Two pairs of neurons control *Drosophila* larval light preference

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Appropriate preferences for light or dark conditions can be crucial for an animal's survival. Innate light preferences are not static in some animals, including the fruitfly *Drosophila melanogaster*, which prefers darkness in the feeding larval stage but prefers light in adulthood. To elucidate the neural circuit underlying light preference, we examined the neurons involved in larval phototactic behavior by disrupting neuronal functions. After screening a batch of Gal4 lines and comparing the expression patterns of these Gal4 lines, we found that blocking two pairs of isomorphic NP394 neurons in the central brain was able to reverse the larval light preference from photophobic to photophilic. These neurons were in close proximity to *pdf* neurons, which are innervated by larval photoreceptors. Furthermore, we proved that they might form synaptic contact with the help of GRASP technique. In addition, the NP394 neurons were responsive to light stimulation in calcium imaging assay. When the pdf neurons were ablated, the calcium response in NP394 neurons upon light stimulation was stronger and faster, suggesting that *pdf* neurons deliver inhibitory signals to NP394 neurons.

Our results revealed a neural mechanism that could enable the adjustment of animals' response strategies to environmental stimuli according to biological needs.