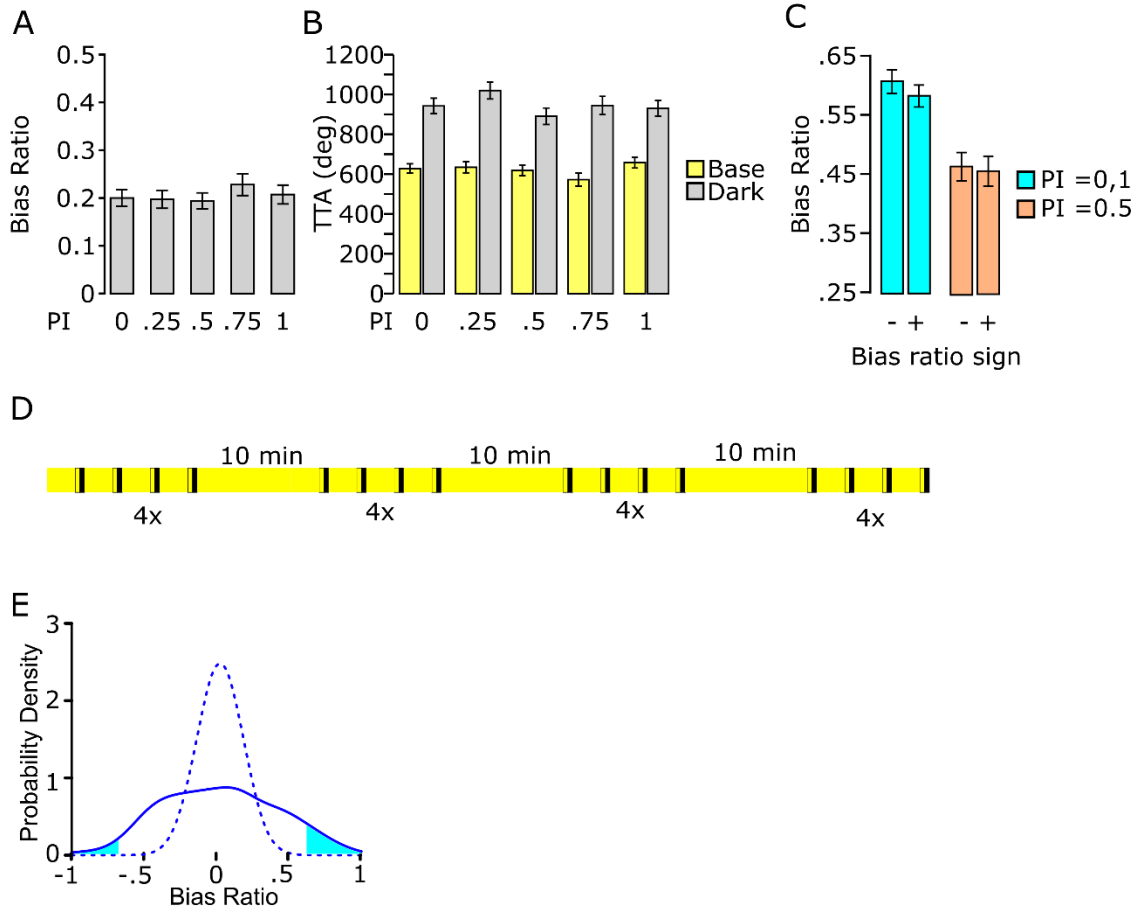


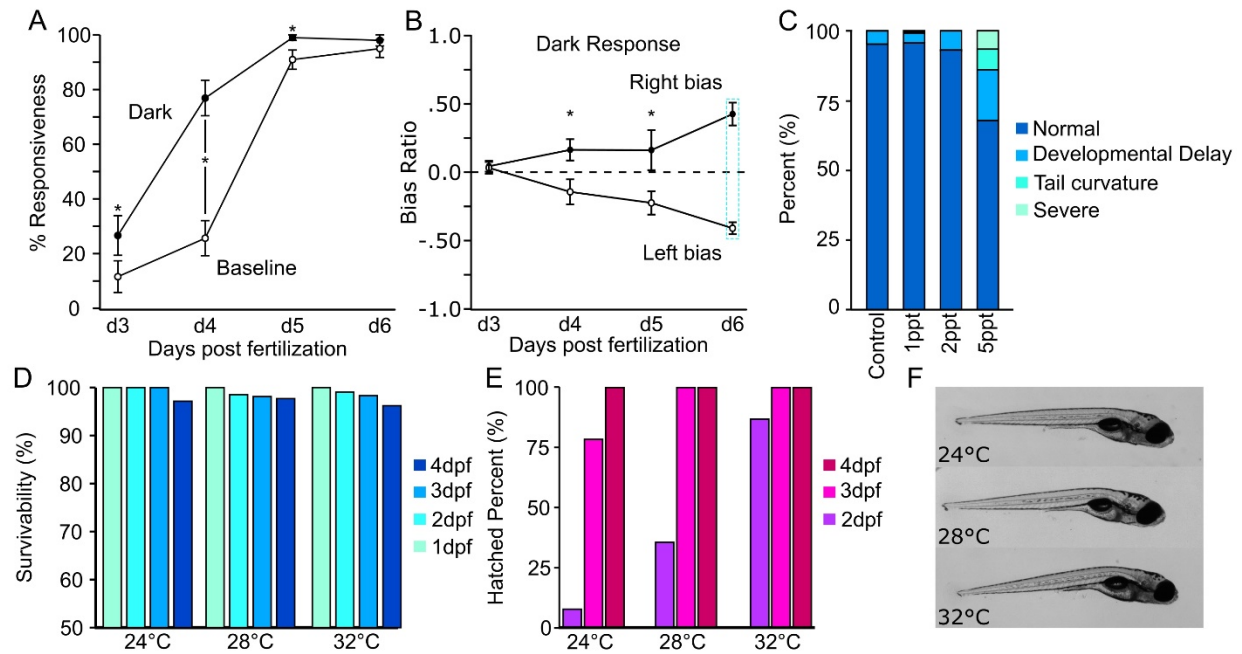
Supplementary Figure 1

Supplemental Figure 1. (A) 4X match index for paired baseline (yellow) and dark response (grey). Red dotted line indicates random choice. Asterisk, $p < 0.05$ Wilcoxon signed-rank test ($N = 374$). **(B)** Representation and calculation used for generating bias ratio. NTA is the sum of left (-) and right (+) angular displacement, while TTA is the absolute sum of all angular displacement. Bias ratio is the dividend of NTA to TTA. **(C)** Population average of 4X recordings ($n = 374$) **(D-F)** Same analysis as in Figure 1C-E except for 8X recordings. Asterisk $p < 0.05$. Asterisk in circle, $p < 0.05$ to MAD permutation value. **(G-H)** 4x ($N=374$) and 8X ($N=189$) TTA for baseline (yellow) and dark response (grey).



