



## Background

### GnRH-a Effects

Its short-term cognitive effects are known, but long-term developmental impacts are unclear.

### GnRH-a Function

GnRH-a suppresses sex hormones that support neurogenesis and synaptic plasticity.

DOPAMINE NMDA GABA

### Model

Drosophila + Habituation

Habituation depends on NMDA-driven synaptic plasticity and GABAergic inhibition.

How does GnRH-a affect brain plasticity?

### Project Need

- GnRH-a is widely used in adolescents during critical brain development

### Drosophila as a Model

- Flies share core memory mechanisms with humans (dopamine, NMDA, GABA).
- AKH is GnRH equivalent in Drosophila

DOPAMINE NMDA GABA

## Results

- Odor pre-exposure caused a **significant reduction in avoidance behavior**
- Naive flies showed ~85% avoidance, while pre-exposed flies showed only ~30% and ~34%, producing a large behavioral shift.
- A two-sample t-test confirmed the differences were **statistically significant**
- Short-term odor exposure caused a rapid decrease in avoidance that recovered within 30 minutes.
- Prolonged odor exposure resulted in sustained avoidance reduction at Day 1, **confirming long-term habituation**.
- By Day 6, avoidance responses recovered to statistically insignificant near-naïve levels

### Short Term Olfactory Habituation

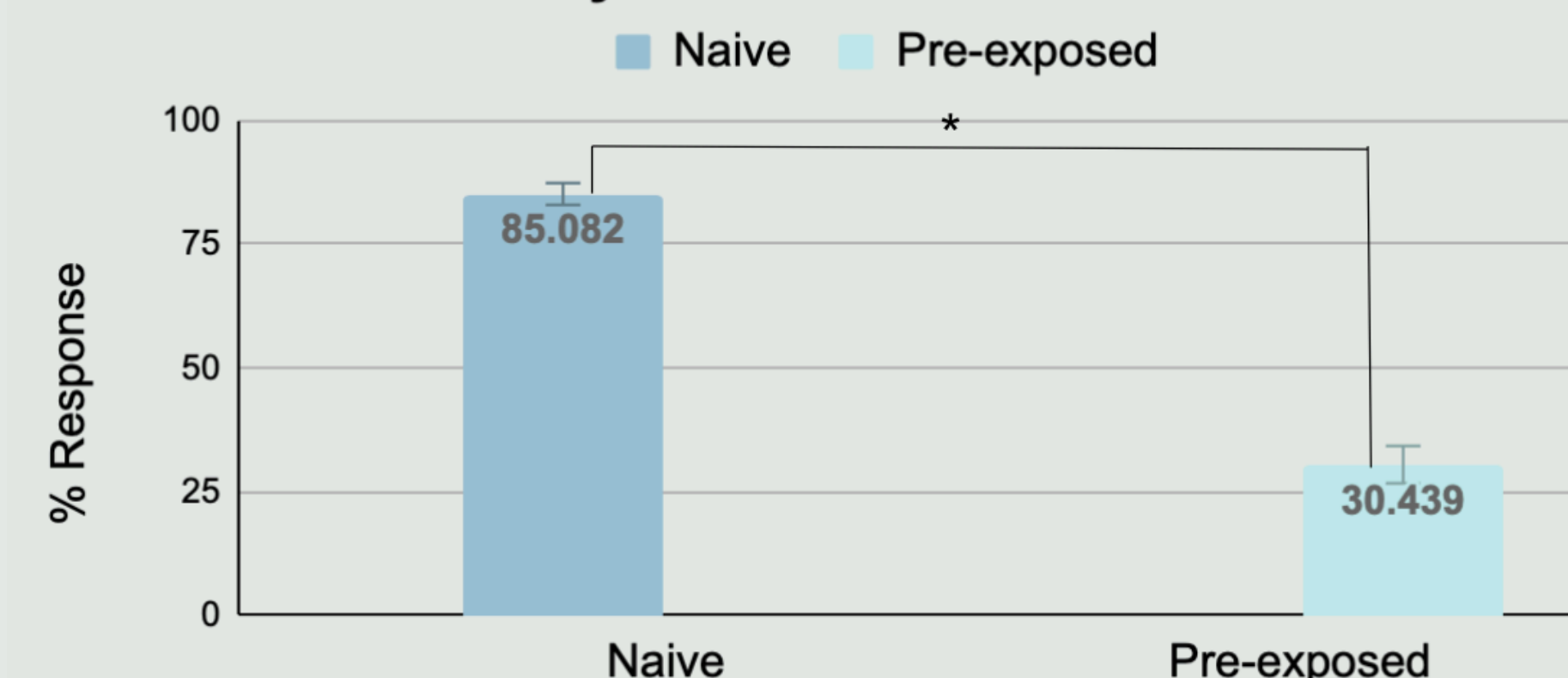


Figure 1. Naïve flies show significantly higher avoidance responses than odor pre-exposed flies (30 mins). Bars represent mean ± SEM. A two-sample t-test indicates a significant difference (t = 12.513, p = 0.01125).

