



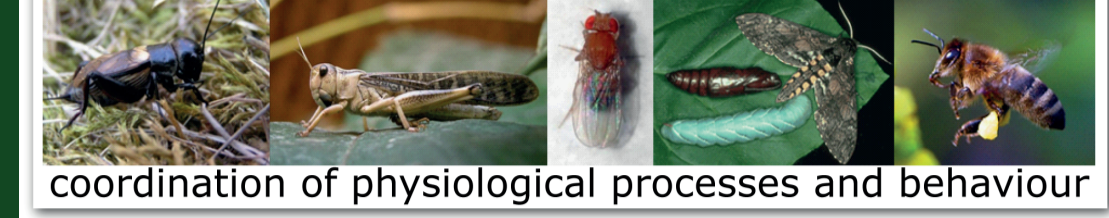
Role of octopamine in walking behavior and sucrose responsiveness

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Biogenic amines in insects



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 order to coordinate those different behaviors?

Octopamine synthesis

Wild type:

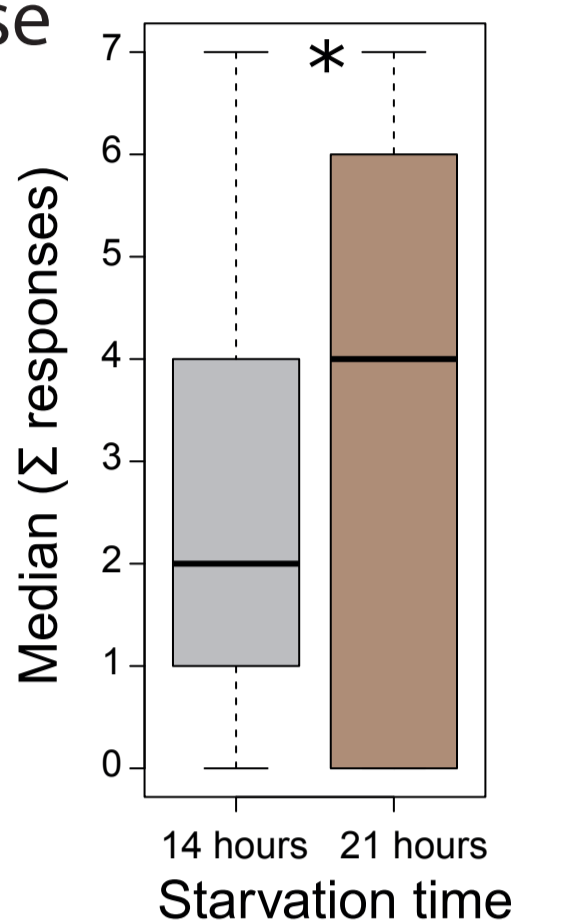
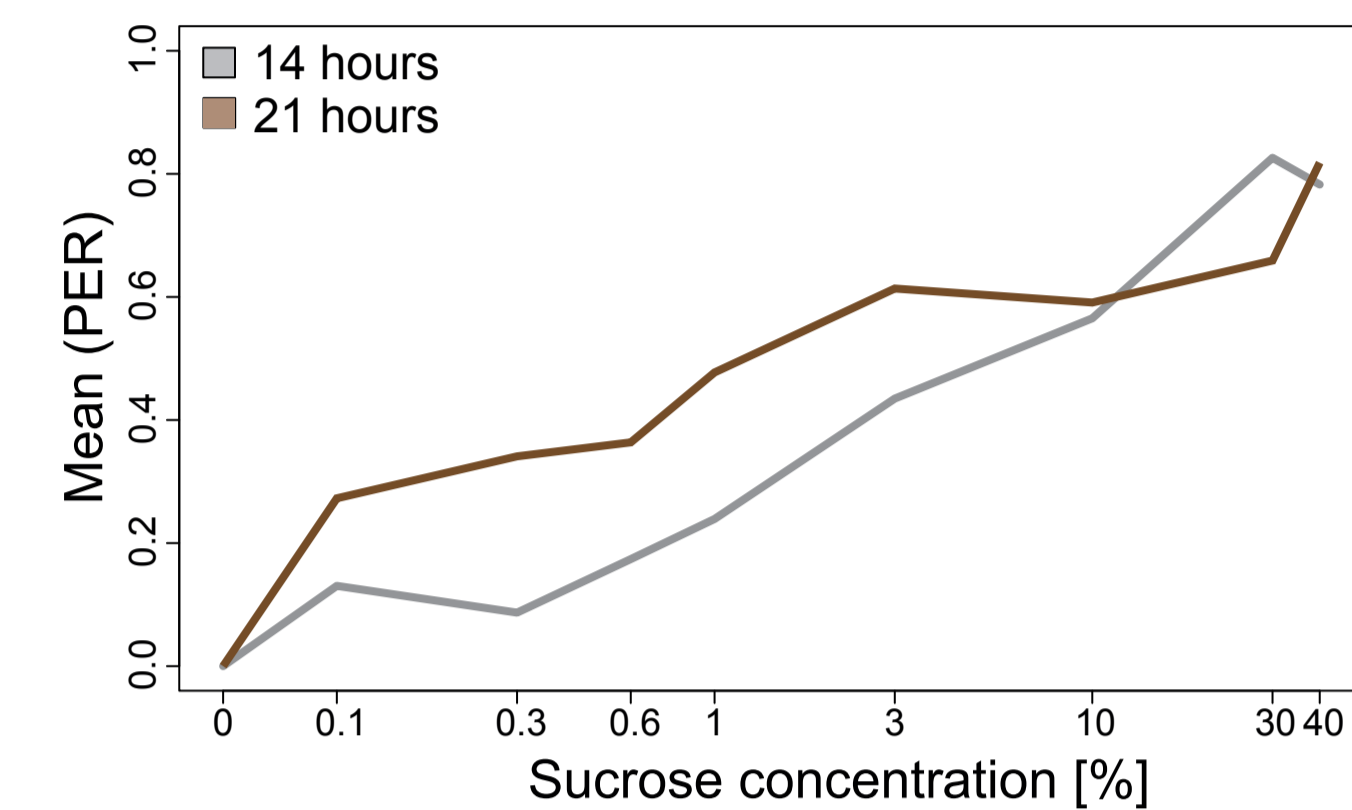


Mutant:



