

Relative reward processing of ethanol following sucrose exposure in non-food-restricted rats



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Introduction

Background

- Alcohol Use Disorder (AUD) is a disease that has a devastating effect on millions of individuals around the world. Using natural reward sensitivity to predict future addictive-like behavior could aid significantly in preventing and treating substance use disorders.

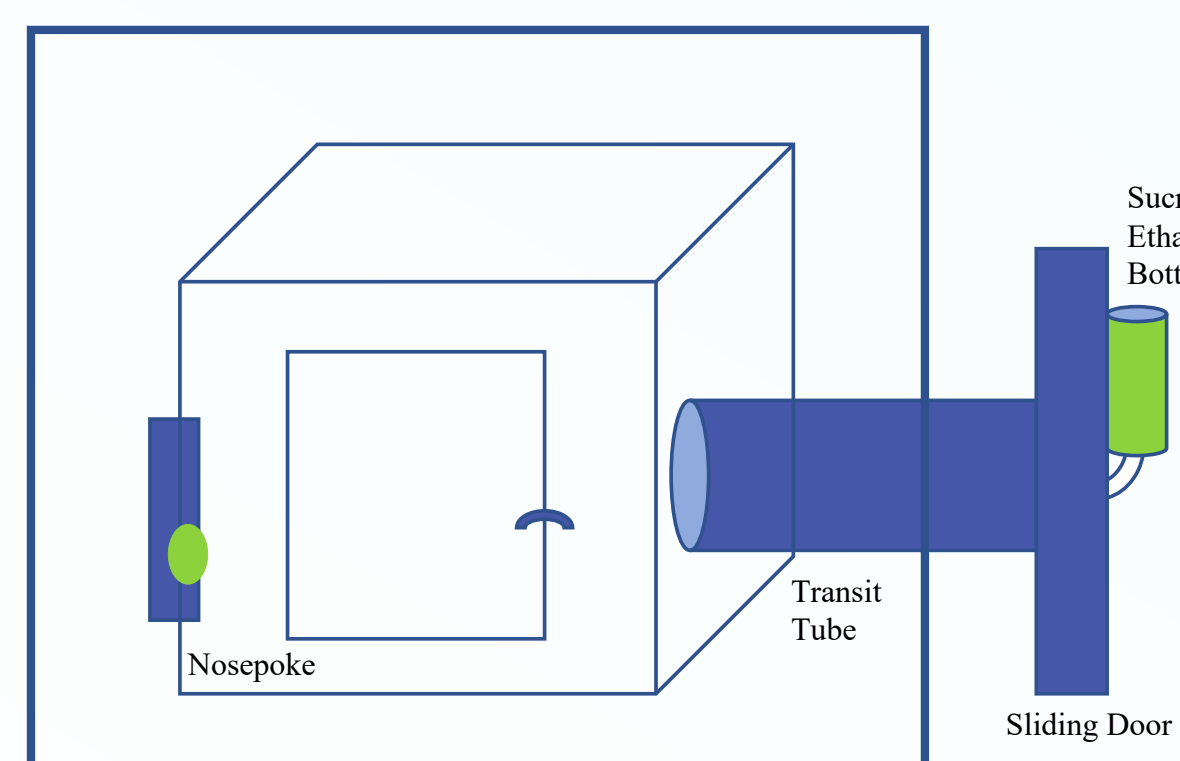
Rationale

- Impaired reward sensitivity and response to natural reward may play a role in an individual's propensity to develop AUD.
- Little research has been done without the use of food or water deprivation to coax animals into addiction.

