

## ABSTRACT

**THESIS:** Serotonin Autocrine Signaling is Required for the Formation of Functional Serotonergic Circuits in *Drosophila*

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Serotonin (5-hydroxytryptamine, 5-HT) is a monoamine neurotransmitter produced by serotonergic neurons that modulates various behaviors in *Drosophila* such as locomotion and feeding. In addition to this canonical function, it is also an autocrine signaling molecule that shapes the morphology of axons during development by activating serotonin receptors. Whether serotonin autocrine signaling is required for the formation of functional circuits is unknown. To test this, I manipulated serotonin levels during a critical period of development when serotonergic axons are forming and connecting with post-synaptic targets. I then analyzed behavior later in development when serotonin levels returned to normal physiological levels and found locomotion and feeding were disrupted. This suggests that 5-HT levels during development cause structural defects in circuitry which persist throughout development to impact behavior. Next, I asked if this process relies on serotonin receptors by temporally manipulating the expression of serotonin receptor 5-HT1A selectively in serotonergic neurons. I found feeding to be similar regardless of 5-HT levels in 5-HT1A mutants, whereas locomotion

still decreased. Altogether, these data suggest that serotonin autocrine signaling through 5-HT<sub>1A</sub> directs the formation of functional feeding circuits, whereas locomotion circuits utilize an alternative autocrine signaling mechanism.