

What role does octopamine play in behavioral control in Drosophila?

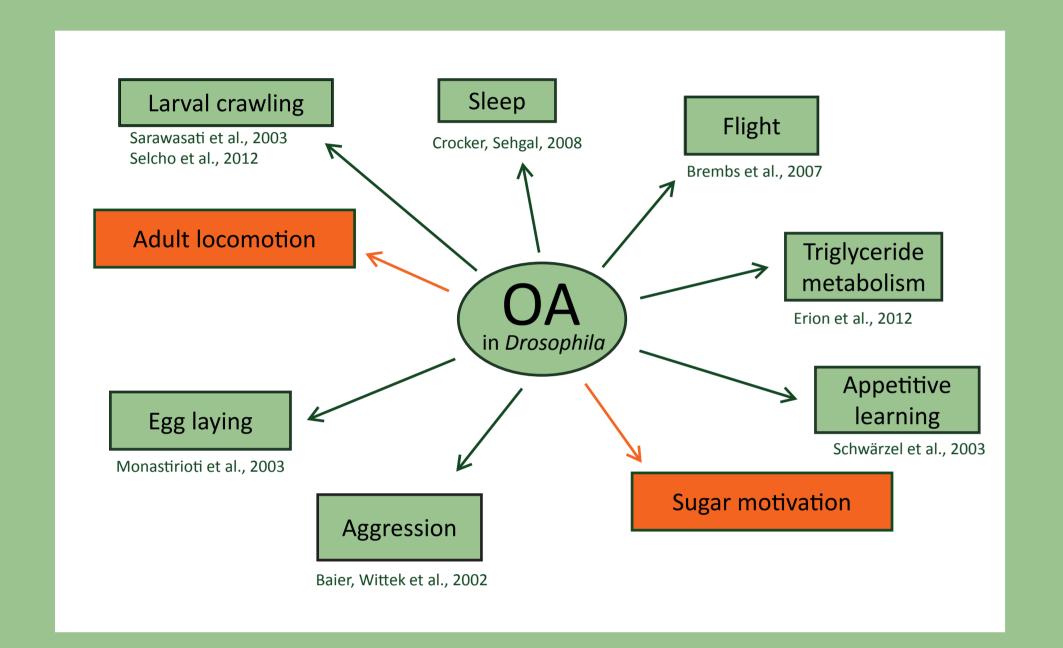
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Introduction

Octopamine acts as a neurohormone, a neuromodulator and a neurotransmitter, contributing to the control of the animal physiology and behavior.



What cellular processes are at play in coordinate those different behaviors?

enzyme tyramine-beta-hydroxylase (tBh) have no octopamine (OA) and a 10-fold increased tyramine (TA) level.

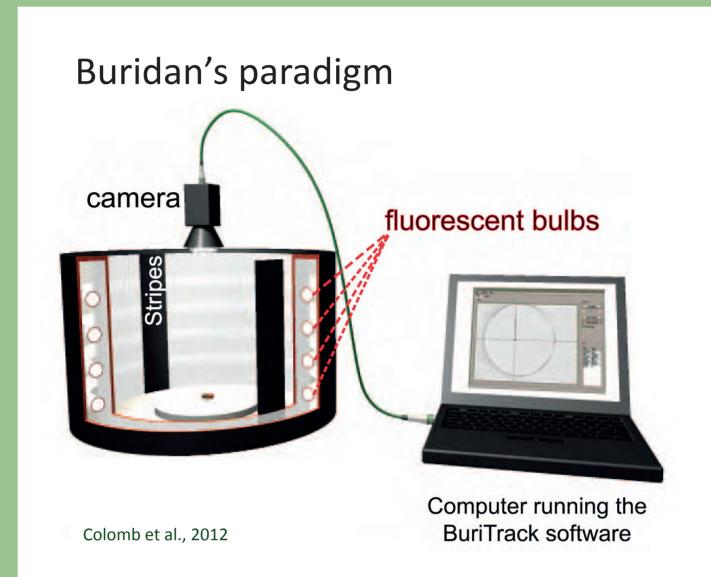
Octopamine synthesis Wild type: $TYR \xrightarrow{TDC} TA \xrightarrow{TBH} OA$ Mutant: TYR TDC TA TISH OA

