Male *Drosophila melanogaster* experience larger increases in sucrose sensitivity than females when starved

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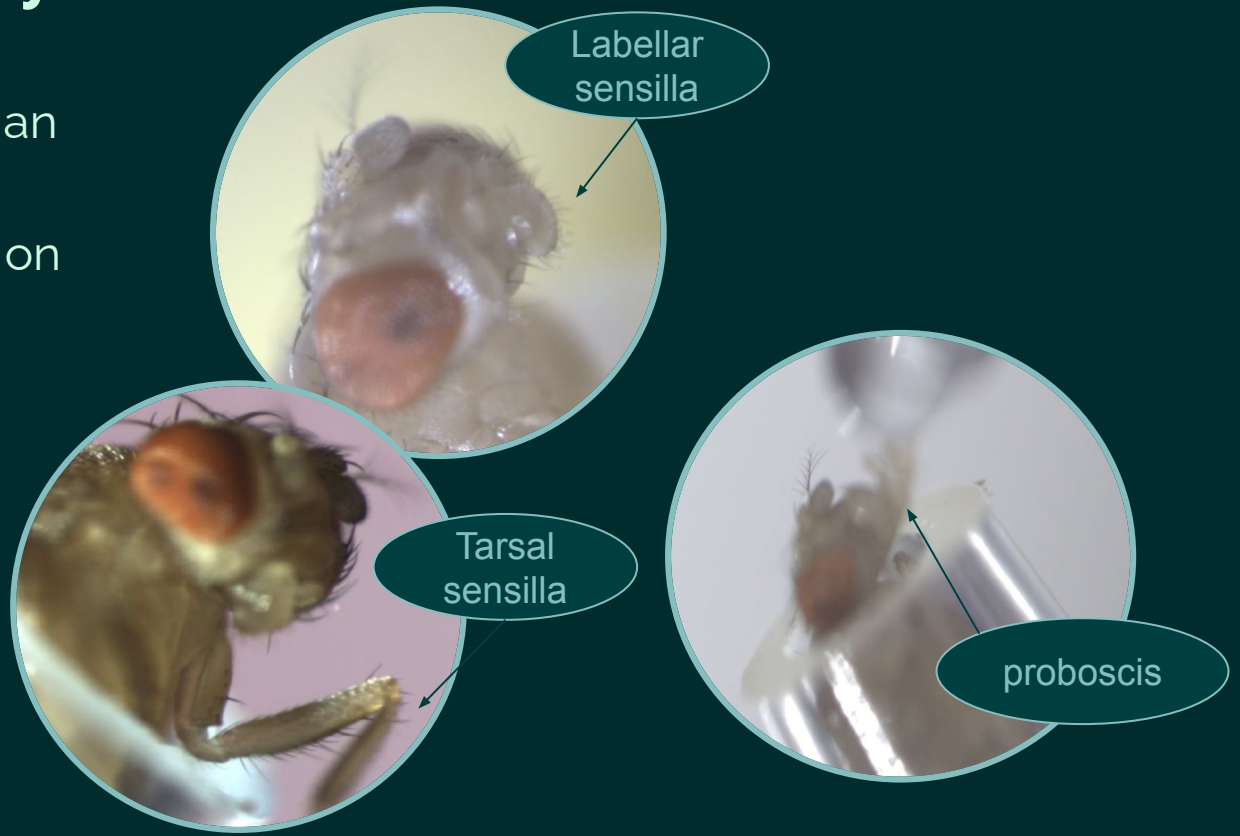
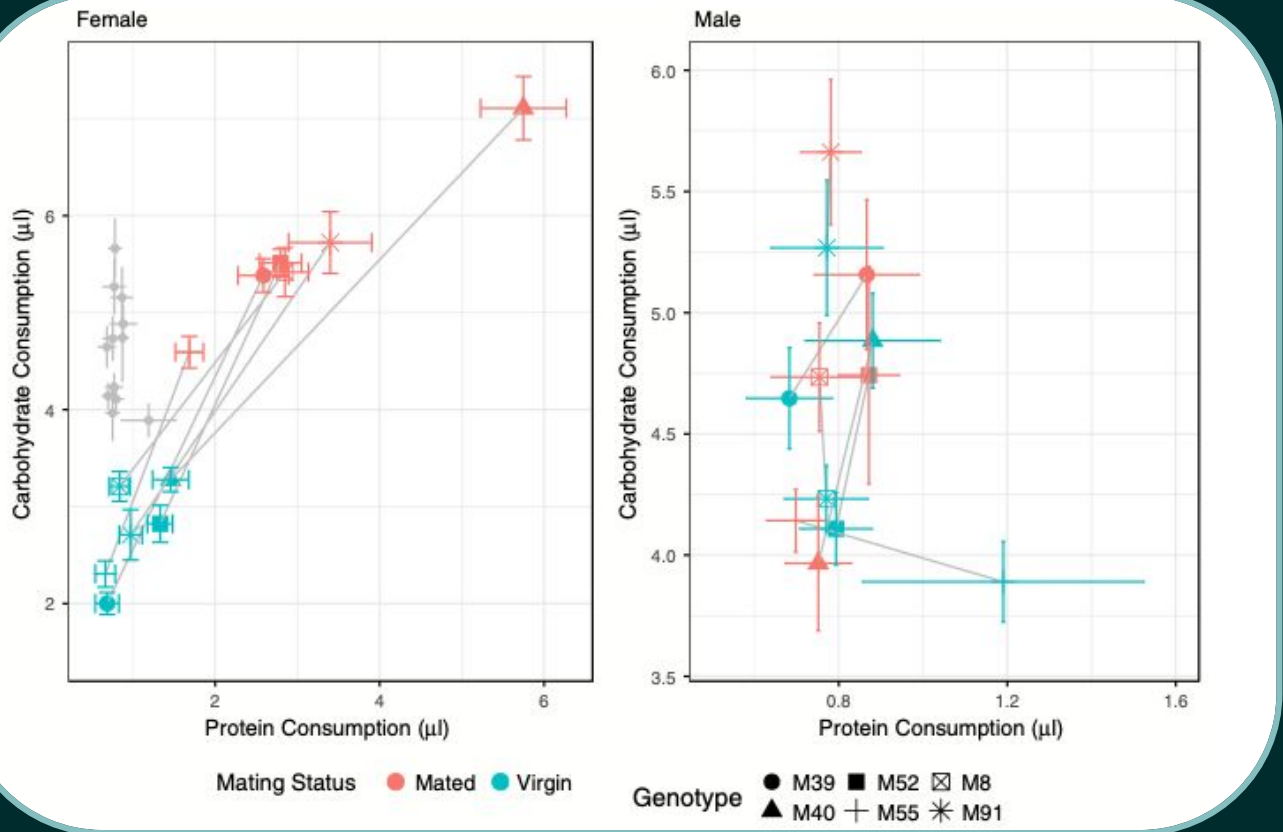
Drosophila anatomy

