Neurobiological mechanisms of spontaneous behavior and operant feedback in *Drosophila*

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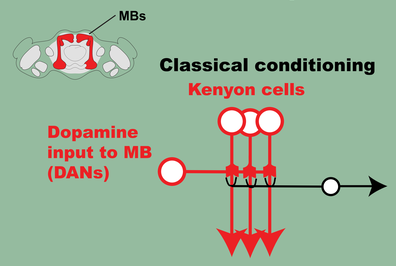
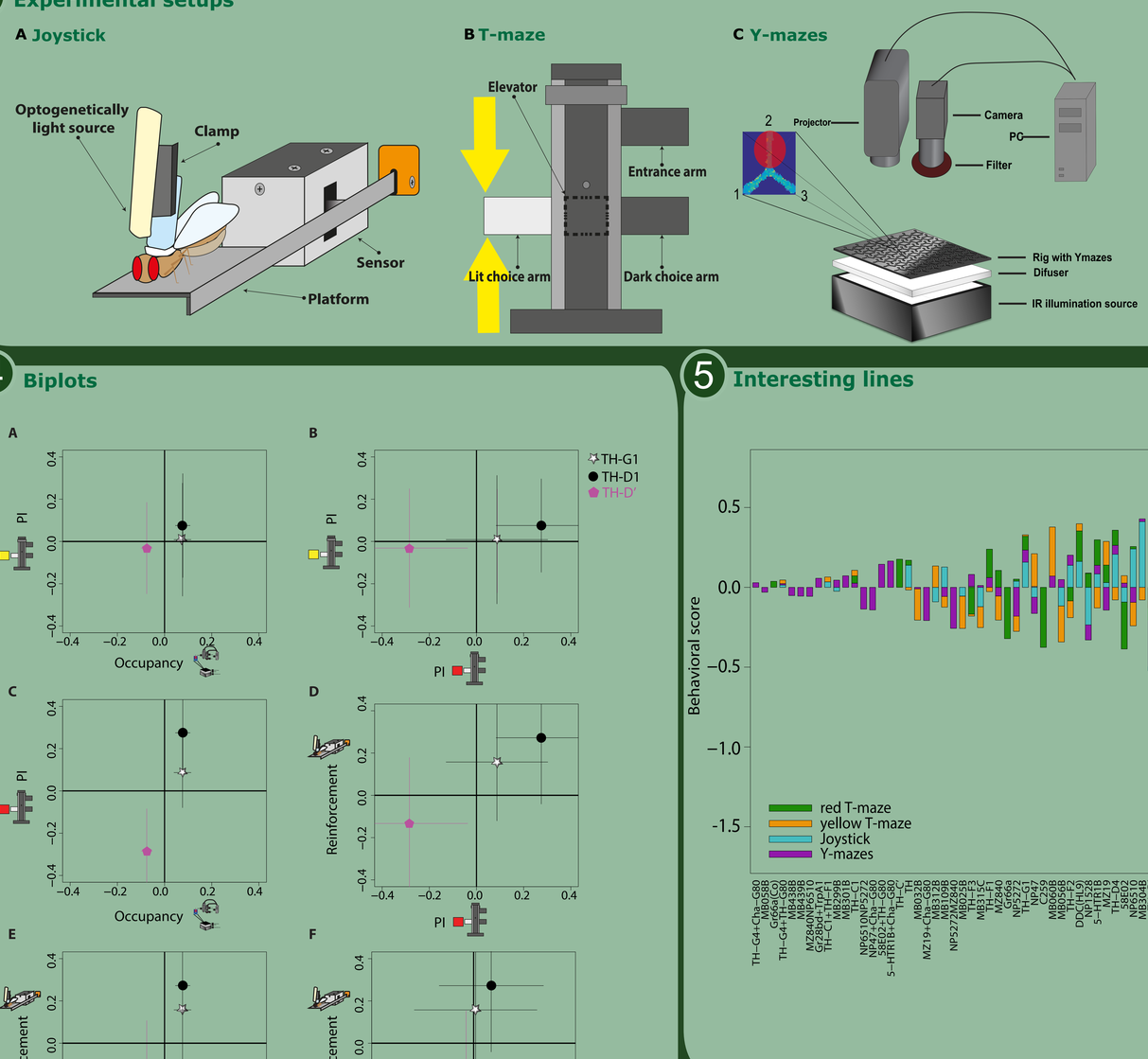
1 Goal

How does activation of dopaminergic neurons affect operant behavior in the fruit fly?