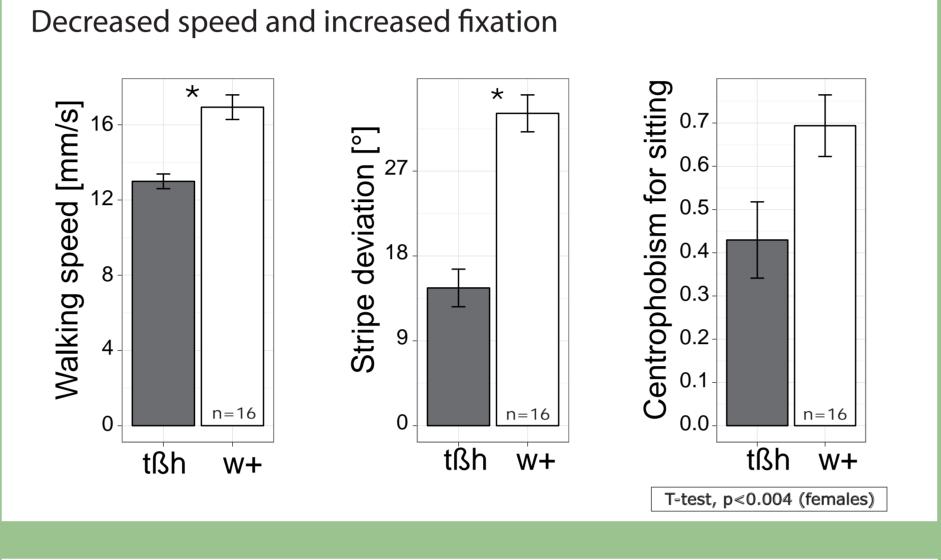
We investigate walking behavior in Buridan's paradigm and study the proboscis extension response (PER) as a locomotion-independent test for sucrose responsiveness after starvation. different hypothesize that subpopulations octopaminergic neurons are involved in the two different

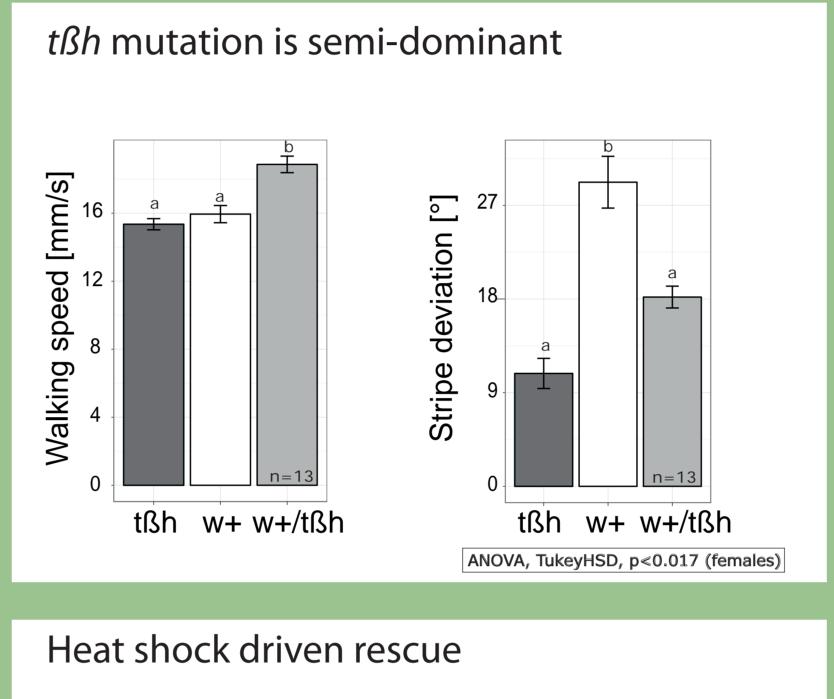
behaviors.