- Proboscis: feeding organ
- Labellum: taste organ on end of proboscis
- Tarsi: legs
- Sensilla: sensory organs



Background

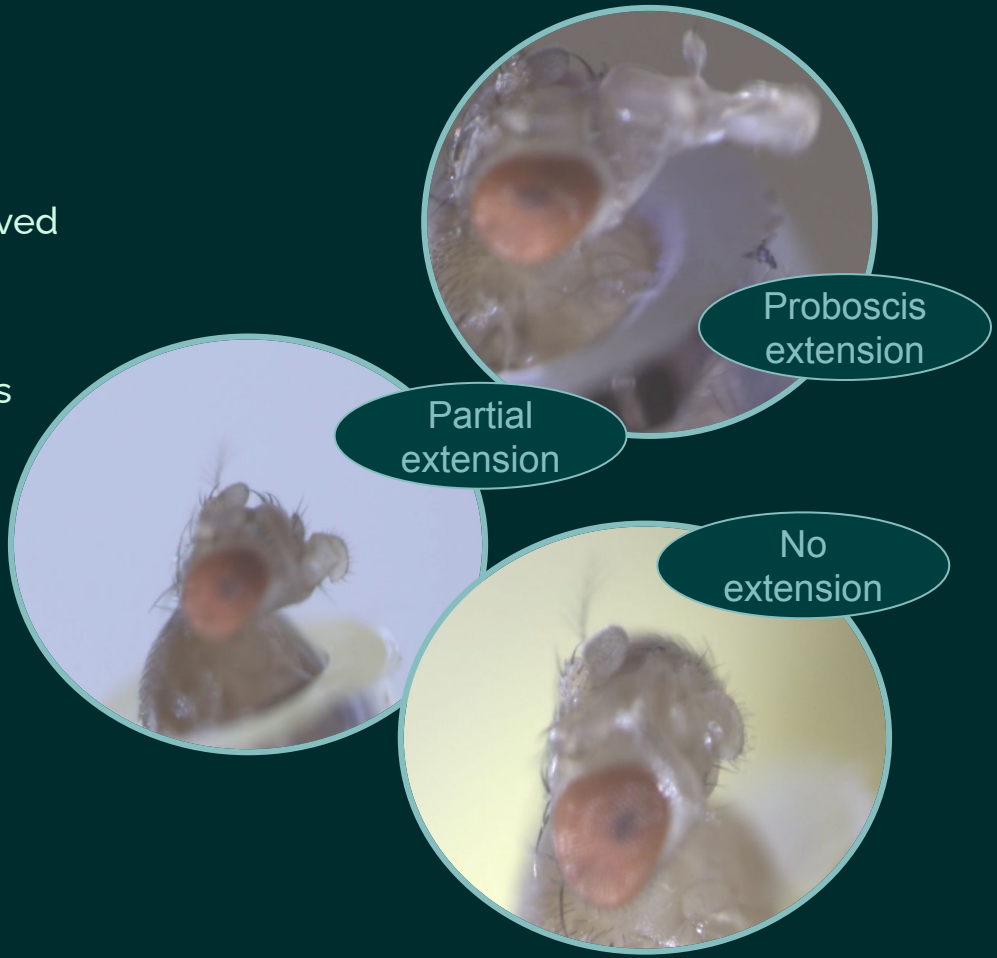


(Camus et al., 2008)

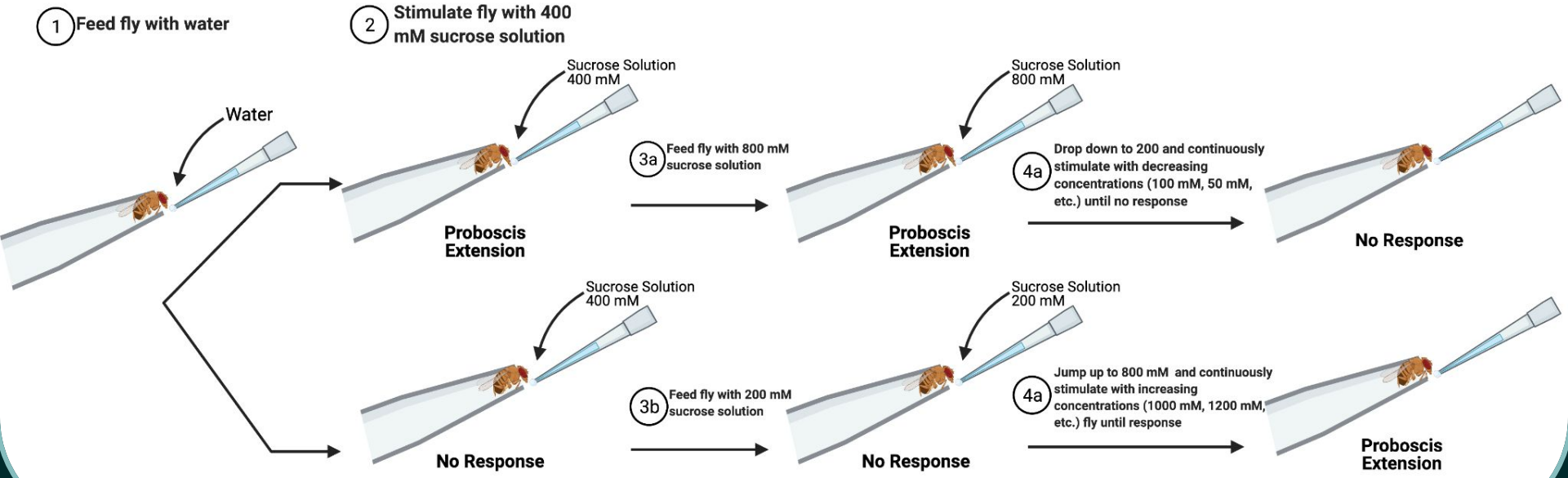
- Male and female flies have different nutritional needs
- Consume different amounts of carbohydrates (Camus et al., 2008)
- Known sex differences in morphology of tarsi (Lang et al., 2014)

