

# Enriched housed rats show greater sign tracking during and after social and environmental stressors

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### Introduction

Sign-tracking procedure, a form of **Pavlovian conditioning**, has been used to measure compulsive-like behaviors. Sign-tracking procedures with rats involves repeated presentation of an object **conditioned stimulus (CS)** that is immediately paired with the response-independent delivery of a rewarding **unconditioned stimulus (UCS)**. After repeated pairings, two behaviors develop: **sign tracking** (contacting the object CS) and **goal tracking** (headpoking in the food tray in anticipation of the food UCS) (Robinson & Berridge, 1993). When an ethanol bottle is used as the CS rats can be induced to compulsively drink ethanol (Tomie *et al*, 2002). We found that rats will sign track an ethanol bottle even while housed in an enriched environment. The enriched housing environment allowed us to investigate the effects of **acute environmental and social isolation stress** on compulsive-like ethanol drinking (measured as sign-tracking) and goal-directed action (measured as goal-tracking). Because stressors are known to increase sign tracking in standard-housed rats (Anderson *et al*, 2013) and escalate drug use, **we asked if our stressor manipulations would increase sign tracking and alter goal tracking of enriched-housed rats.**

### Procedure



**Sign-tracking procedure.** 25 trials of a bottle CS containing 5% ethanol presented for 10 seconds and then retracted, followed by a sucrose pellet dispensed into pellet tray. Pairings were fixed-60-seconds ITI.



8 Sprague-Dawley rats housed from 21 days of age in two (n=4) environmentally enriched wire-mesh towers (shown).

**Phase 1** - Acquisition of Sign Tracking inside the environmentally enriched home towers (18 days)

**Phase 2** – Two Stressor conditions each applied for 6 days (Within-subjects, counterbalanced order).

- **Environmental Stressor:** rats separated from home tower environment but pair-housed with a social partner.
- **Social Stressor:** rats separated from home tower AND isolated from social partners.

**Testing** – Sign- and goal-tracking performance on 3 days **During** and 3 days **After** Stressor treatments.



### Conclusions

We confirm that in Enriched-housed rats acute social and environmental stressors can:

- ↑ **increase compulsive-like behavior** measured as sign tracking, and
- ↓ **decrease goal-directed behavior** measured as goal tracking.

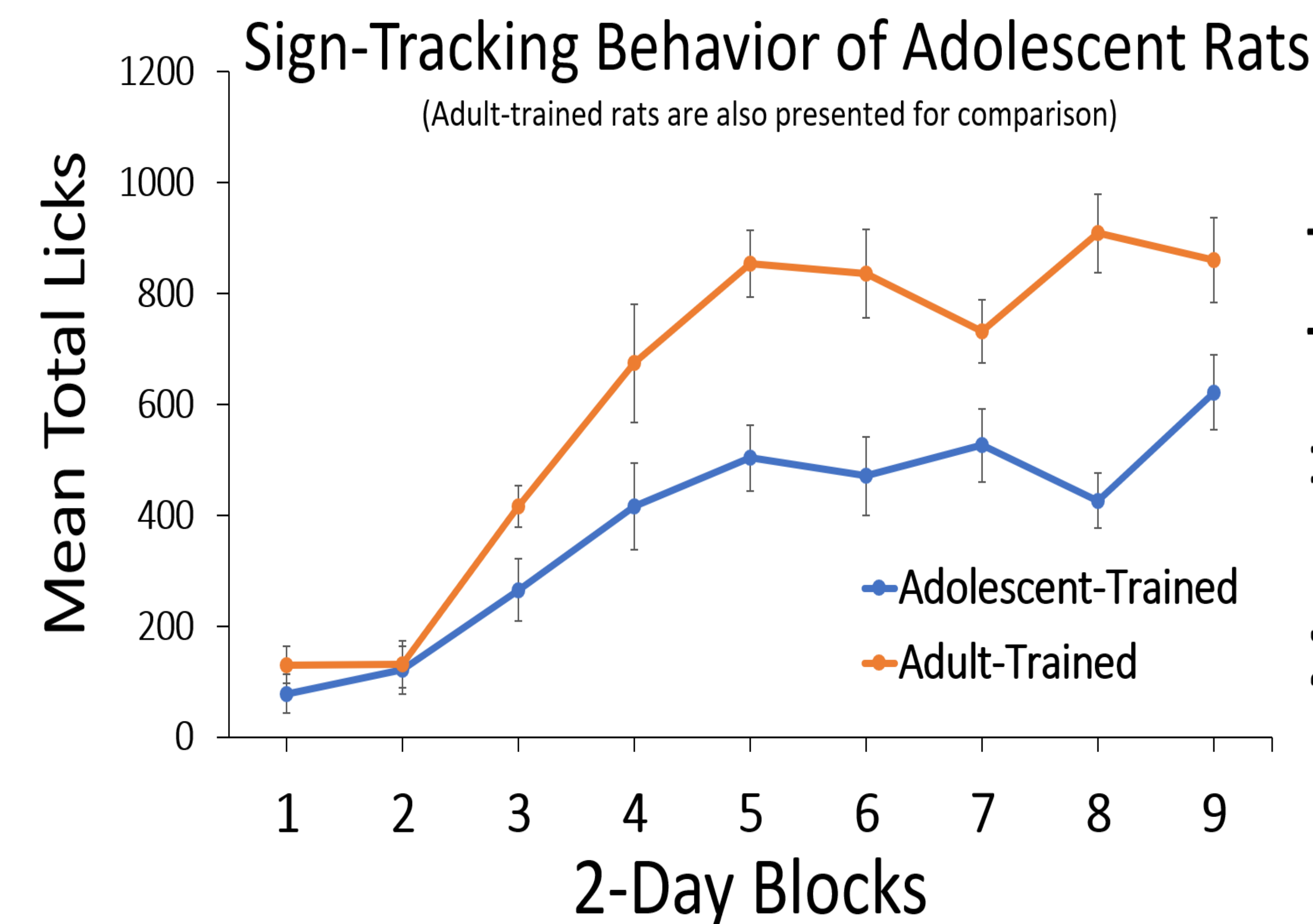
We also found:

- **lingering stress effects** after the rats were returned to their home towers
- more consistent effects on goal-tracking than on sign-tracking behaviors

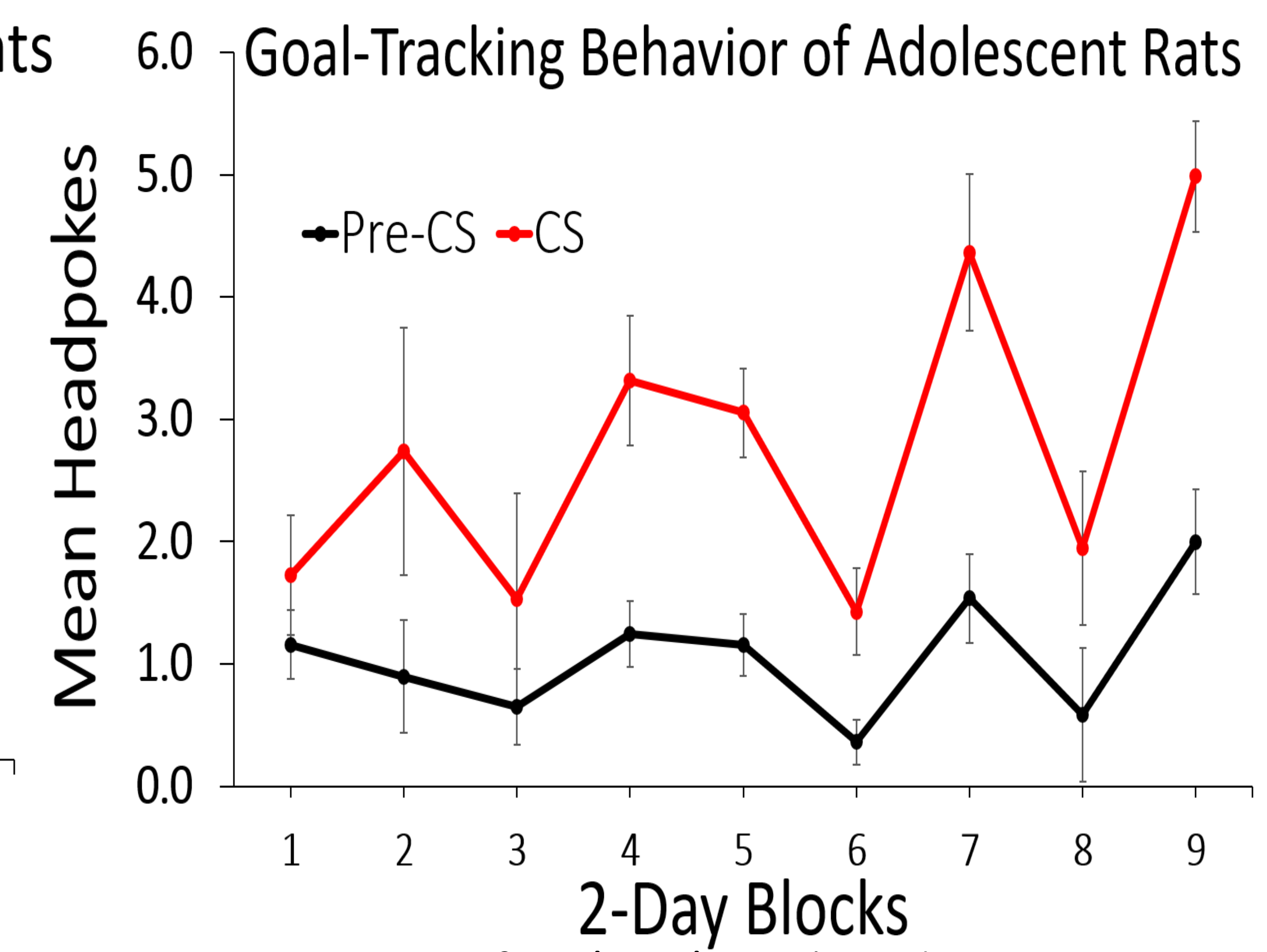
Further work is needed to determine whether the increase in compulsive-like sign tracking is:

1. due to the **self-medicating** effects of the ethanol in the bottle
2. more resistant to stress effects than goal-directed behaviors (Morrison *et al*, 2015).