Purpose

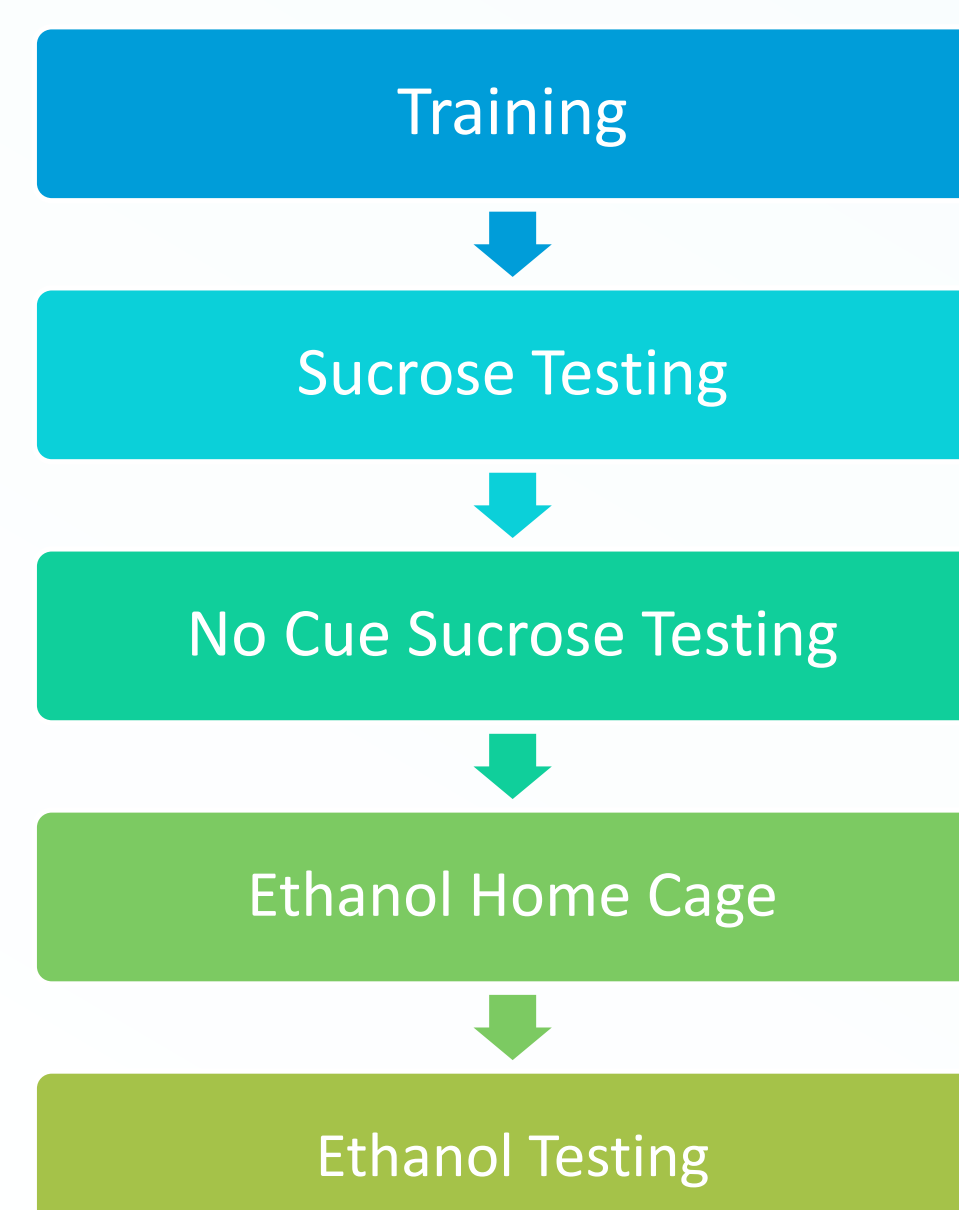
- Examine the appetitive and consummatory behavior of female Wistar rats in self-administration tasks of sucrose and ethanol solutions.
- Evaluate relative reward effects and reward sensitivity on both an inter-session and intra-session basis.
- Determine the predictive potential of natural reward response to drug reward response.