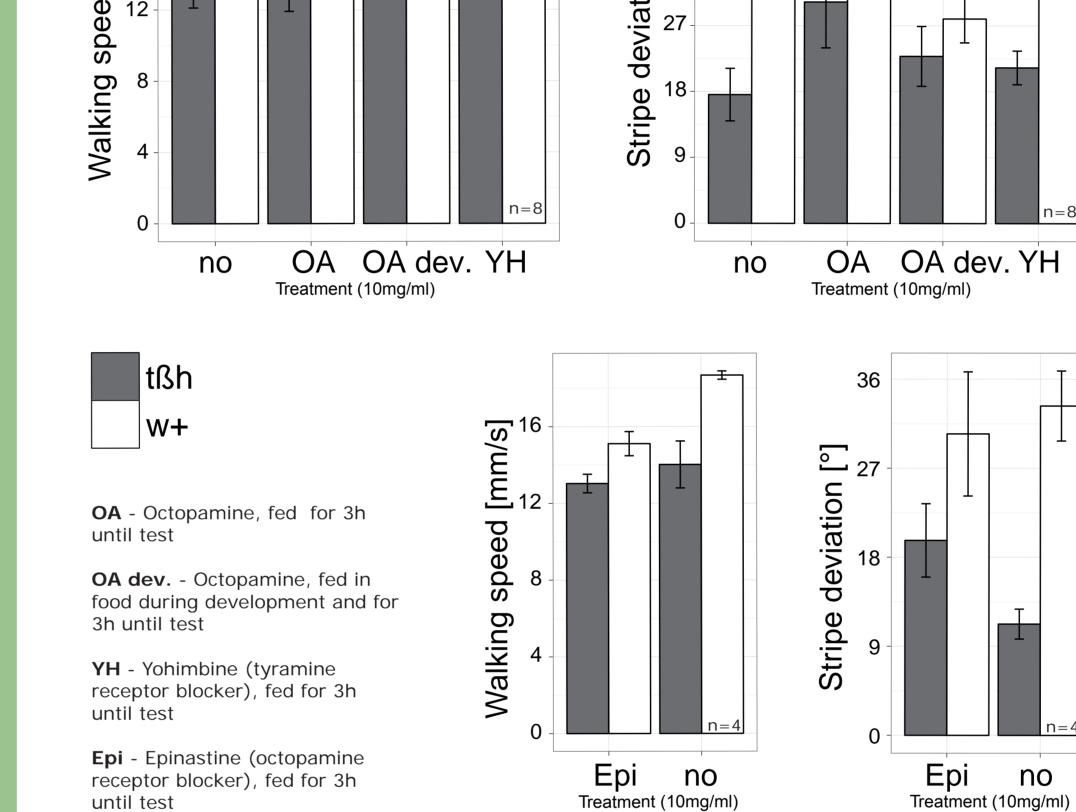
Locomotion behavior is different in the mutants

tßh mutants:

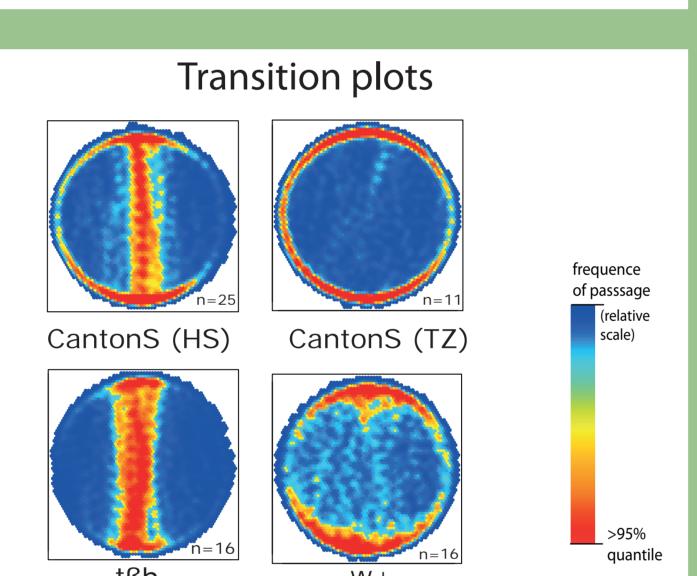


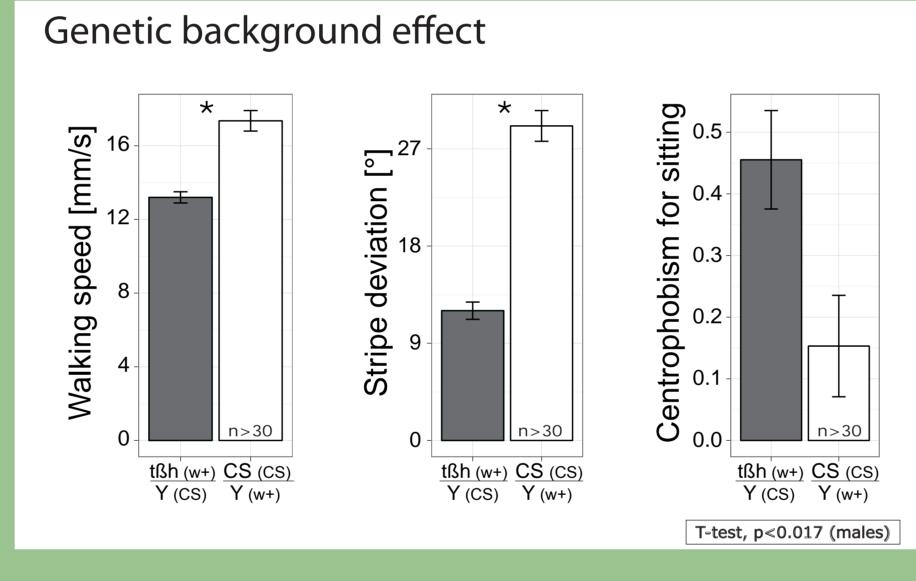


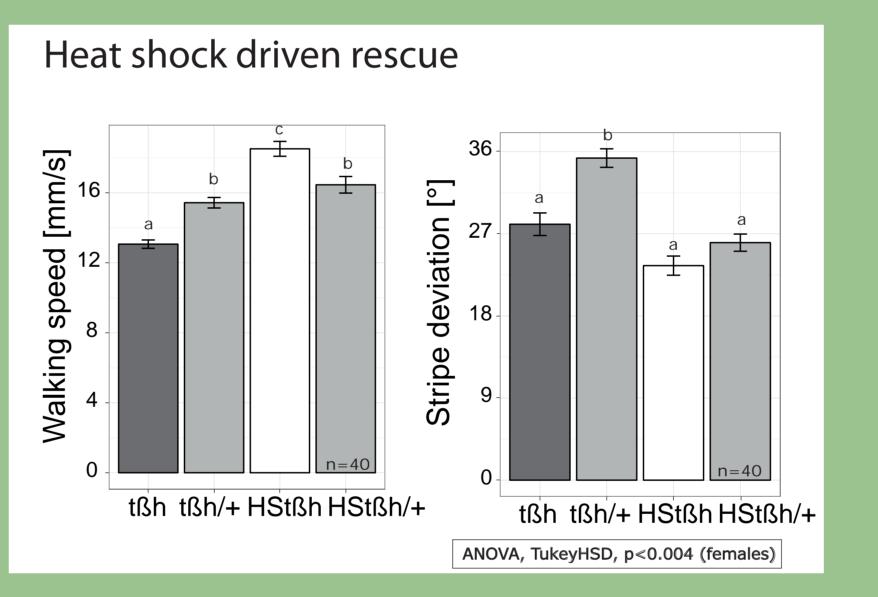


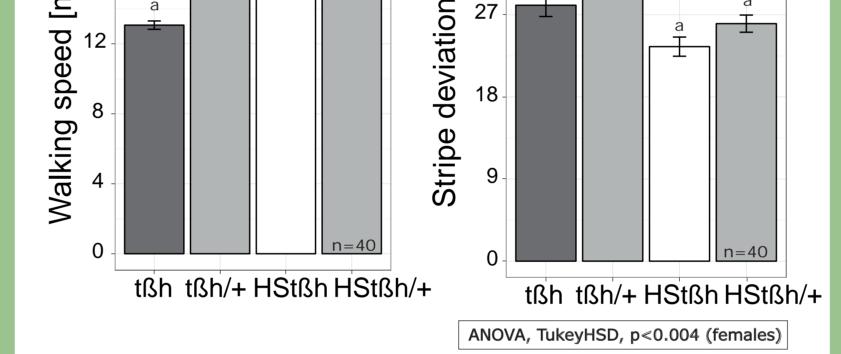


Pharmacological approach









tBh mutants have a deficit in locomotion and fixation behavior.