Sugar motivation is lower in *tβh* mutants

Locomotion independent and starvation level sensitive assay to test sugar response



n>20, CantonS, females, MWU-Test, p<0.05

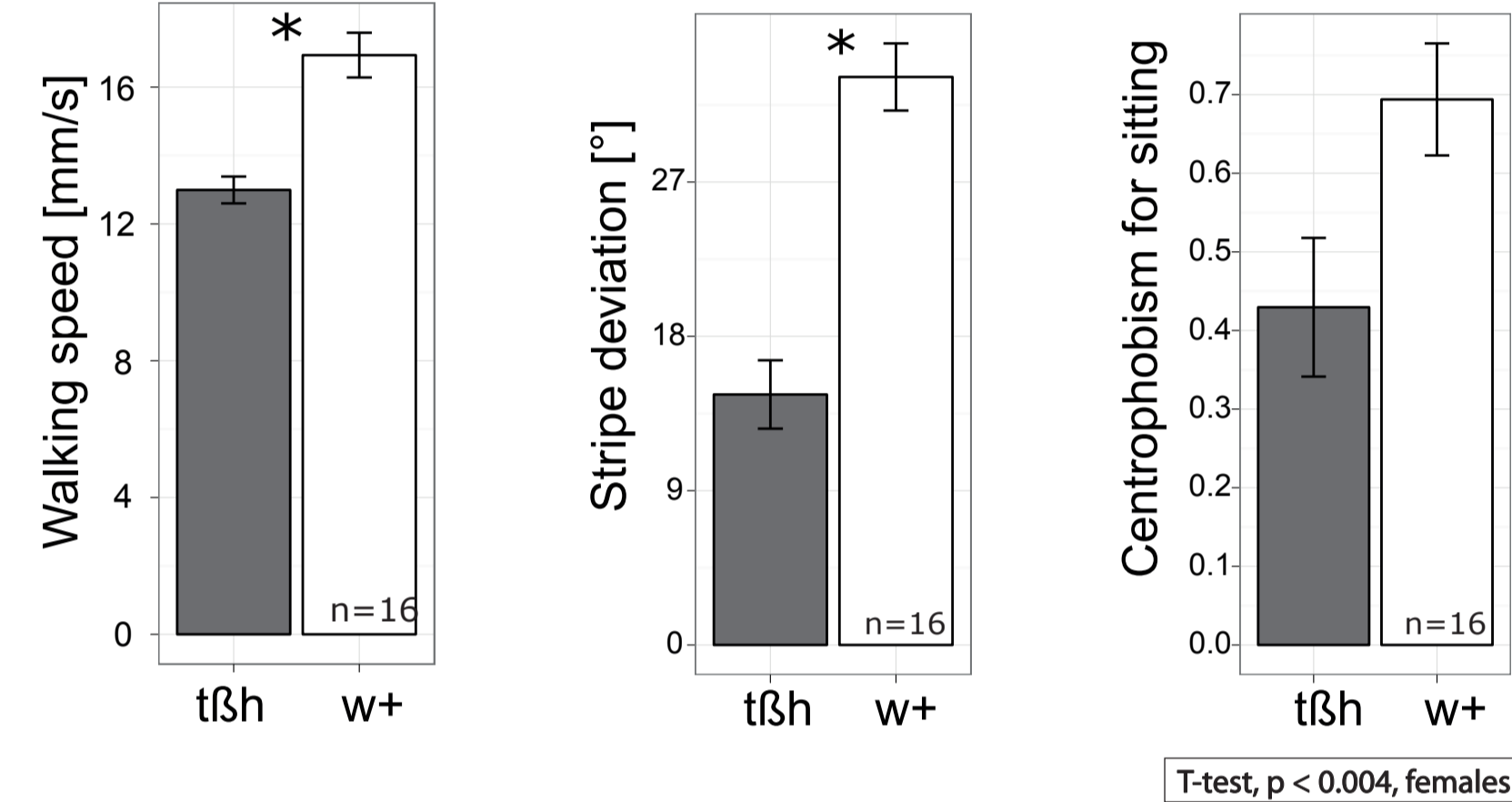
Locomotion behavior is different in *tβh* mutants

Buridan's paradigm



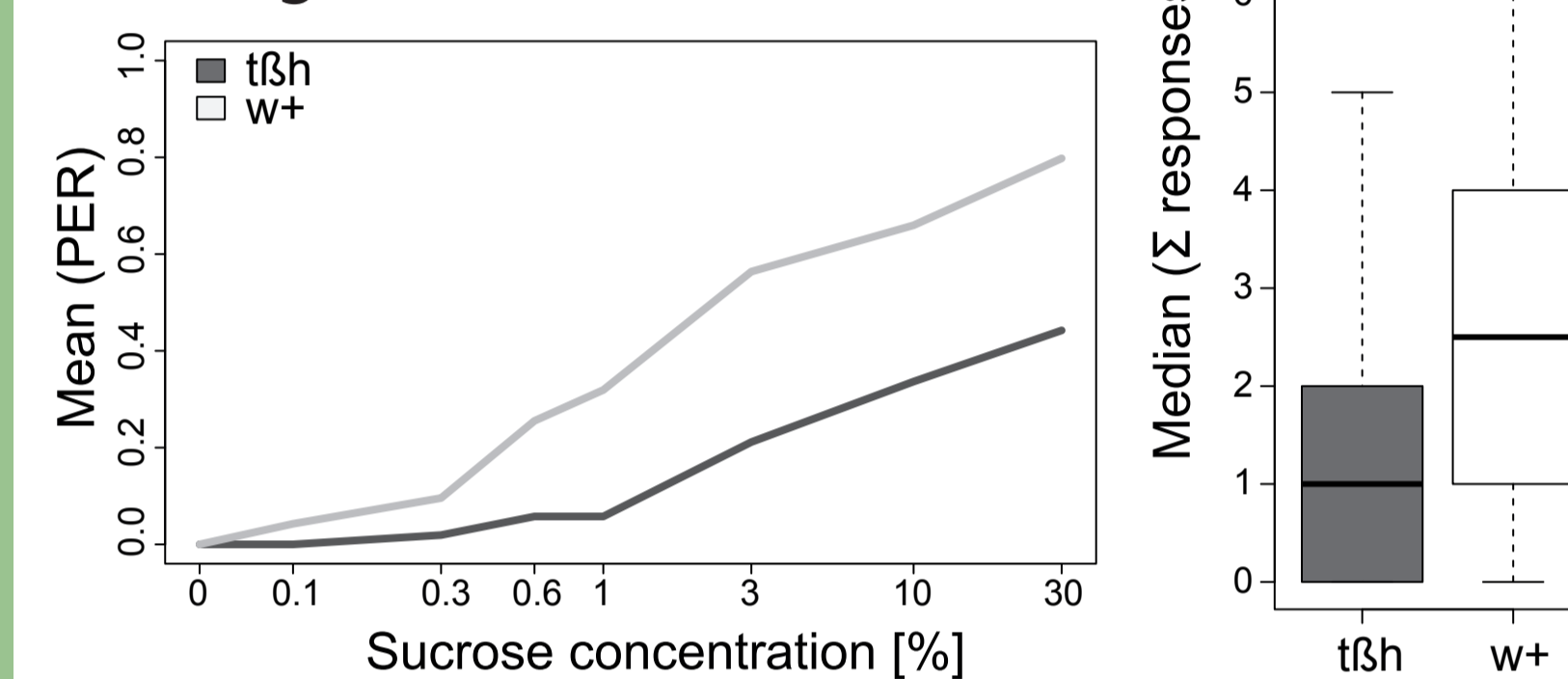
tβh mutants:

Decreased speed and increased fixation



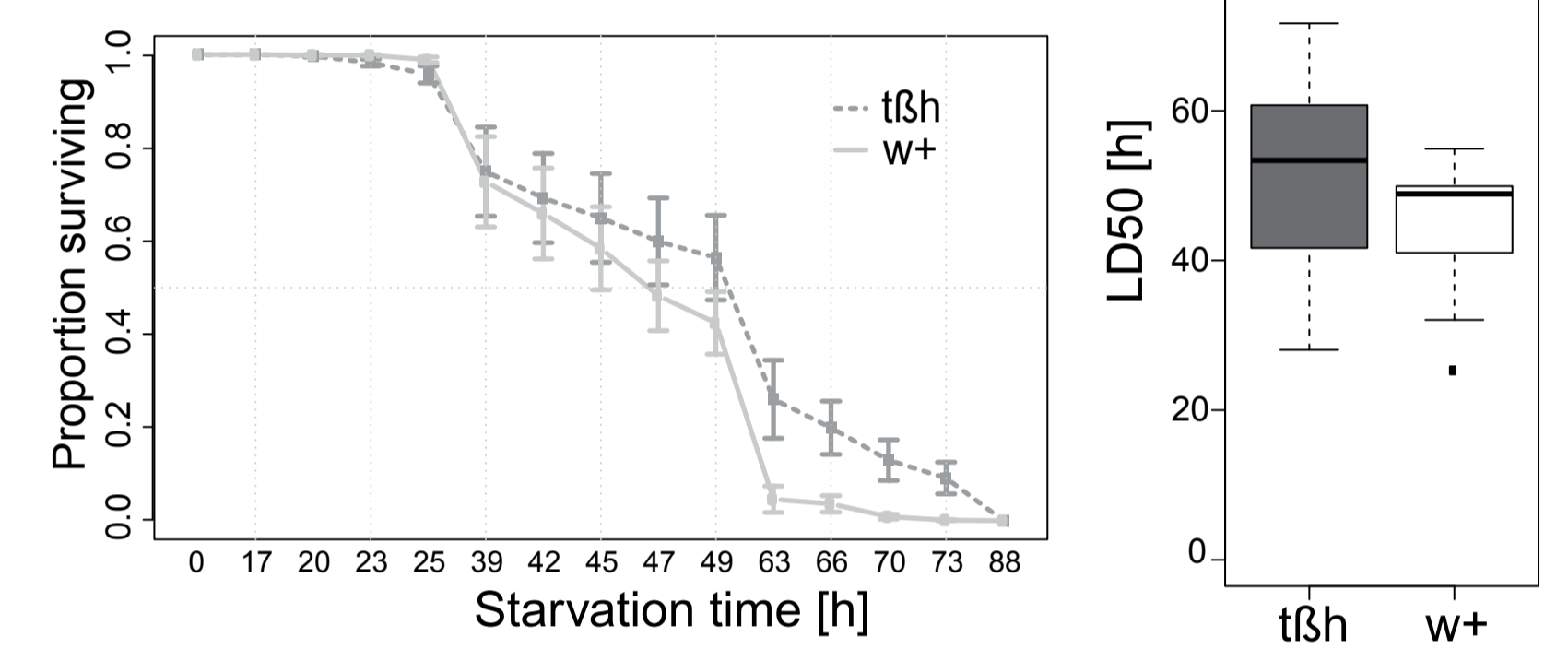
T-test, p < 0.004, females

tβh mutants are less responsive to sugar after 20h starvation



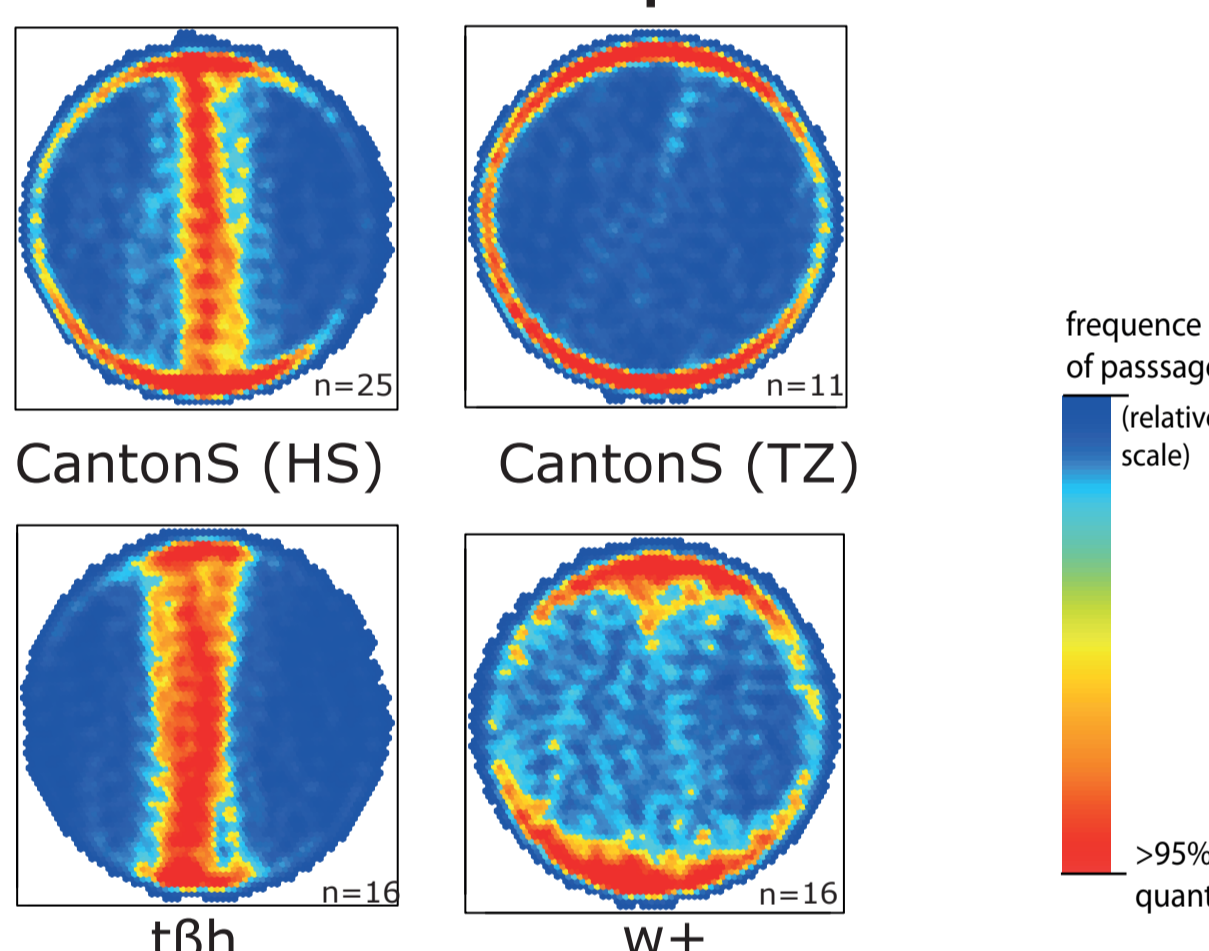