Materials/Methods

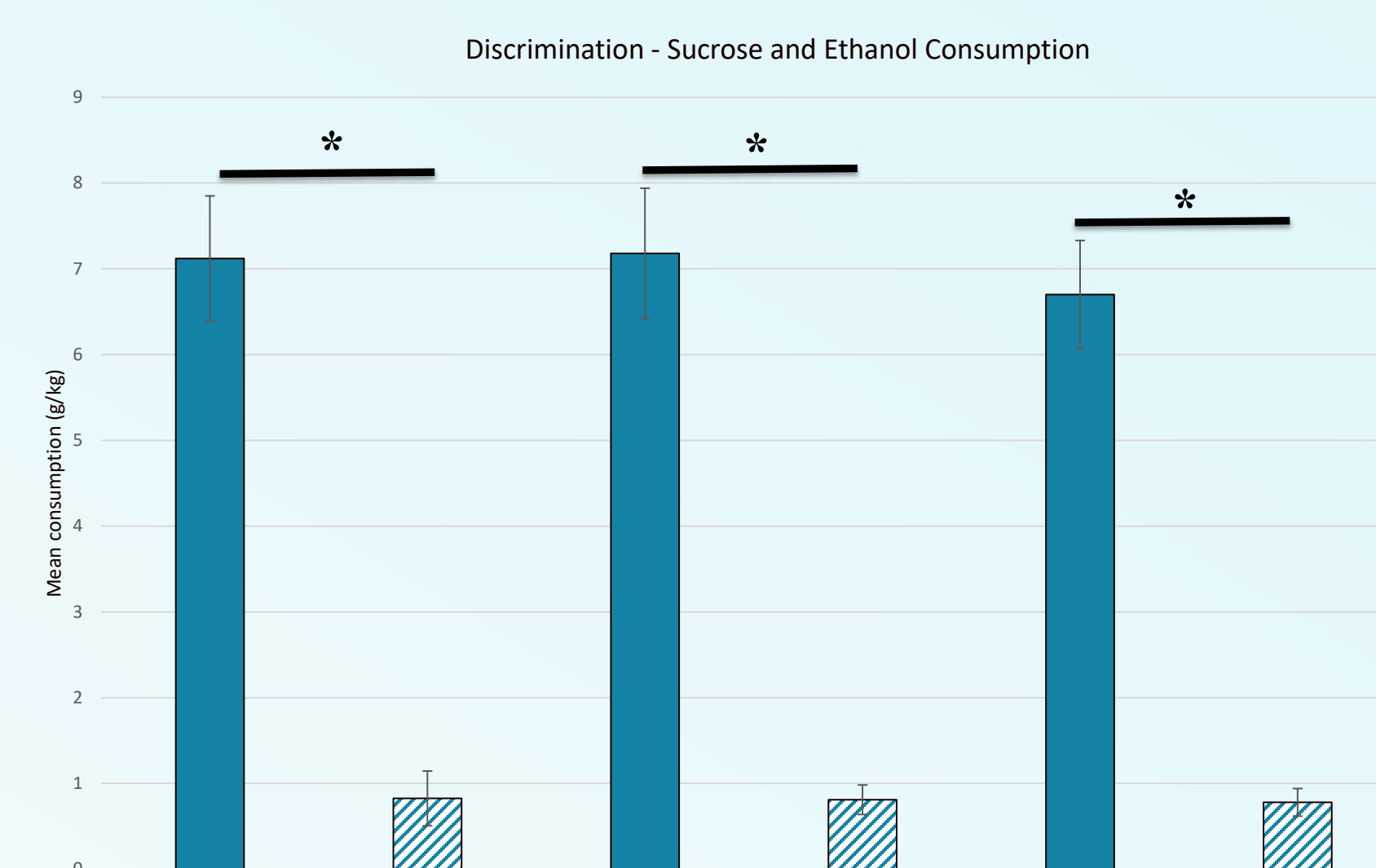


Female Wistar rats (n=25) were trained to nosepoke for timed access to a bottle of 32% sucrose solution. Trial types were baseline (20sec, 10sec, 5sec) and shift (20->10sec, 10->20sec, 20->5sec, and 5->20sec). The total access time to reward was always 240 seconds.