Walking speed may be controlled by a balance between both, tyramine and octopamine since the mutant phenotype can be rescued by giving a tyramine blocker (yohimbine), and induced by an octopamine receptor blocker (epinastine).

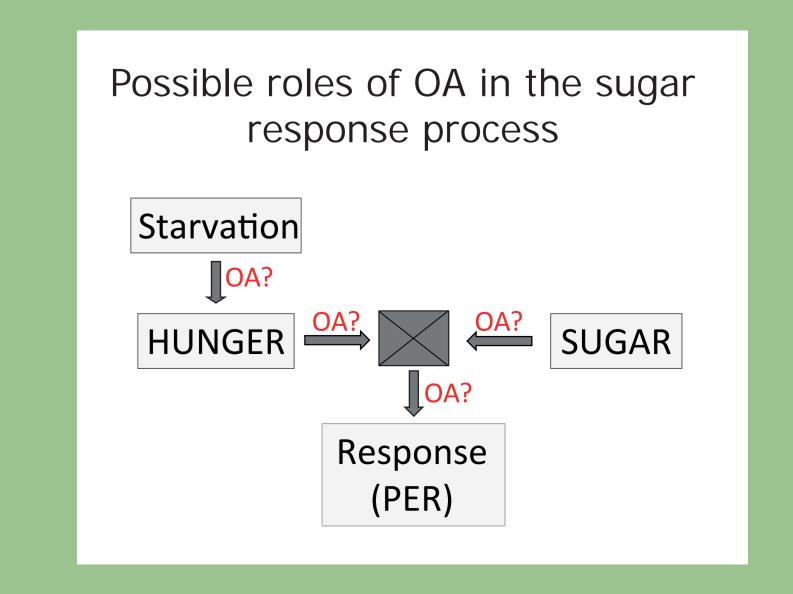
Fixation behavior seems to be controlled dosage-dependently by octopamine.

tBh mutants show lower starvationdependent sucrose responsiveness and prolonged survival while starved to Both phenotypes may be explained by an action of the amines on the metabolic rate.

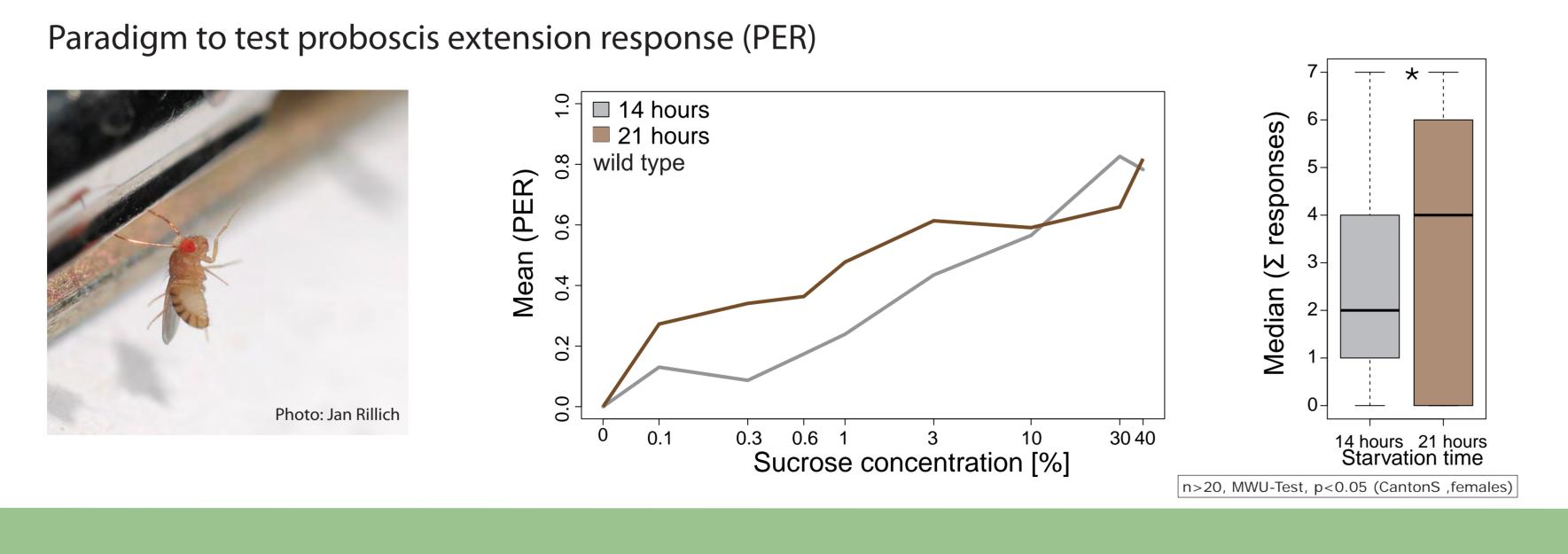
Interestingly, the *tBh* loss of function mutation shows dominant effects for motivation, while semi-dominant effect on locomotion control.