n>45, females, MWU-Test, p<0.05

tβh mutants survive longer when starved to death

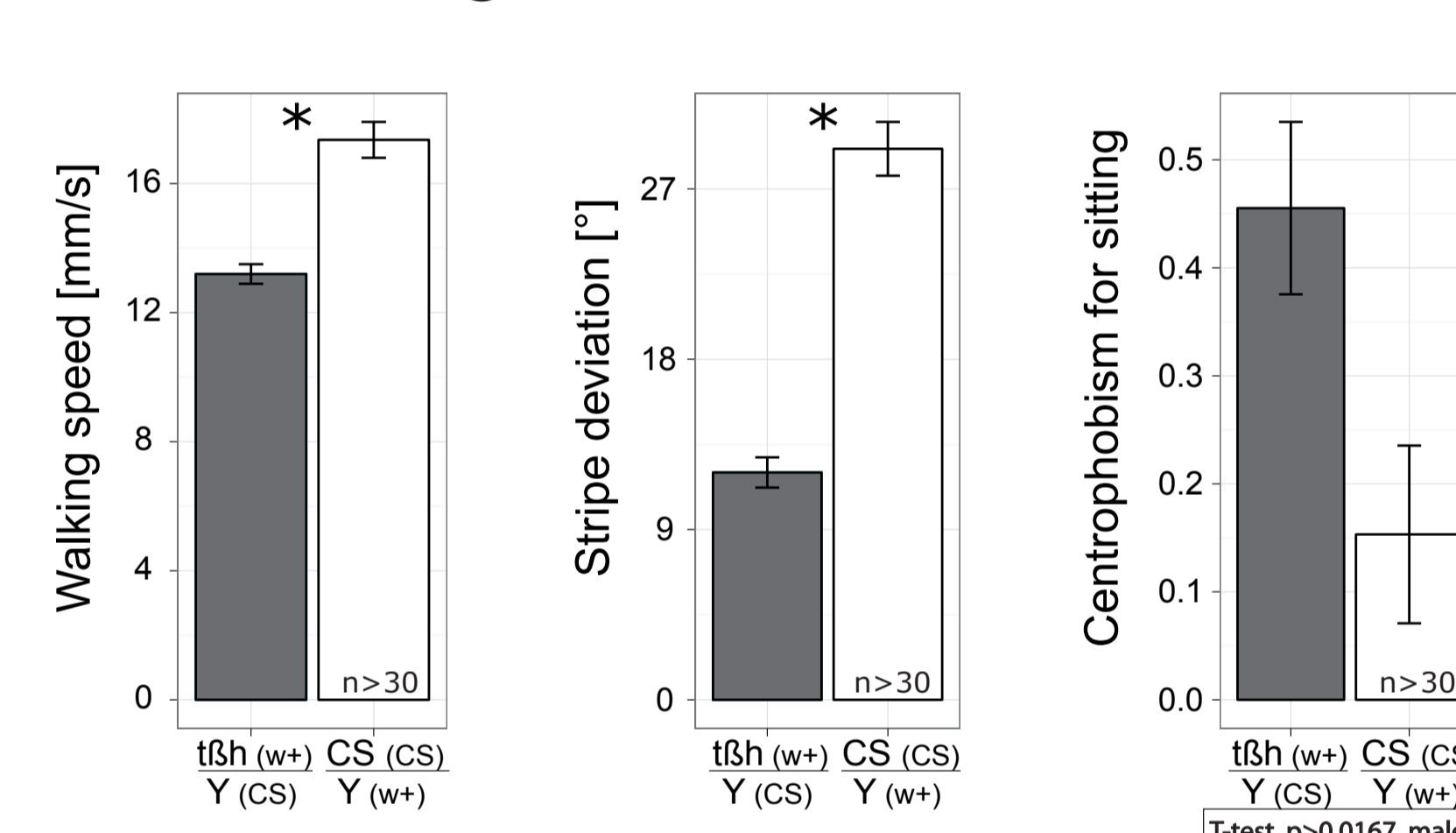


n=16, females, MWU-Test, p<0.05

Transition plots

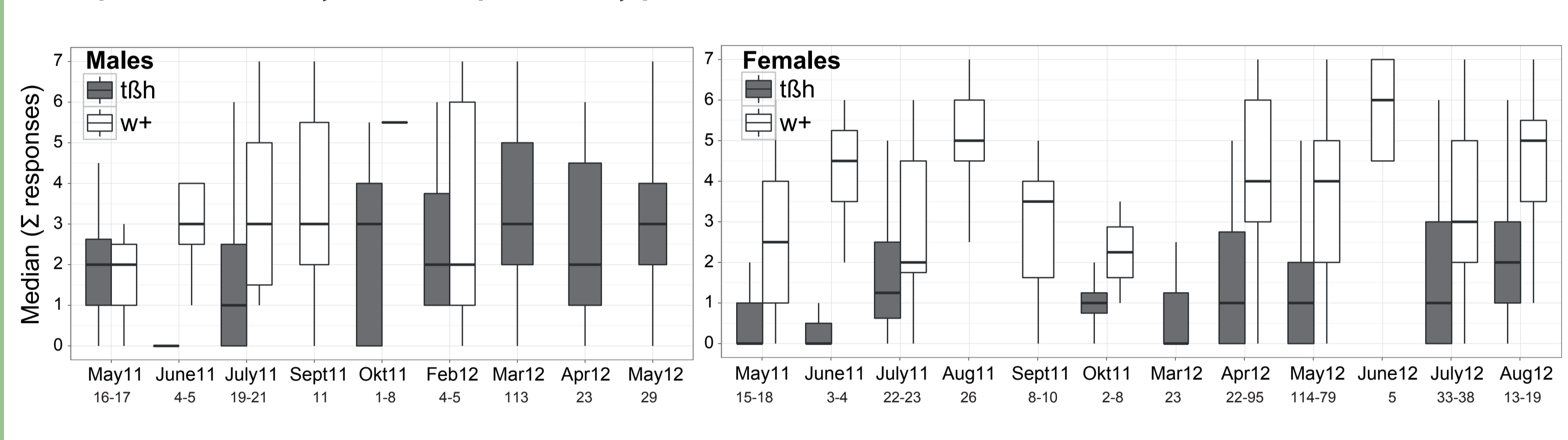