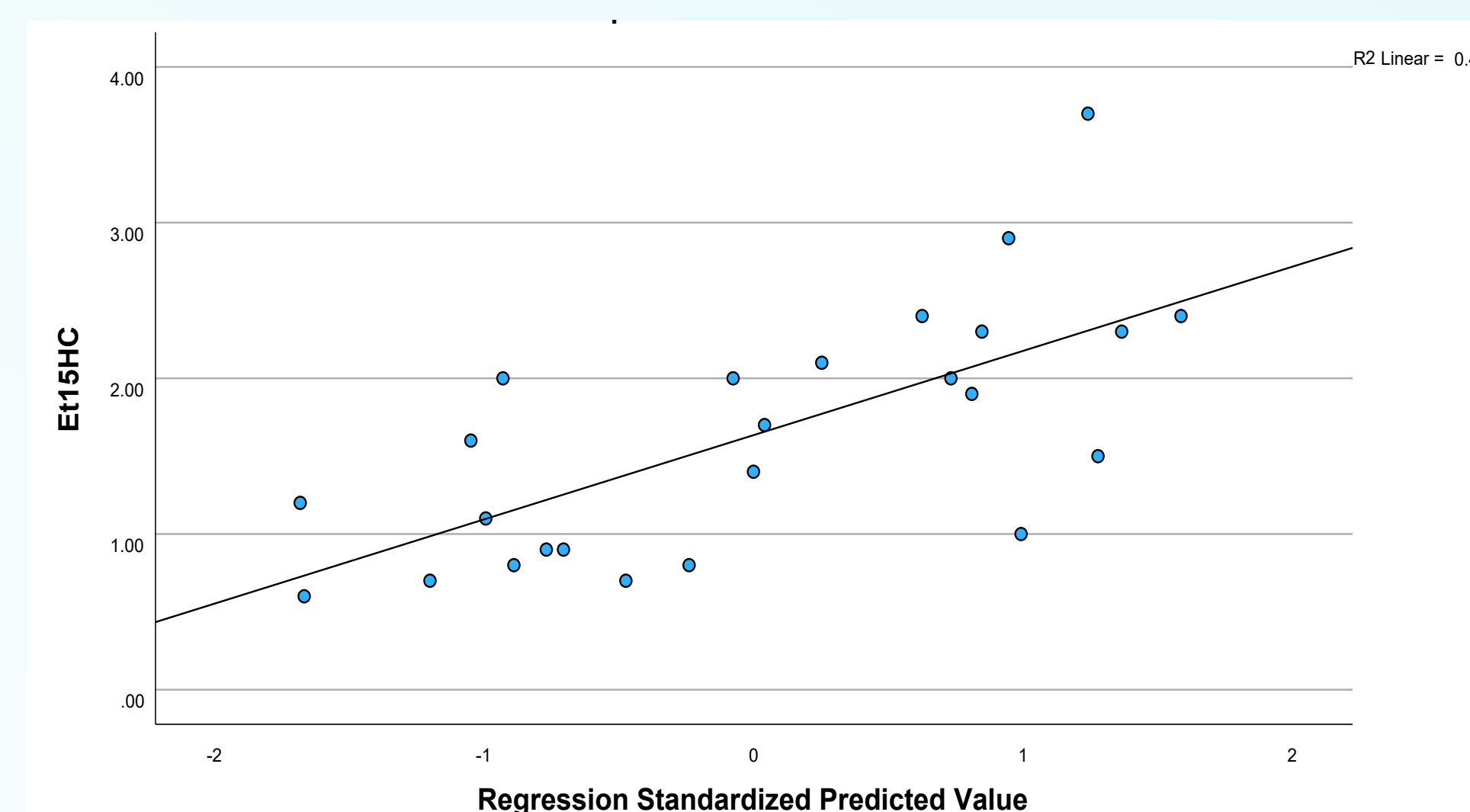
Cue lights corresponding to the type of trial were activated after each nosepoke. These were inactivated during the no cue week. Following the no cue week, the rats were exposed to 15% and 30% ethanol in the home cage for 3 weeks – 24h per day for 2 weeks, 30min per day for 1 week. They were then tested in the operant chamber using 30% ethanol.