Sucrose sensitivity

- Increased sucrose sensitivity in wet-starved flies (Nishimura et al., 2012)
- Stimulate sensilla and observe proboscis extension behavior
    - Labellar or tarsal sensilla
- Proboscis extension response (PER) is a food seeking behavior
- Present sucrose to determine sucrose sensitivity (Inagaki et al., 2012)



Directions for Conducting PER Assay



Rader et al. (2020) developed PER for use in NSCI class

- Collected pilot data

Fall 2019 and Spring 2020

Fall 2020

CURE class built on these data

Each group found different results

We reanalyzed video recordings of PER assays performed in that class

This semester

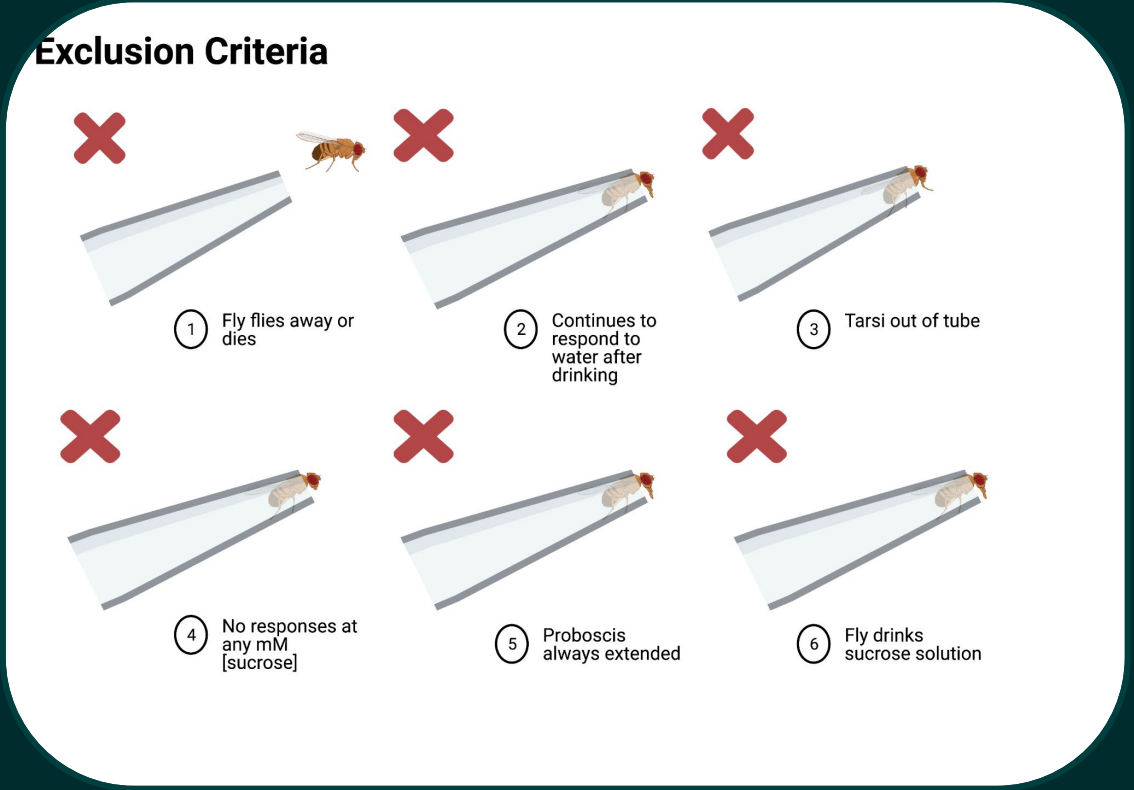
Number of flies in each condition

	Female fed	Female wet-starved	Male fed	Male wet-starved
Fall 2020 (range)	**3 - 11**	**5 - 15**	**4 - 19**	**4 - 9**
After reanalysis	**3**	**5**	**8**	**4**