### Short Term Olfactory Habituation

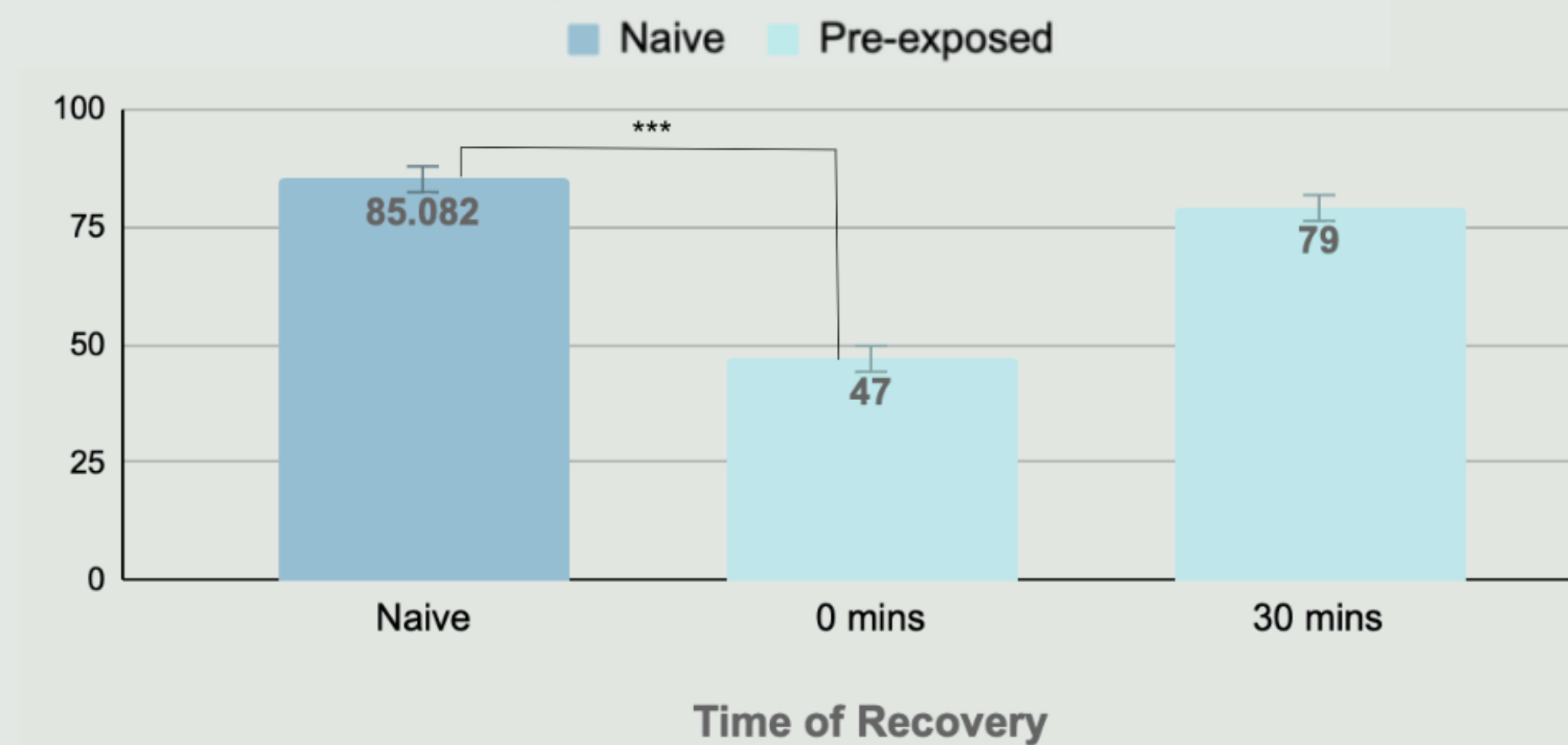


Figure 2. Flies show reduced odor avoidance immediately after exposure, indicating short-term habituation. After 30 minutes in clean air, odor avoidance return to levels that are not statistically different from naïve controls. Bars represent mean response index ± SEM.