2 Experimental setups



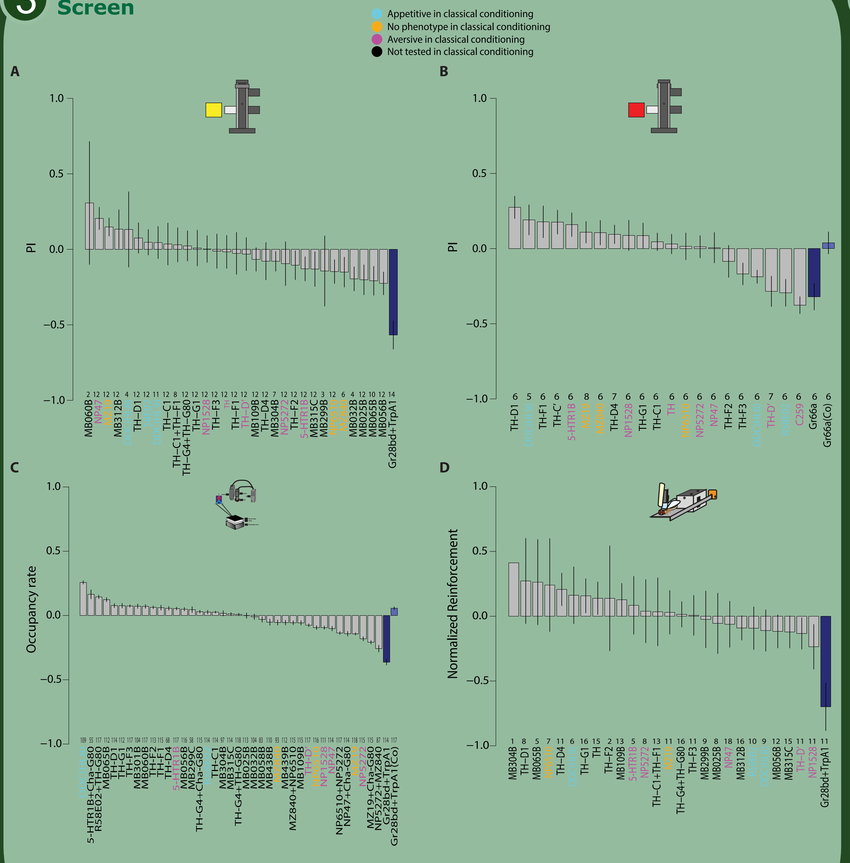
We used optogenetics to screen subpopulations of dopaminergic neurons in three different operant paradigms for their reinforcing properties. The experiments resemble self-stimulating paradigms. To avoiding confounding effects from visual input, we used blind flies (*norpA*$^{-}$). All the flies were fed with all-trans-retinal (ATR) to yield a functional light-gated channel (unless otherwise specified). Thus, in all these paradigms the flies are allowed to activate their subset of dopaminergic neurons by themselves.

A. Joystick. A tethered fly is standing on a flexible platform that the fly can move either to its right or its left side. In a spaced training protocol, we alternate periods without reinforcement with periods where reinforcement can occur (e.g., switching the optogenetically stimulating light on when pushing the platform to the right).

B. T-maze. A group of flies is allowed to choose between a dark arm and an arm where the optogenetically stimulating light is presented. Choice time is 60 s.

C. Y-maze. Individual walking flies continuously explore three arms, one of which is illuminated with the optogenetically stimulating light.

3 Screen



4 Biplots

5 Interesting lines

7 Conclusion

-Dopaminergic neurons have a different function in classical and operant paradigms.

-TH-D' is a candidate for punishment and TH-D1 for positive reinforcement, probably through PPM3