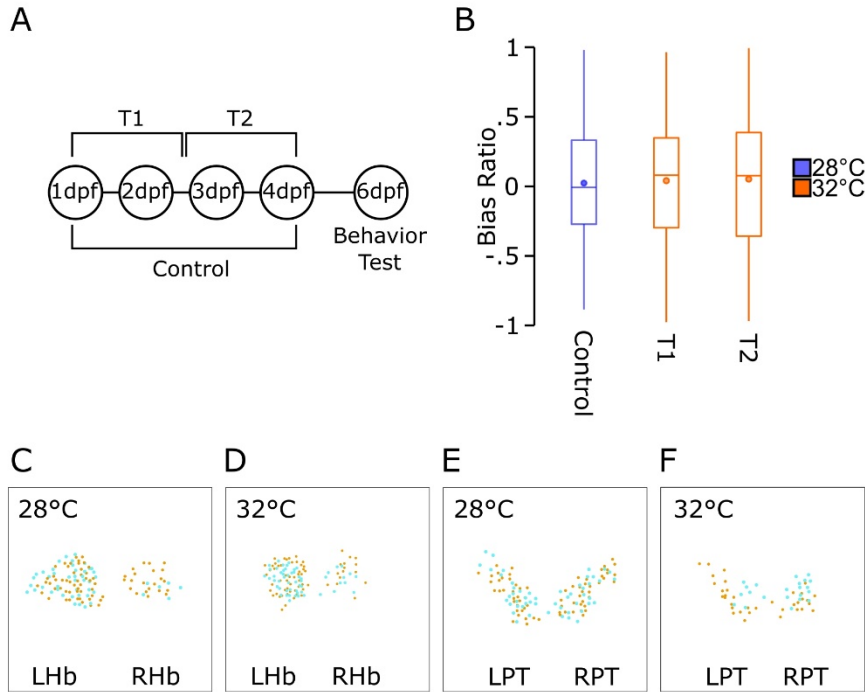
Supplementary Figure 2

Supplemental Figure 2. **(A)** Absolute bias ratio for 4x baseline illumination responses per PI (PI 0, N=66; PI 0.25, N=74; PI 0.5, N=75; PI 0.75, N=75; PI 1, N=67). **(B)** TTA for data in A, showing baseline (yellow) and dark (grey) responses. **(C)** Single event absolute bias ratio for matched (PI 0,1 cyan) and unbiased (PI 0.5, orange) individuals sorted by direction (+, rightward; -, leftward). **(D)** Diagram of q4x recording. Yellow and black indicating lights on and off, respectively. Black outline areas indicate 30 second recording windows. **(E)** Average q4X probability density distribution for dark responses (solid line, N=114) and permutation populations generated from the average of 1000 resampled populations (dotted line). Cyan fill displays percent of population with strong left (<-0.3) and right (>0.3) average bias ratios.



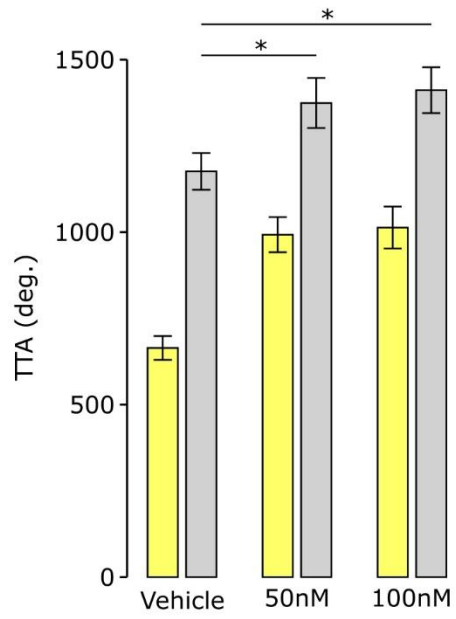
Supplementary Figure 3

Supplemental Figure 3. (A-B) Developmental onset of turn bias. Individual larvae were tested daily in a 4X assay from 3 to 6 dpf. **(A)** Proportion of individuals that show motor responsiveness (N=25) **(B)** Presence of turn bias during development. At 6dpf (dotted blue box), larvae were categorized as right (N=9) or left (N=16) bias based on average bias ratio (+, right bias; -, left bias) to group responses over the testing interval. Asterisk $p < 0.05$, t -test between points at same developmental stage in A and B. No significance shown for 6dpf in B as this timepoint was used to group larvae by performance. **(C)** Phenotypic scoring at 4dpf following variable salinity exposures during early development. As 5ppt generated some developmental abnormalities this treatment was excluded from behavior testing. **(D)** Survival of larvae raised from 1-4dpf at different temperatures (24°C, N=103; 28°C, N=180; 32°C, N=209). **(E)** Proportion of hatched (dechorinated) embryos due to different temperatures (24°C, N=103; 28°C, N=180; 32°C, N=209). **(F)** Representative images of 6dpf larvae after varying temperature exposure from 1-4 dpf.



Supplementary Figure 4

Supplemental Figure 4. (A) Timeline of elevated temperature testing showing control (28°C) and T1 (31-55 hpf, 32°C) and T2 (55-79 hpf, 32°C) testing conditions which are not statistically different from random (1 sample t-test against 0: control- 0.023 ± 0.043 $t(100)=0.53$, $p=0.60$; T1- 0.040 ± 0.042 $t(100)=0.97$, $p=0.33$; T2- 0.052 ± 0.045 $t(106)=1.151$, $p=0.25$). **(B)** Average population bias ratio for 28°C control (purple, N=101) and T1 (orange, N=111) and T2 (orange, N=107) elevated temperature groups. Circles show means. **(C-F)** Representative neuron counts showing two overlaid examples (represented by orange and cyan, respectively) with circles representing the location of individual neurons for the habenula (28°C (C); 32°C (D)) and the PT (28°C (E); 32°C (F)).



Supplementary Figure 5

Supplemental Figure 5. TTA following Notch inhibitor exposure during early development (vehicle, N=69; 50 μ M, N=69; 100 μ M, N=48).