Genetic background effect

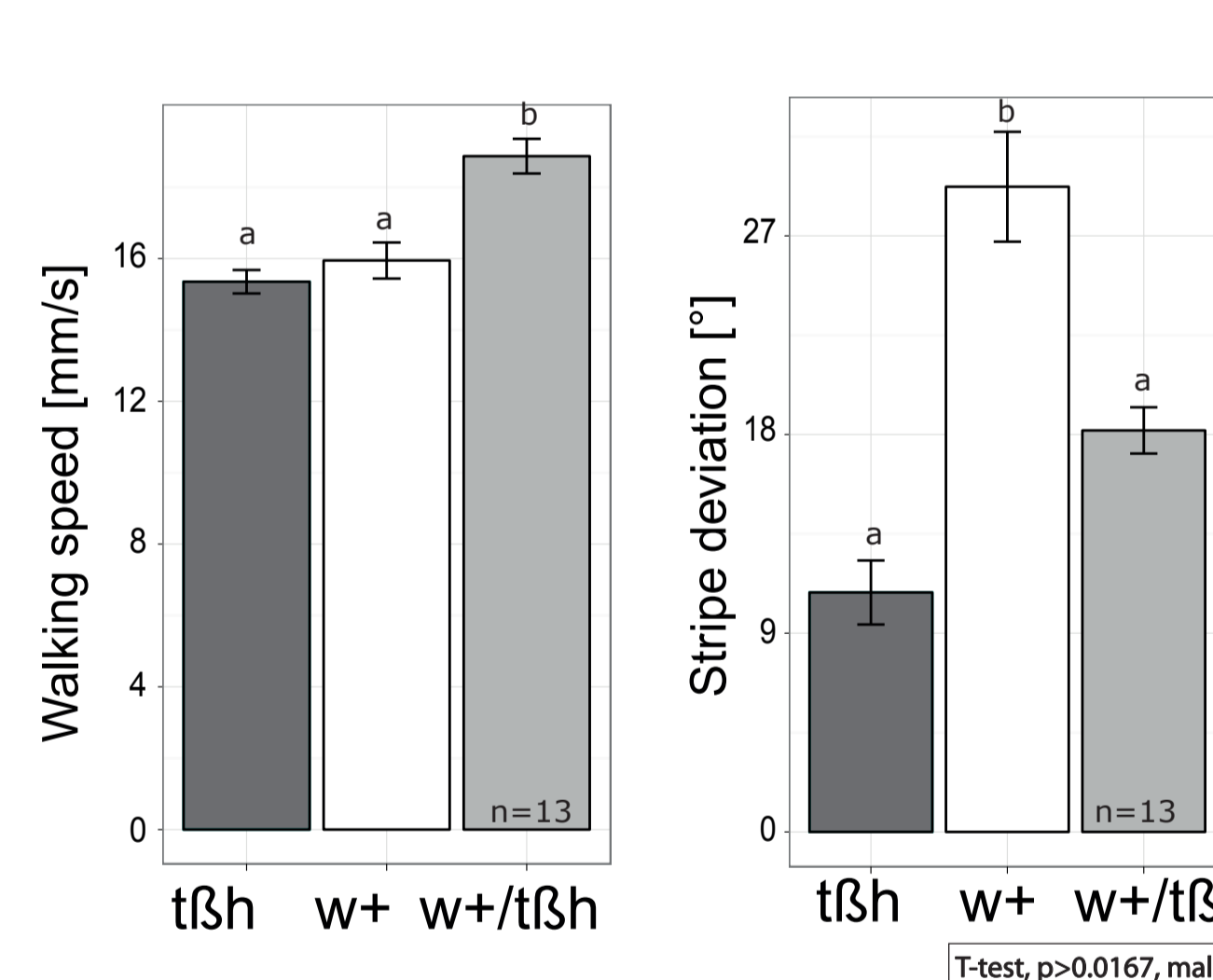


T-test, p<0.0167, males

Reproducibility of the phenotype

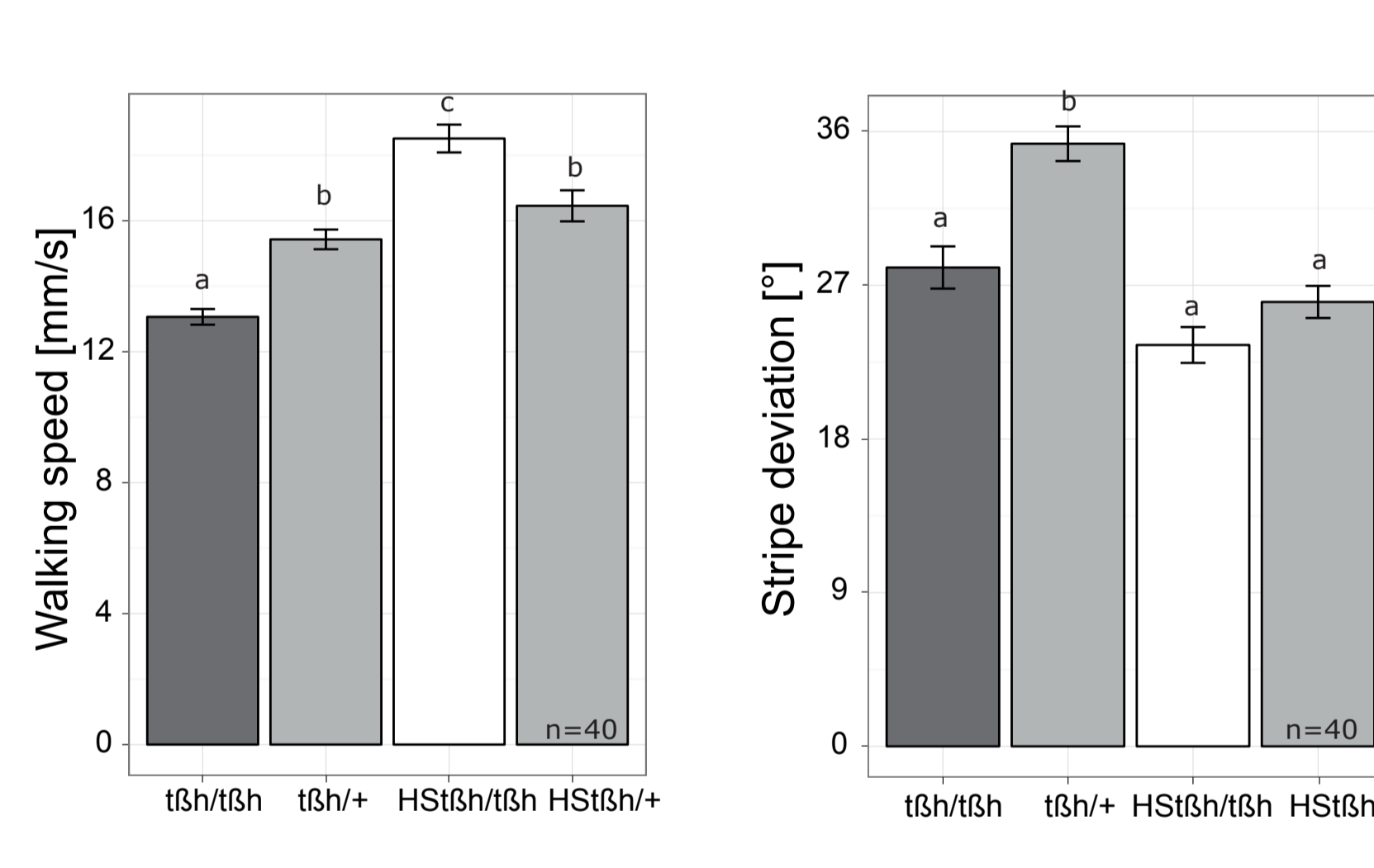


tβh mutation is semi-dominant