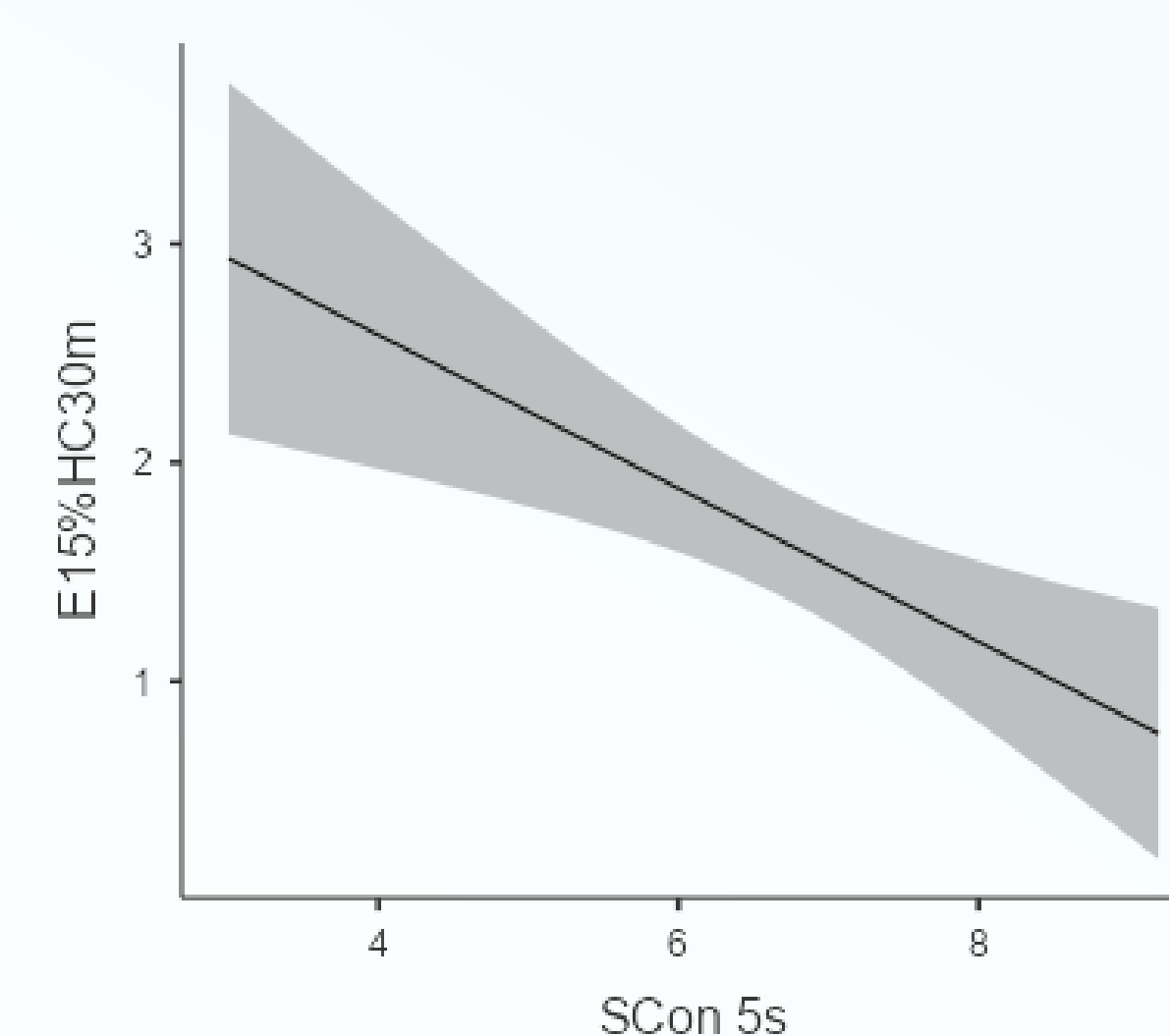
Results



A Friedman's analysis was conducted to determine if Wistar rats show discrimination in their consumption of sucrose and ethanol between 20s, 10s, and 5s trials ($\chi^2(5) = 98.1, p < 0.001$).



