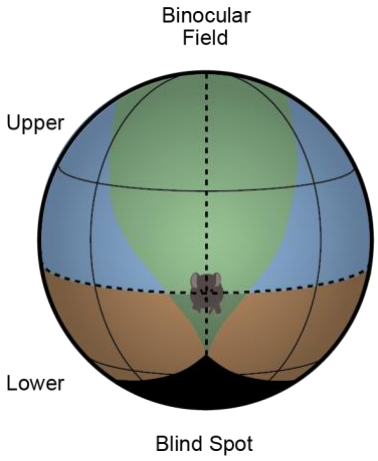

Figure S1. A three-dimensional depiction of the mouse visual field, Related to Figure 1.
The field is projected onto a global with the mouse within the center of that globe. Green represents where both eyes project (binocular overlap). Blue represents the upper half of the visual field and Brown represents the lower half of the visual field. There is greater binocular overlap in the upper field compared to the lower field.

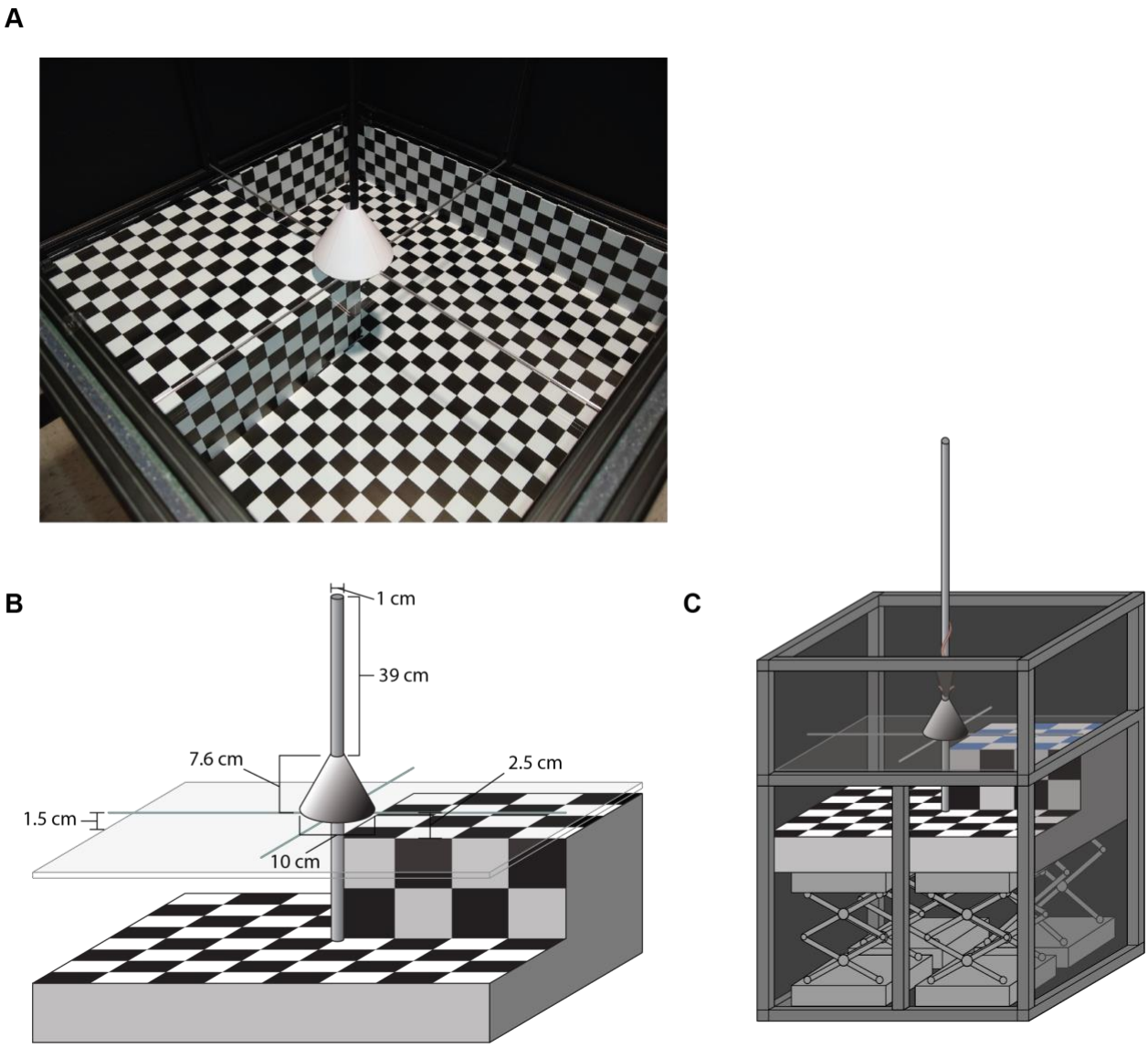

Figure S2. Image and Diagram of the Pole Descent Cliff Task (PDCT), Related to Figure 1
(**A**) Image of the PDCT. The quadrant and surface nearest the pole is at far right. The distance pairs presented are 2.5 cm (nearest quadrant) and 15.2 cm. All interior surfaces are covered with black and white 2.5cm checkerboard for all distance pairs. (**B**) Schematic of the PDCT with the dimensions for the central components (**C**) Diagram of the PDCT residing inside the testing box positioned on labjacks.

