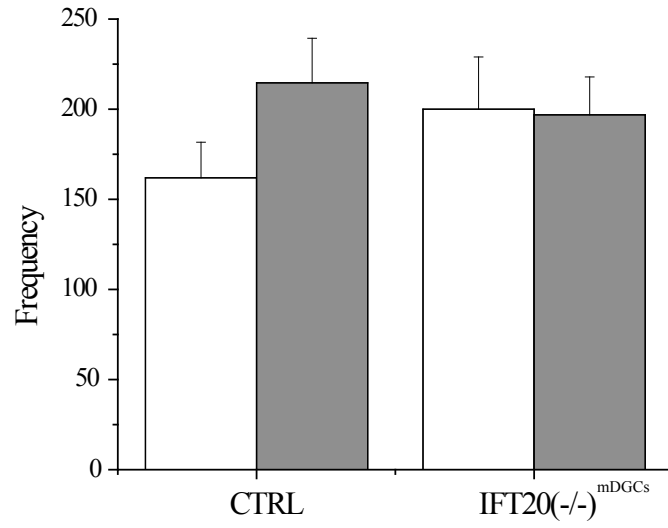
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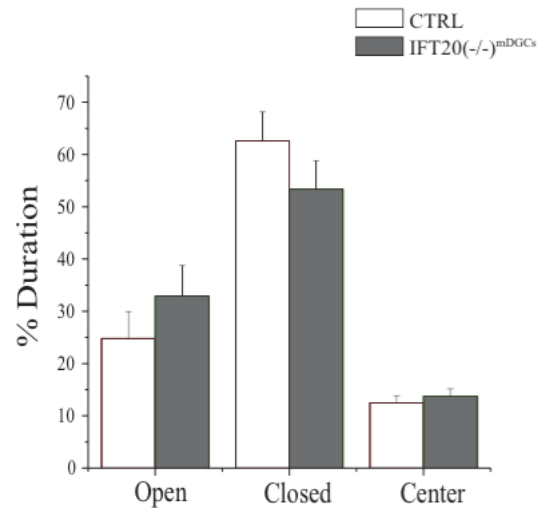
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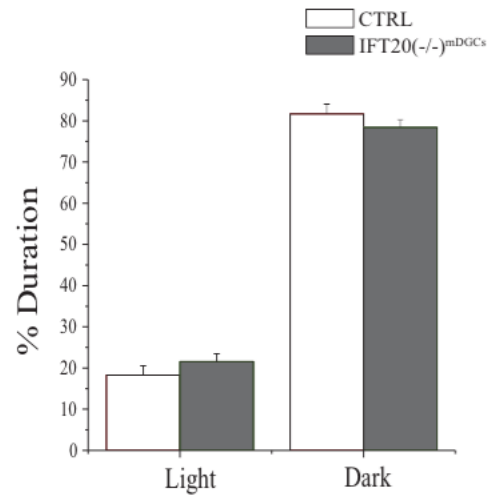
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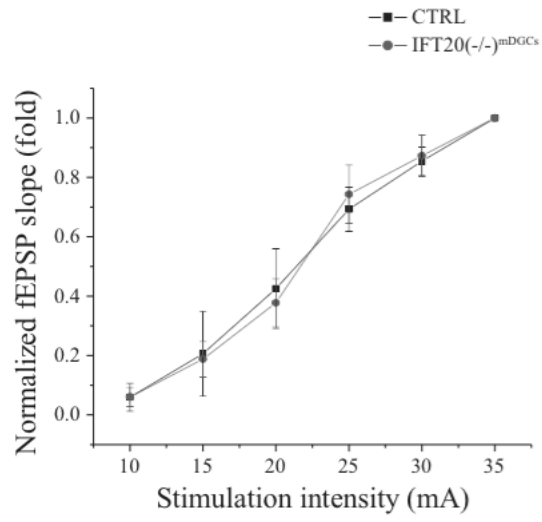
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Supplementary Figure 7. I-O curve for CTRL and IFT20(-/-) mDGCs