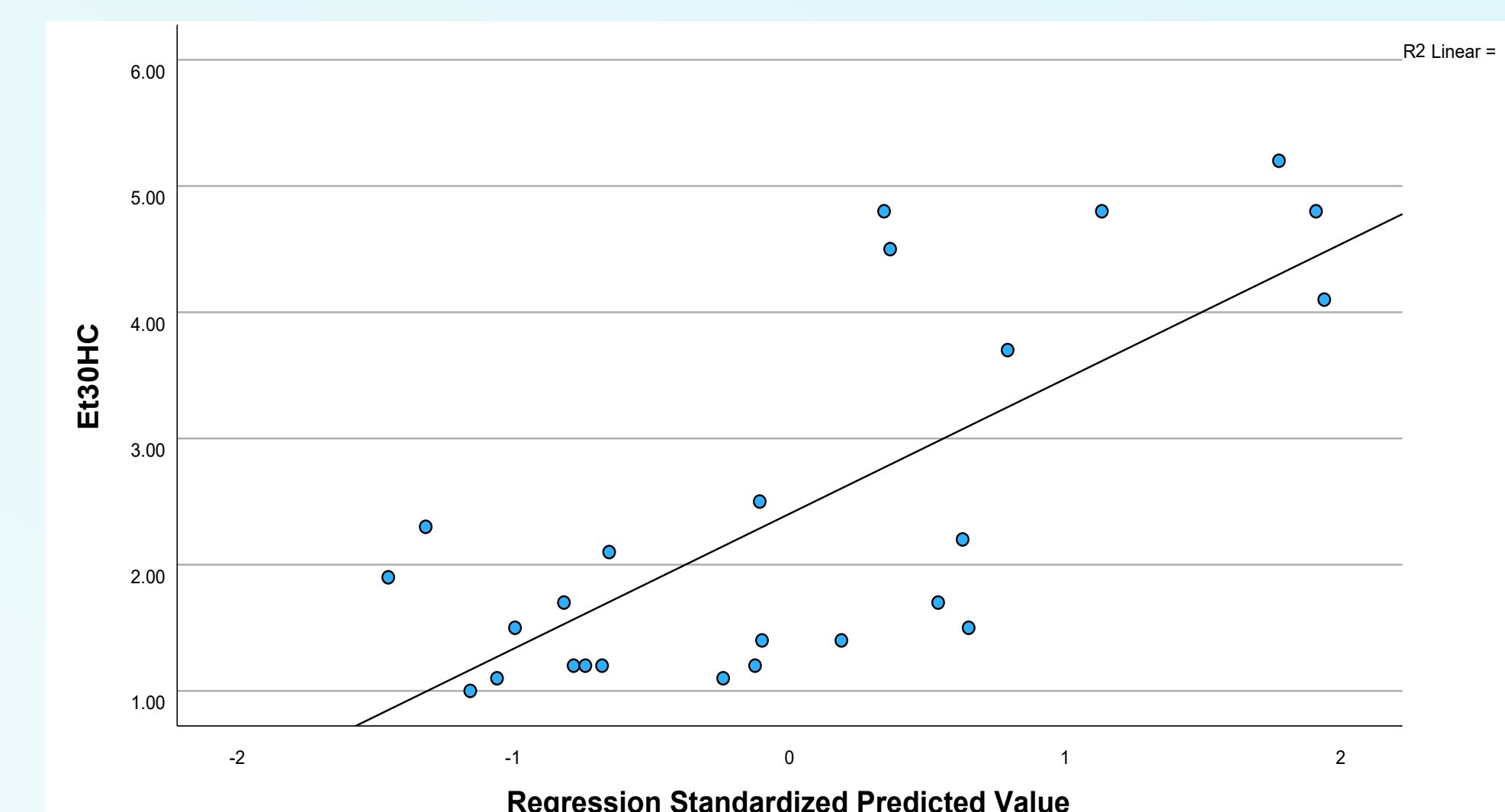
Sucrose consumption during 20s, 10s, and 5s trials explained 47% of the variance in HC 15% ethanol consumption ($R^2 = .47, F(3,21) = 6.27, p < .05$).