### Long Term Olfactory Habituation

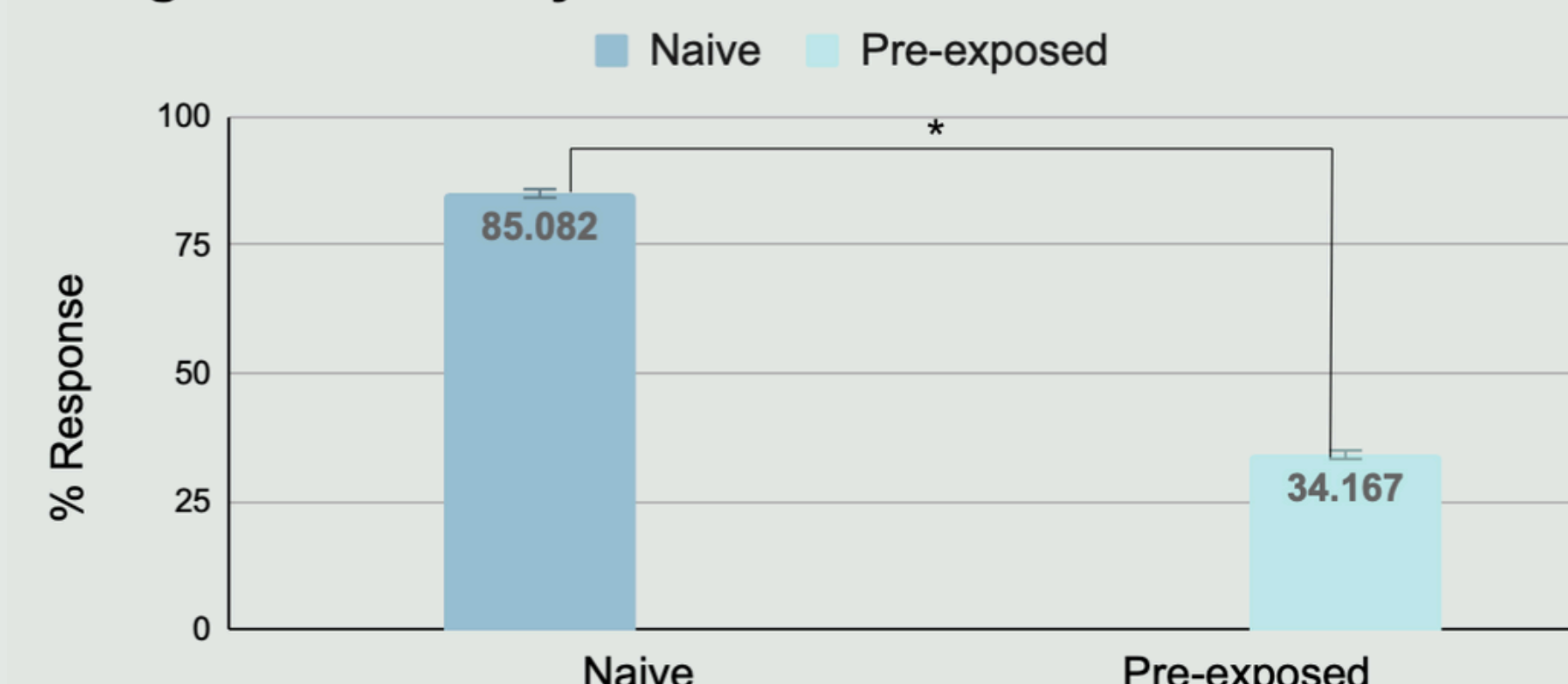


Figure 3. Naïve flies show significantly higher avoidance responses than 4-day odor pre-exposed flies. Bars represent mean ± SEM. A two-sample t-test indicates a significant difference (p = 0.013).