Outlook

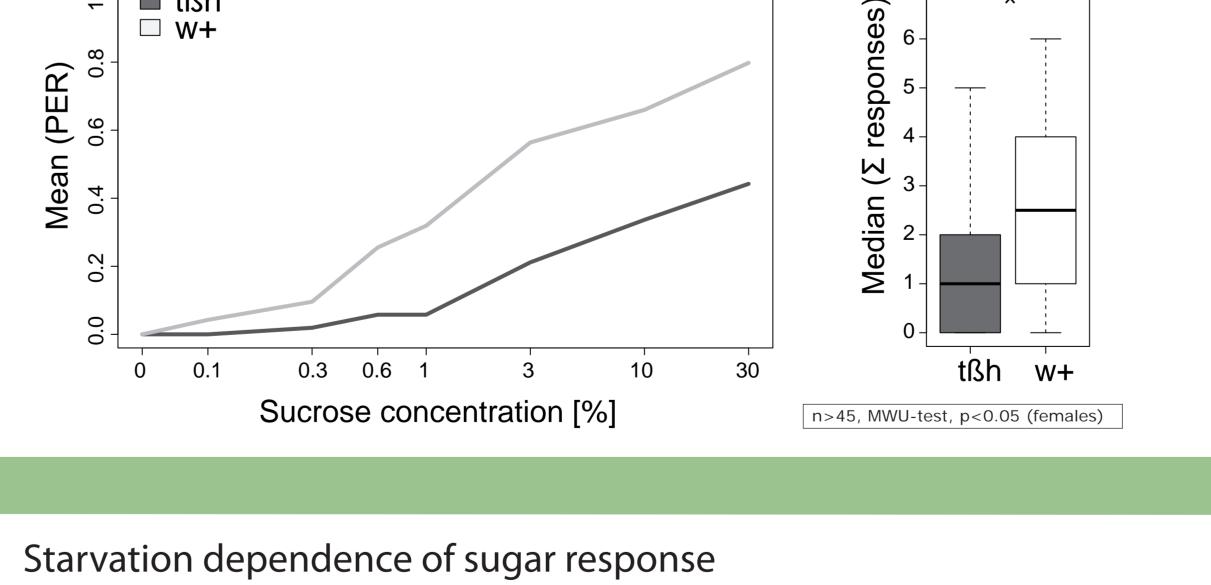
- Trehalose measurement to calibrate starvation effect
- 2. Neuron-specific rescue of the mutation (cell cluster)
- 3. Activation and silencing of aminergic neurons
- 4. Test octopamine and tyramine receptor mutants