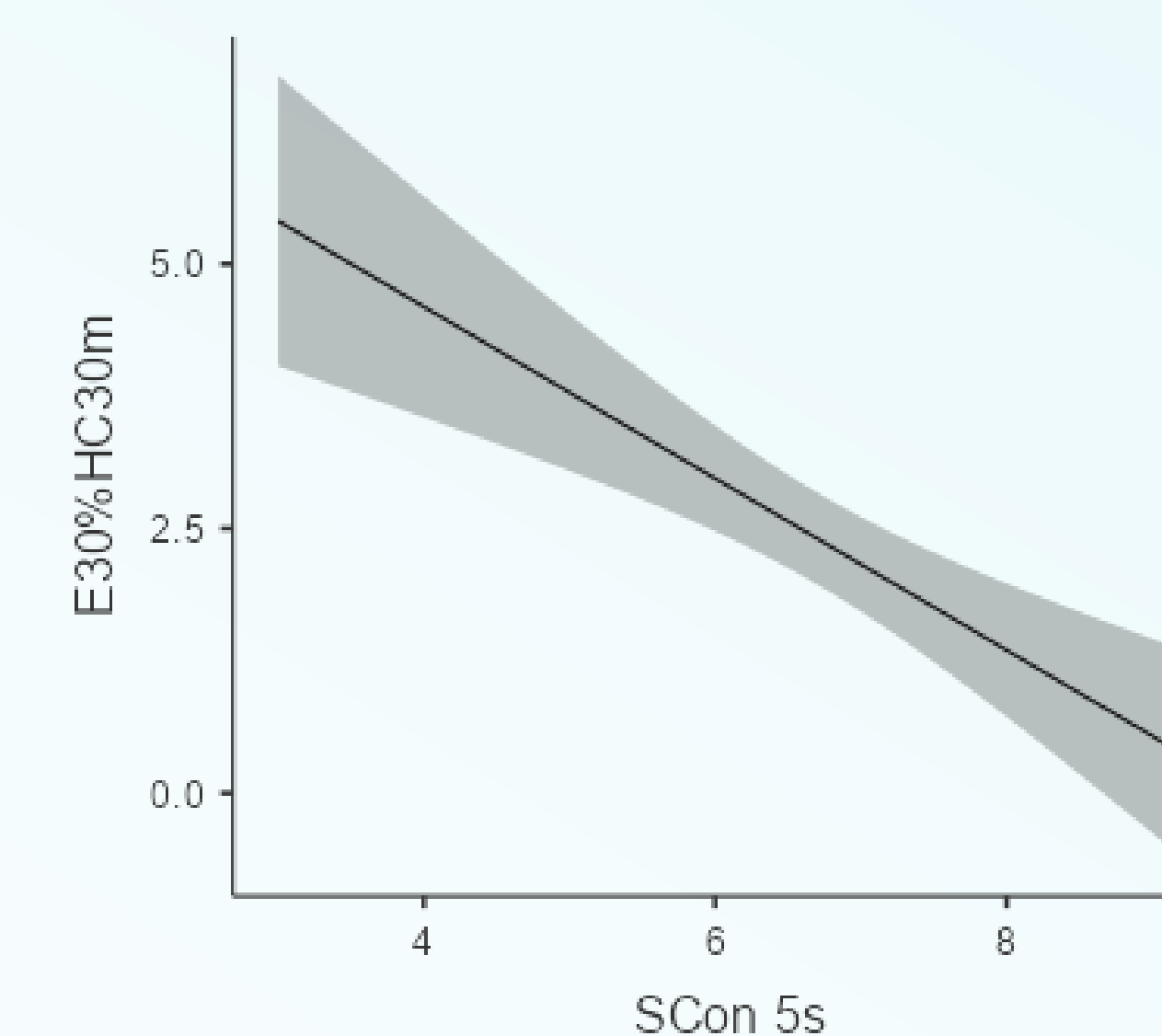
Consumption during 5s trials significantly predicted home cage consumption of 15% ethanol during 30-minute exposure ($\beta = -0.68, p < .01$).