### Long Term Olfactory Habituation

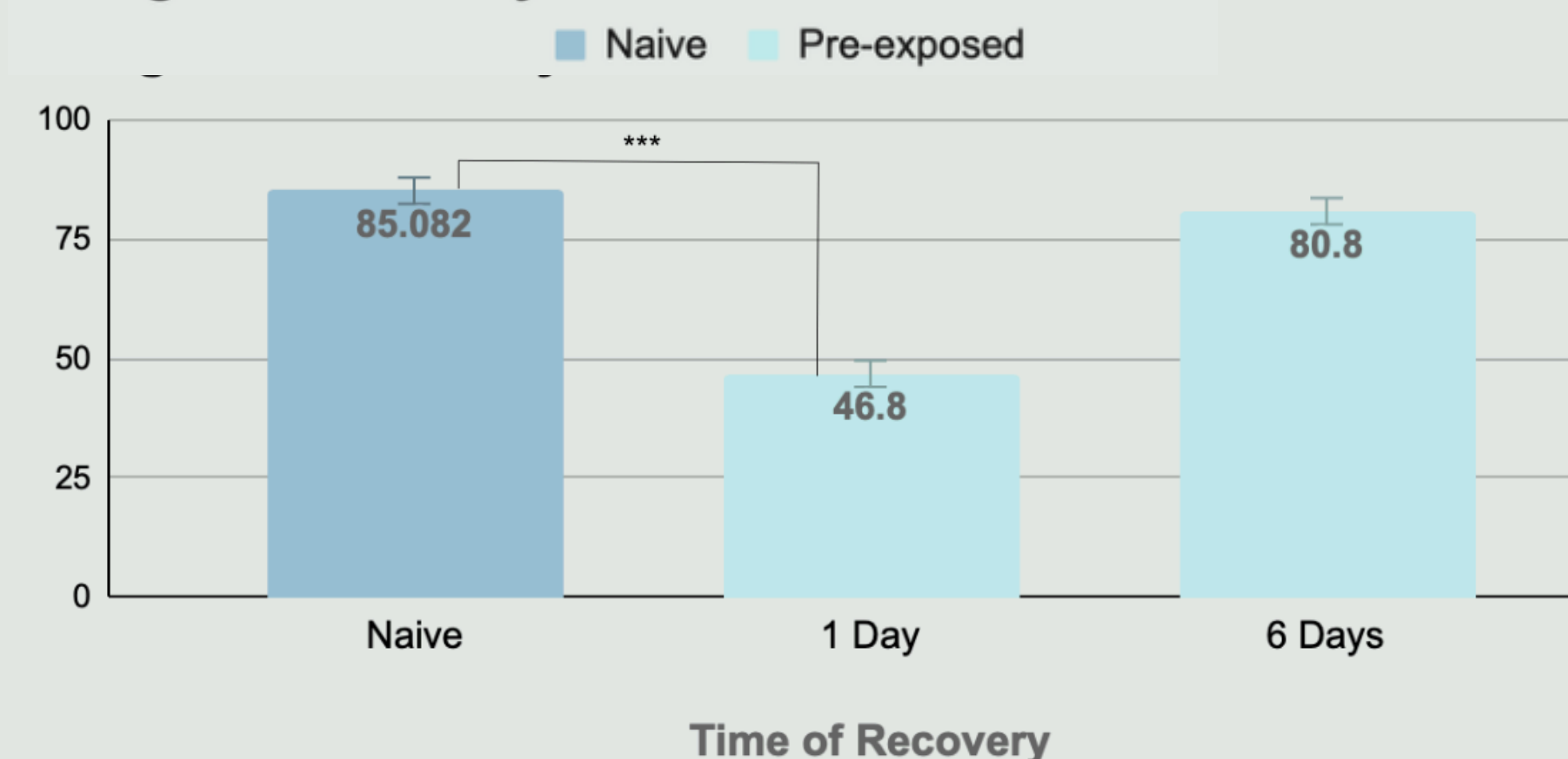


Figure 4. Following prolonged odor exposure, flies exhibit a strong reduction in odor avoidance one day after. By six days after exposure, avoidance responses recover to levels that are not statistically different from naïve controls. Bars represent mean response index ± SEM.