Fall 2020 CURE course: number of flies were different between student groups due to differences in inclusion & exclusion of flies based on video-recorded data

Re-analysis

- Re-evaluated video-recorded PER assays
- Determined exclusion criteria
- Developed teaching guide to reflect our methods
- Used updated criteria to re-collect PER data



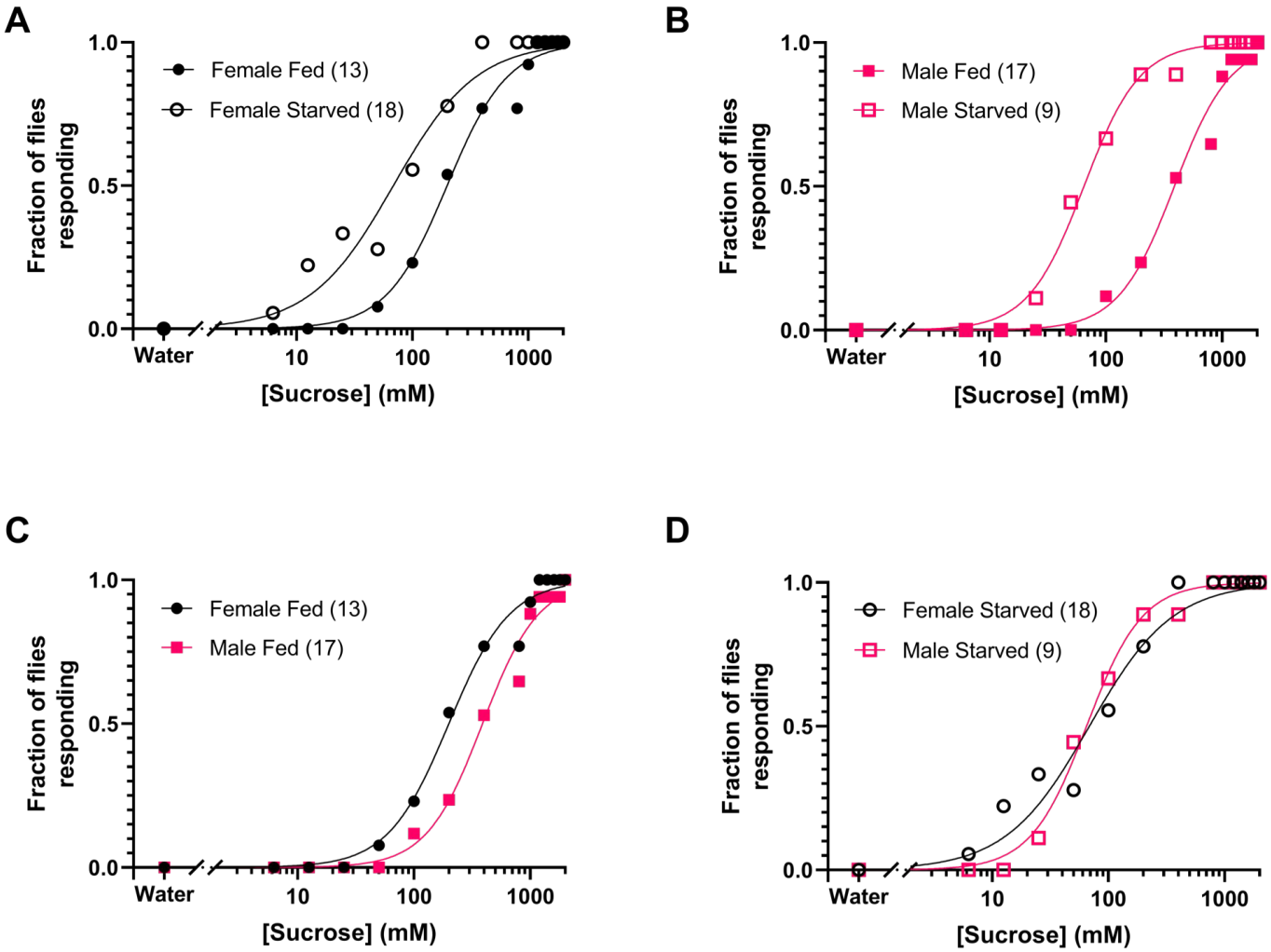


Figure 1. **Comparison of PER between sexes and feeding condition at various sucrose concentrations.**
A) Proportion of female fed (n = 13) and female wet-starved (n = 18) flies showing PER at various sucrose concentrations. B) Proportion of male fed (n = 17) and male wet-starved (n = 9) flies showing PER at various sucrose concentrations. C) Proportion of female fed (n = 13) and male fed (n = 17) flies showing PER at various sucrose concentrations. D) Proportion of female wet-starved (n = 18) and male wet-starved (n = 9) flies showing PER at various sucrose concentrations.

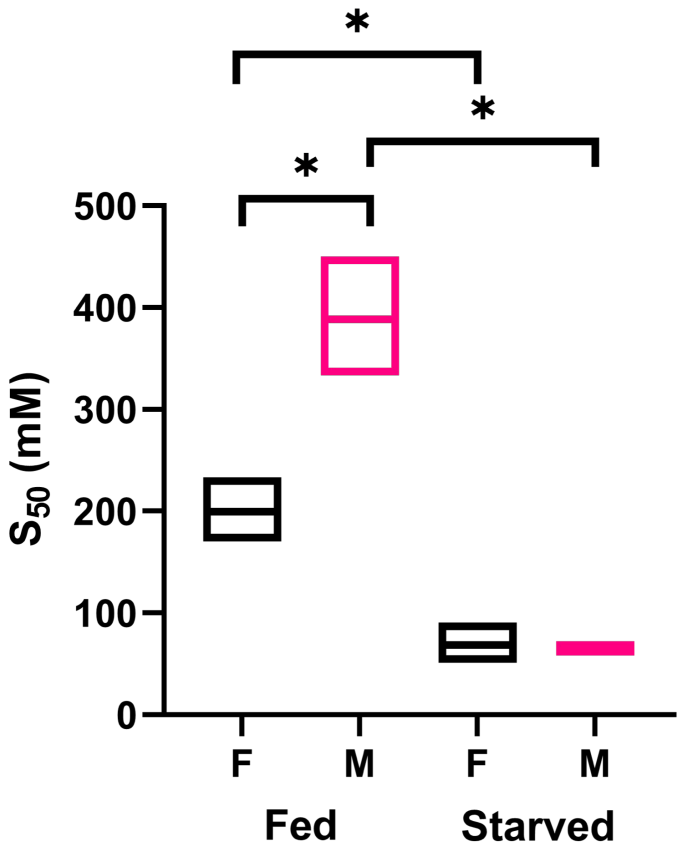


Figure 2. **Comparison of S50s between sexes and feeding condition**. Middle bar gives concentration at which 50% of the flies exhibited PER (S50). Outside bars give 95% confidence interval upper and lower bounds. Sum-of-squares F test was performed to compare groups. * $p < 0.0125$ F: female, M: male

Teaching Guide

1 Introduction to PER

Slides with voiceover explaining how to conduct PER

2 Walkthrough of example

Example PER assay from Fall 2020 with voiceover explanation

3 Exclusion criteria

Slide with voiceover explaining exclusion criteria

4 Examples of flies drinking

Clips of flies drinking from Fall 2020

5 Practice

Select videos from Fall 2020 with practice questions after each

Future Directions

- Future researchers taking the CURE course should study sucrose sensitivity via labellar OR tarsal sensilla
- Assess training guide by measuring inter-rater reliability
- Explore how mating status affects sucrose sensitivity

References

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Ling F, Dahanukar A, Weiss LA, Kwon JY, Carlson JR (2014) The Molecular and Cellular Basis of Taste Coding in the Legs of Drosophila. J Neurosci 34:7148–7164.

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