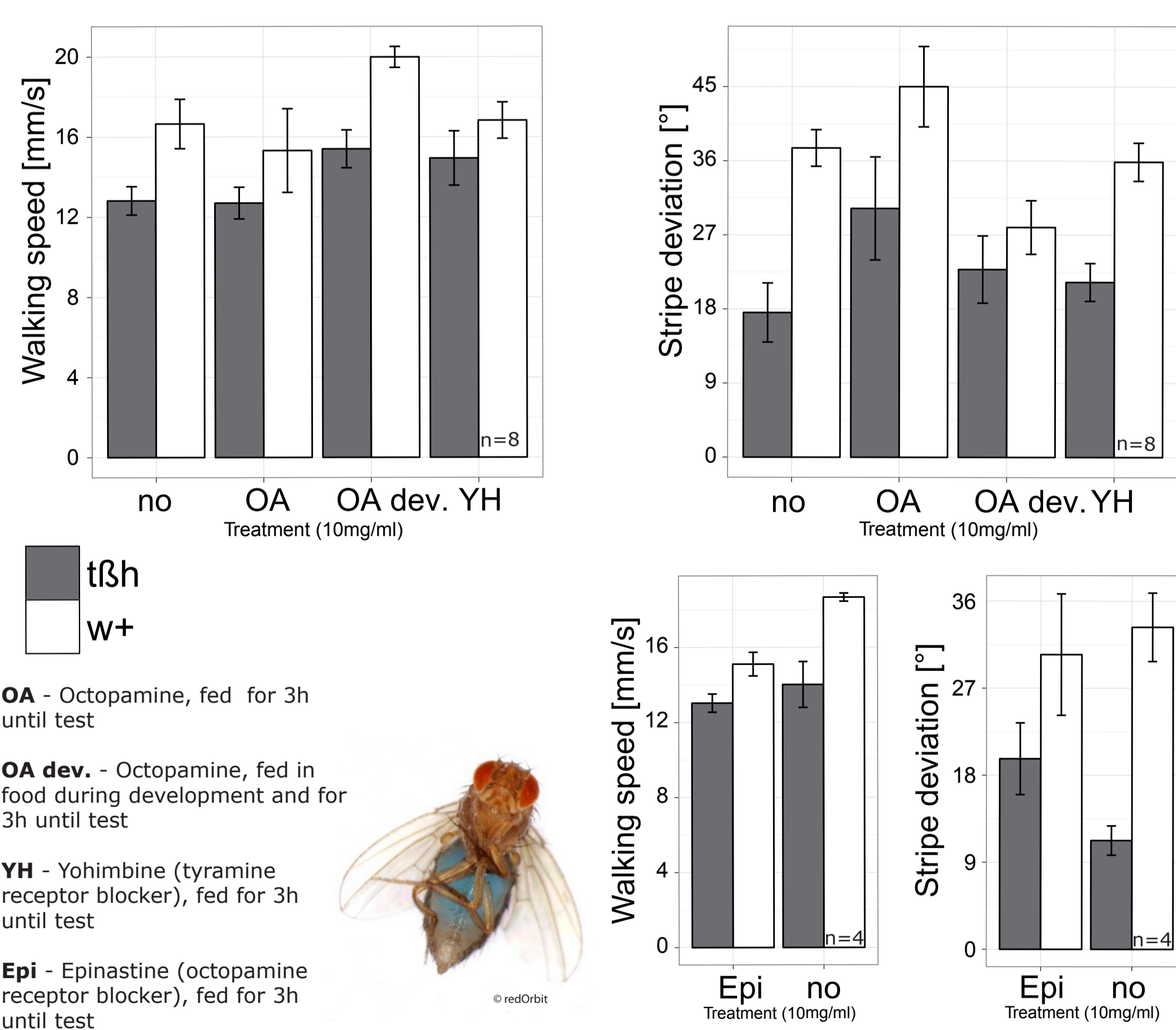
T-test, p<0.0167, males

HS driven rescue



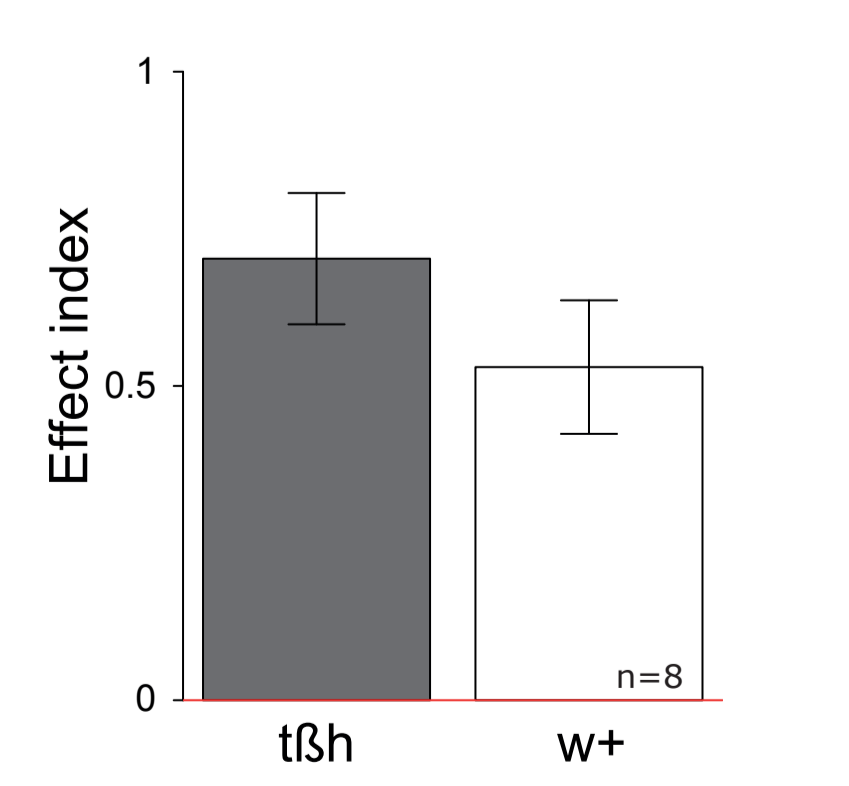
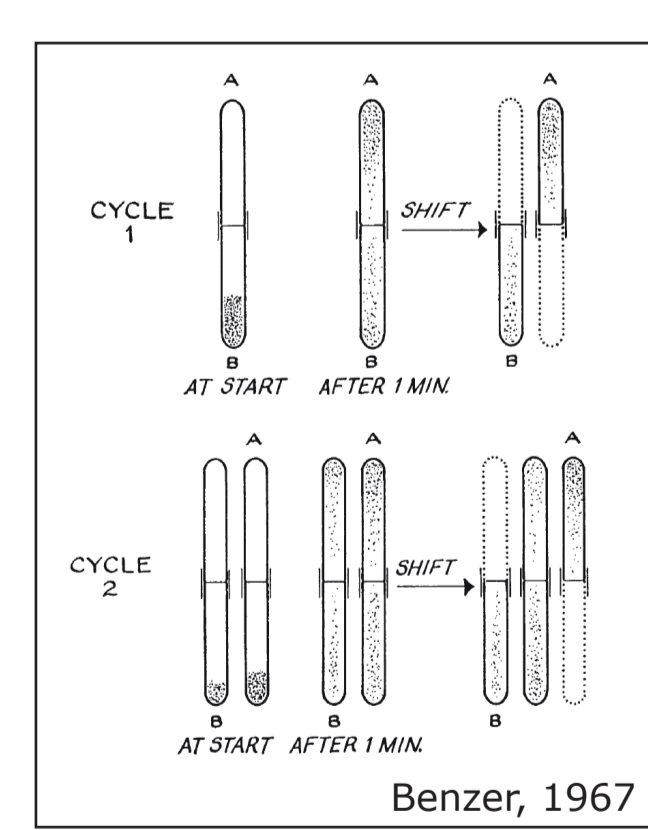
preliminary

Pharmacological Rescue



OA - Octopamine, fed for 3h until test
OA dev. - Octopamine, fed in food during development and for 3h until test
YH - Yohimbine (tyramine receptor blocker), fed for 3h until test
Epi - Epinastine (octopamine receptor blocker), fed for 3h until test