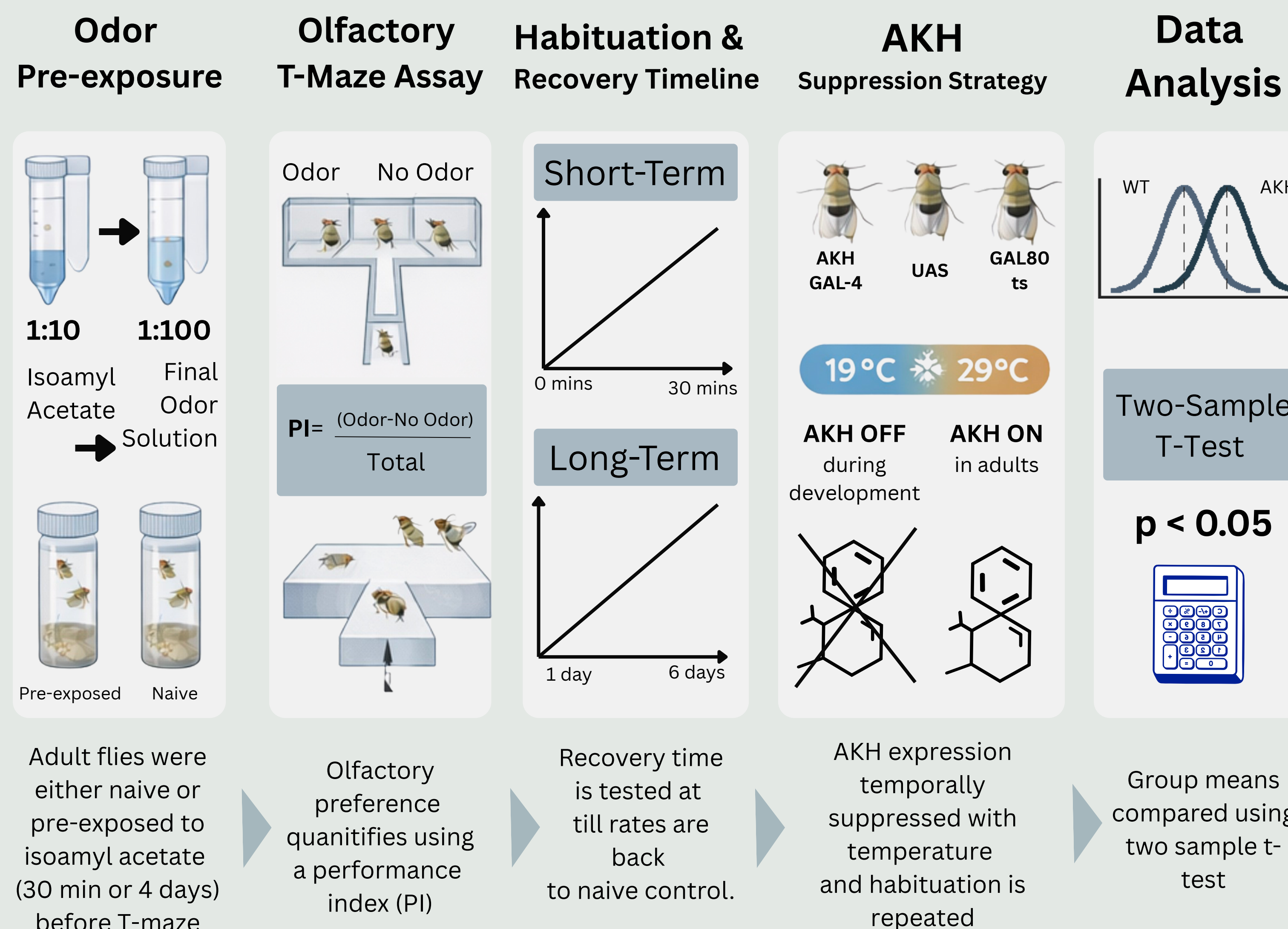
## Research Question

Does AKH suppression in Drosophila larvae have significant effects in cognition as the larvae mature into adults?

## Hypothesis

Suppressing AKH signaling during larval development will result in impaired odor habituation and reduced cognitive performance in adult Drosophila.

## Methodology



## Discussion & Conclusion

- Olfactory habituation in Drosophila occurs on distinct timescales depending on exposure duration.
- Short-term habituation recovers rapidly within 30 minutes, indicating transient neural plasticity.
- Long-term habituation persists for days but recovers by day six, suggesting more stable yet reversible synaptic changes.
- These results demonstrate that sensory experience duration shapes the stability of learned behavioral responses..
- Validates habituation as a method of memory measurement

## Future Steps

- After the flies are crossed, I plan on targeting developmental AKH suppression through temperature control.
- Testing olfactory habituation between naive AKH-suppressed Drosophila and pre-exposed AKH-suppressed Drosophila and calculating significance tests
- Expanding to different age stages of Drosophila