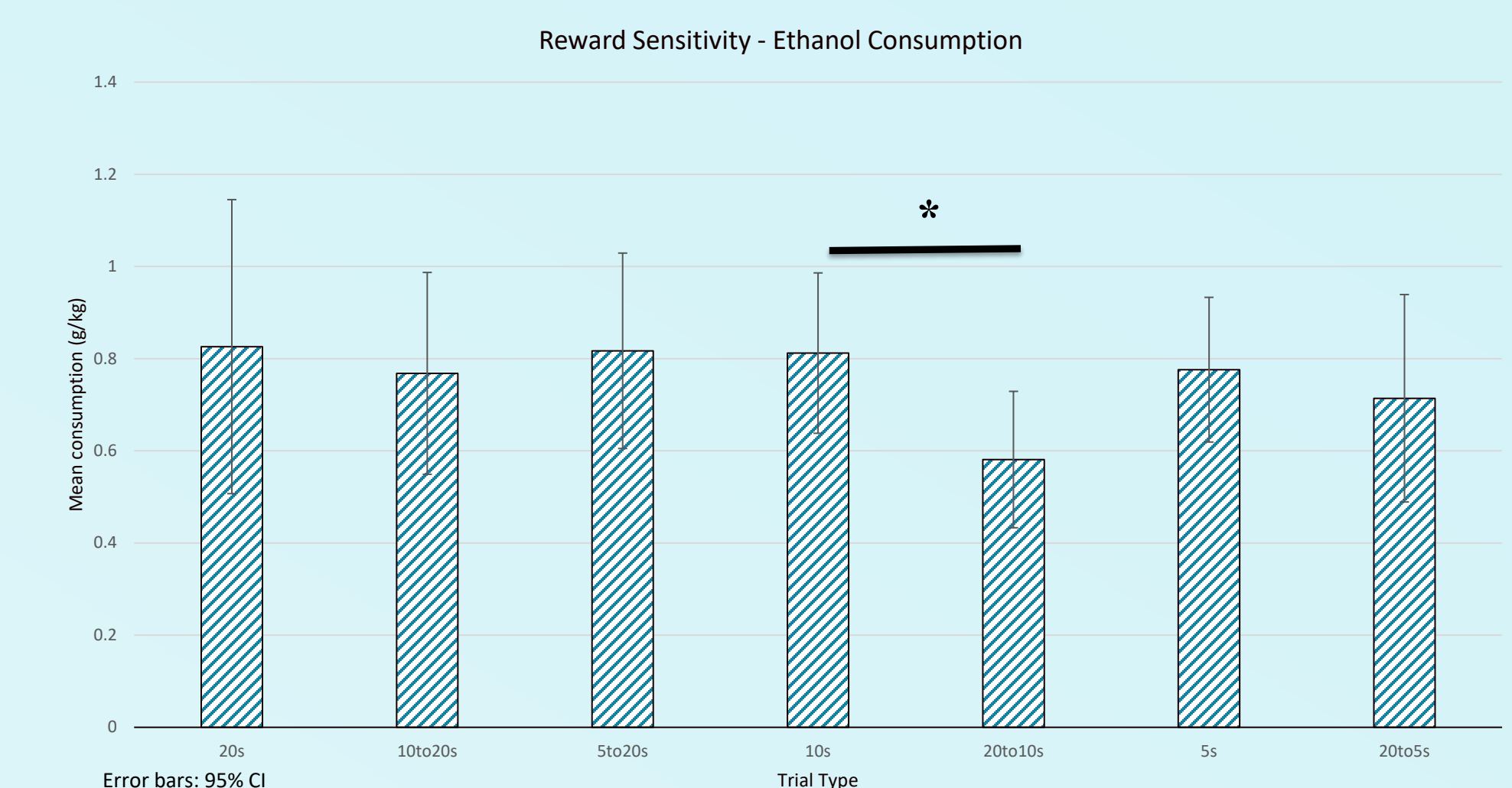
A Friedman's analysis was conducted to determine if Wistar rats change their consumption of sucrose following an increase or decrease in time of access compared to that same trial length in isolation. There were no significant differences in the relevant pairwise comparisons.



Sucrose consumption during 20s, 10s, and 5s trials explained 55% of the variance in HC 30% ethanol consumption ($R^2 = .55, F(3,21) = 8.40, p < .001$).



Consumption during 5s trials significantly predicted home cage consumption of 30% ethanol during 30-minute exposure ($\beta = -0.85, p < .001$).



A Friedman's analysis was conducted to determine if Wistar rats change their consumption of ethanol following a change in time of access compared to that same trial length in isolation. There was a significant decrease in 10s consumption when access shifted from 20s to 10s.

Conclusion

- Wistar rats developed addictive behaviors with both sucrose and ethanol while allowed ad libitum food and water.
- Wistar rats show discrimination between substance, as well as some sensitivity to intra-session alterations in ethanol reward.
- Wistar rats exhibit diminished sensitivity to outcome shifts with sucrose in consumption and lick rate. This is a more addictive profile in Wistars than previously reported in the literature, potentially induced by prior addiction to sucrose.
- Behavioral response to sucrose had some predictive potential regarding behavioral response to ethanol. The results suggest that there may be a contextual or environmental effect impacting the relationship.
- This research highlights the importance of naturalistic paradigms, reward type interactions, and context effects in the study of alcohol addiction.

Read the Thesis