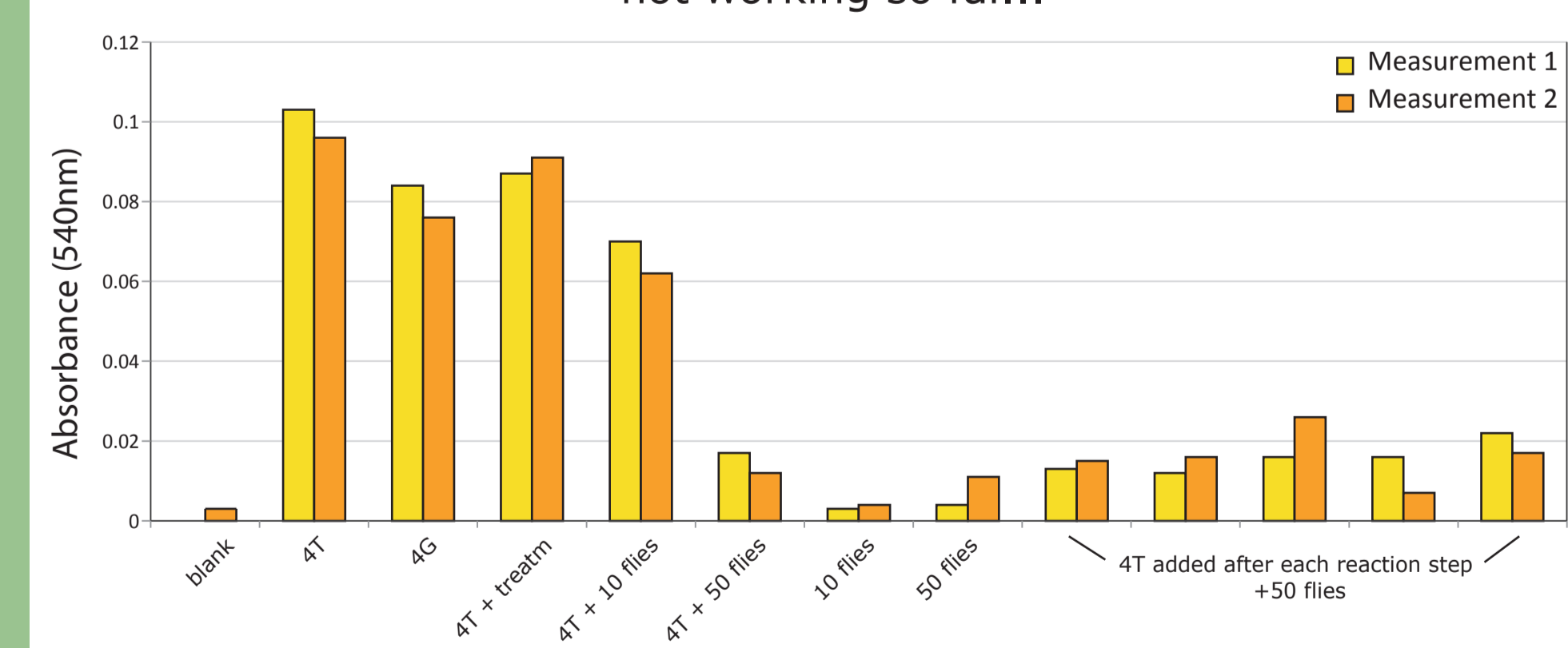
Wing clipping effect on phototaxis



Conclusions:

tβh mutants show lower starvation dependent sucrose response. Therefore we think that OA and/or TA is necessary for sugar motivation.
tβh mutants show prolonged survival. That could mean that OA and/or TA are involved in metabolic processes.

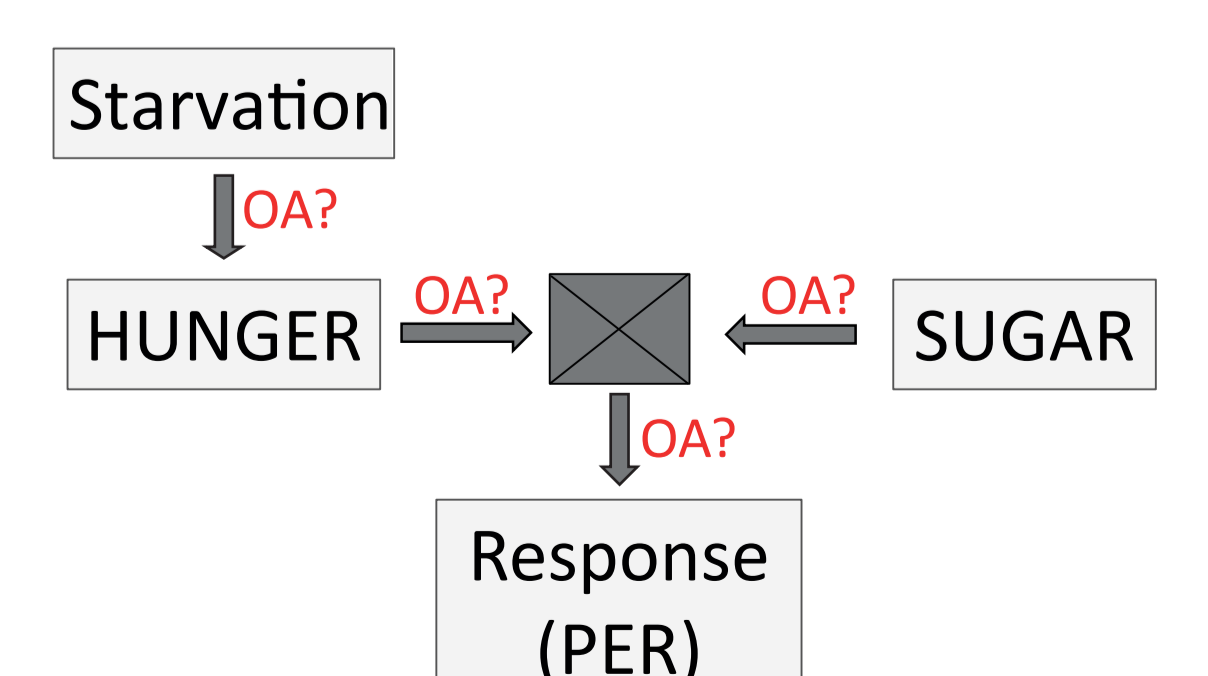
Measurement of trehalose content in flies not working so far...



Outlook

1. Trehalose measurement in hemolymph to define OA's potential role in metabolism
2. TDC2-Gal4 driven rescue of *tβh* mutation
3. Refining Gal4 rescue in only subsets of these tyramineric neurons
4. Test OA-receptor mutants

Possible roles of OA in the sugar response process



Conclusions:

tβh mutants have a deficit in locomotion and fixation behavior. Their walking speed is reduced whereas their stripe fixation is increased. Walking speed seems to be rescued by yohimbine in mutants and reduced in wild type fed epinastine. That would mean that walking speed may be controlled by both, TA and OA. Fixation behavior seems to be controlled dosage dependently by OA.