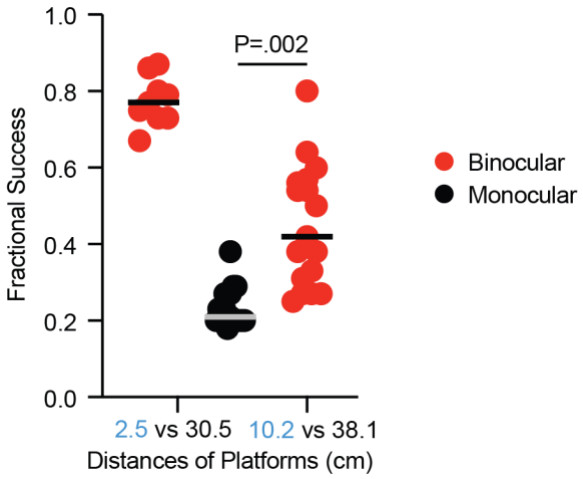

Figure S3. Discrimination analysis based on neuronal disparity tuning predicts reduced performance on the PDCT, Related to Figure 3. Mice (n=17) tested on the PDCT with both the nearest and more distant platforms displaced 7.6 cm farther away (10.2 cm and 38.2 cm, respectively) discriminate the nearest platform (P=.002), but at lower fractional success than 2.5 cm vs. 30.5.

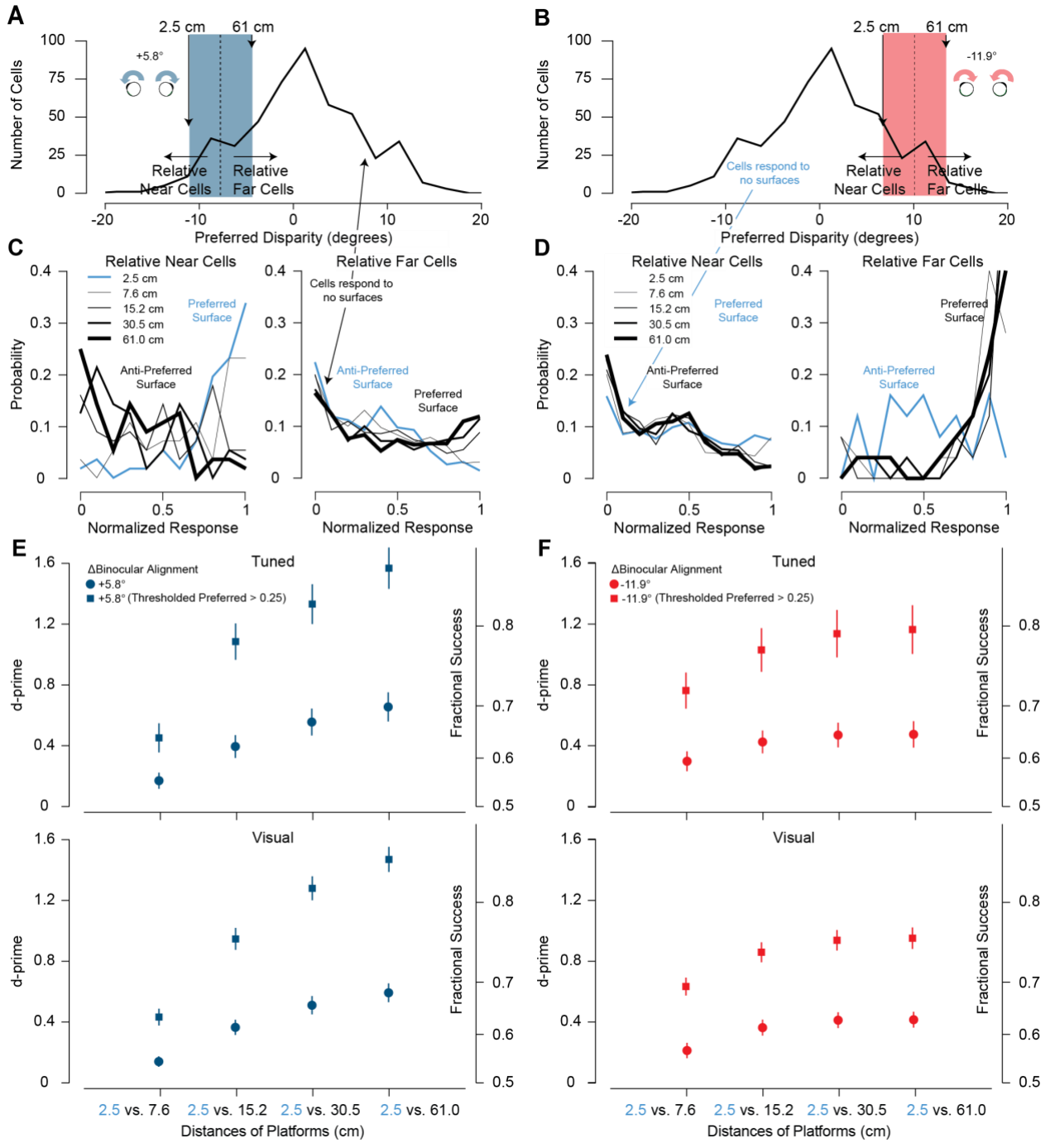

Figure S4. Neuronal Disparity Discrimination Improves by Applying a Response Threshold, Related to Figure 4.
(**A**) Blue shaded region of the disparity preference distribution highlights the range of disparities representing the PDCT surfaces when the eyes are 5.8 degrees more divergent. (**B**) Red shaded region of the disparity preference distribution highlights the range of disparities representing the PDCT surfaces when the eyes are 11.9 degrees more convergent. (**C**) Most relative far cells do not respond to any surface in the PDCT for the more divergent alignment. (**D**) Most relative near cells do not respond to any surface in the PDCT for the more convergent alignment. (**E**) and (**F**) Applying a threshold of a normalized response of 0.25 to surfaces matched to the preference (preferred surface) increases discrimination performance to levels that more closely match the behavior of the mice. This thresholding eliminates including neurons that respond to none of the surfaces from the d' calculation. All error bars are standard error.