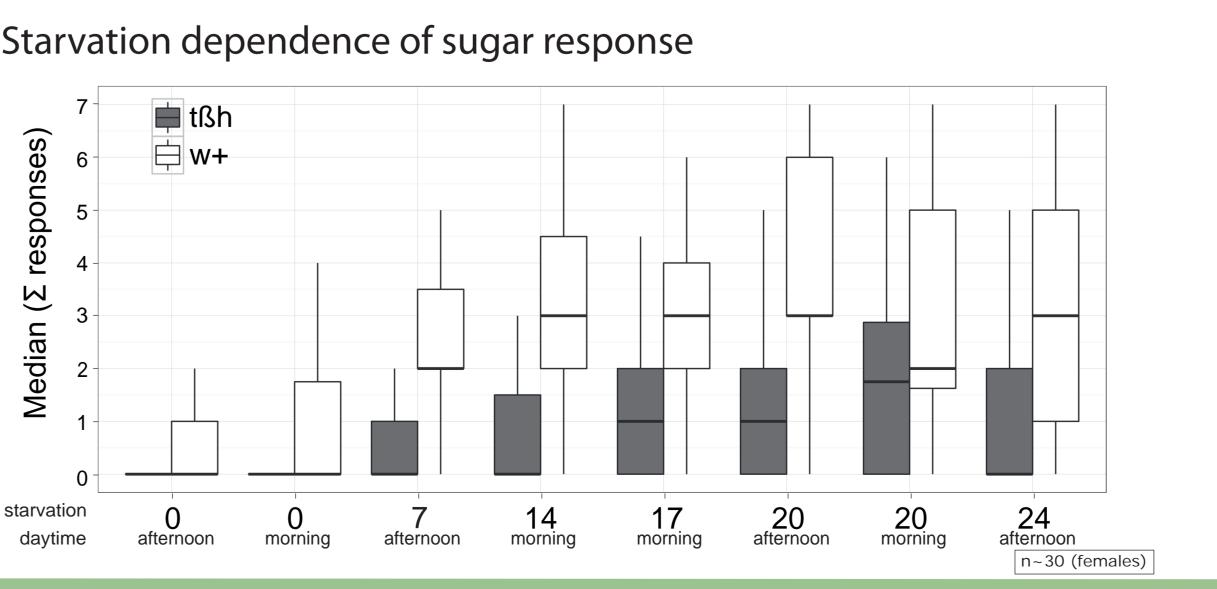
Sugar motivation is lower in the mutants

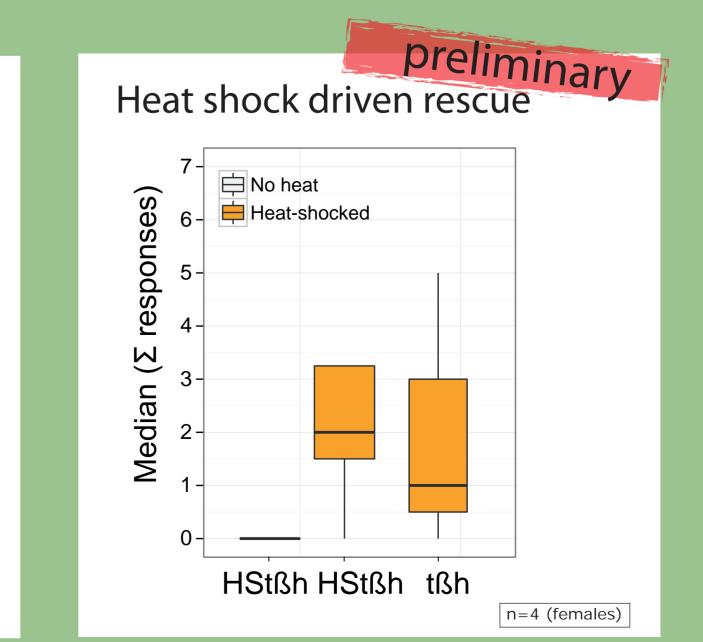






tßh mutants are less responsive to sugar after 20h starvation





o tigh w+ tigh/w+

n~25, Kruskal-Wallis, p<0.05 (females)

tßh mutation is dominant