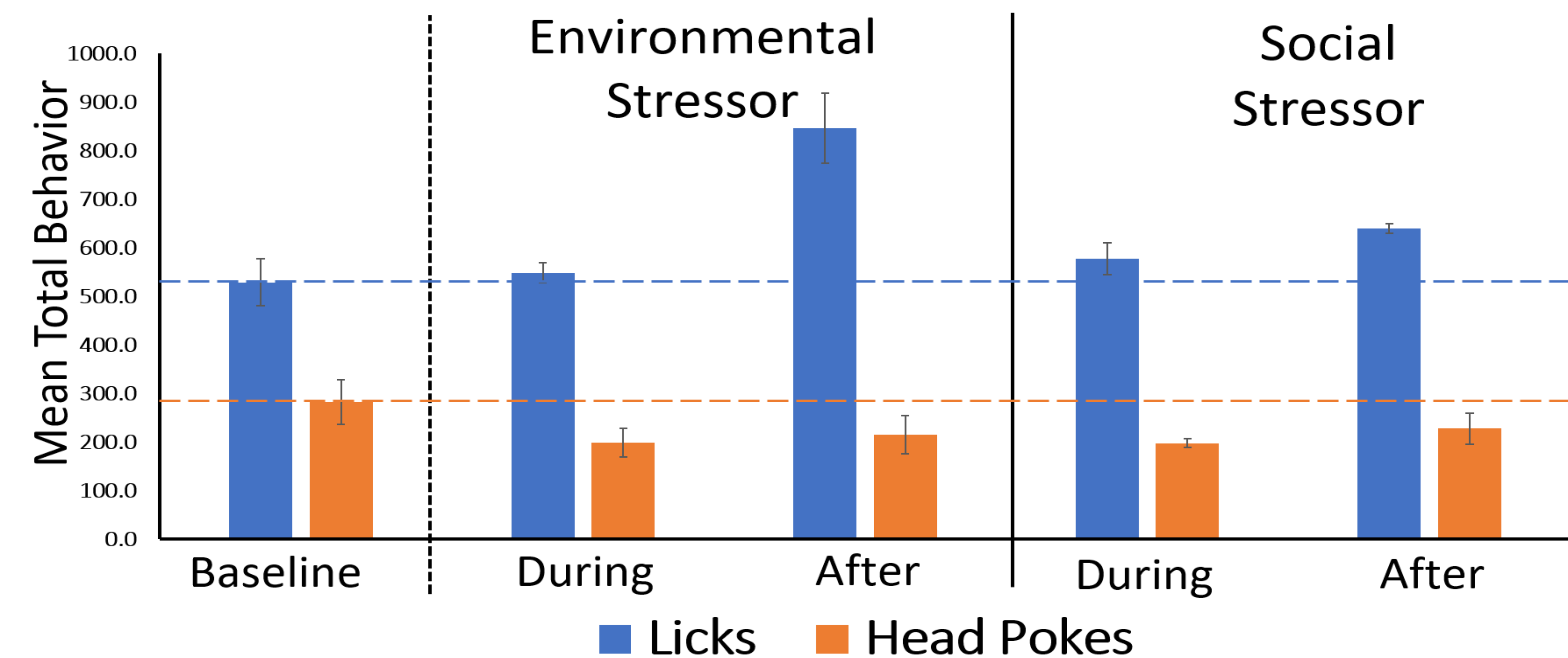
### Main Findings



Acquisition of **sign tracking** plotted as mean total licks on the 5% ethanol bottle.



Acquisition of **goal tracking** plotted as mean headpokes into the food tray per trial during the CS and Pre-CS period.



Sign tracking (licks on the bottle) and goal tracking (headpokes into food tray) observed during baseline (acquisition) and each stressor condition.

#### DURING Stressors

- Headpokes decreased under both stressor conditions  $F(2, 12)=3.83, p=0.05, \eta^2_p=.389$ .
- Licks increased only under Social stressor and only when following the environmental stressor condition (not shown), interaction with order :  $F(2, 12)=3.89, p=0.05, \eta^2_p=.393$

#### AFTER Stressors

- Headpokes decreased under both stressor conditions, interaction  $F(2, 12)=5.71, p=0.02, \eta^2_p=.487$ .
- and moderated by the stressor condition order (not shown), interaction  $F(2, 12)=5.71, p=0.02, \eta^2_p=.487$
- Licks increased under both stressor conditions,  $F(2, 12)=5.17, p=0.02, \eta^2_p=.463$

### References

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