



# Will work for alcohol! Reward value of alcohol in rats.

COLLEGE OF SCIENCE & ENGINEERING

DEPARTMENT OF PSYCHOLOGY

Joanna B. Thompson and Mauricio R. Papini

Department of Psychology, Texas Christian University



## Introduction

- Alcohol misuse is a prevalent problem in the United States.
- Over 16 million Americans per year are diagnosed with an alcohol use disorder (AUD) contributing to an economic burden exceeding \$249 billion (NIAAA, 2017).
- Research with rodents has shown that alcohol possesses rewarding properties (Jupp et al., 2011).
- Rewarding properties contribute to the motivation to engage in alcohol consumption.

## Method

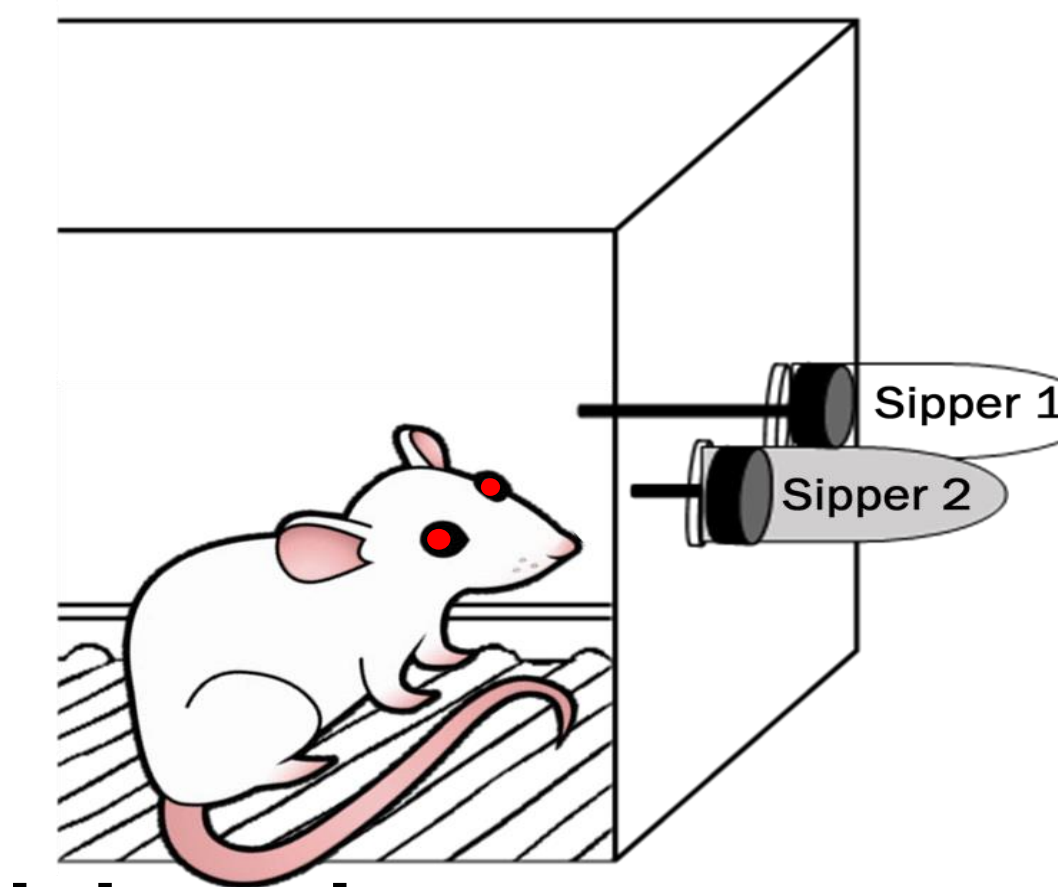
- Phase 1: we used a mixed Pavlovian-Instrumental paradigm to train voluntary oral self-administration to Wistar rats.
- Male and Female Wistar rats (n=8) were given access to two bottles:
  - Empty bottle (S1)
  - Alcohol bottle (S2)
- Responding to (licking) the empty bottle (S1) gave access the alcohol bottle (S2).
- Phase 2: after three consecutive days of training under continuous reinforcement conditions, rats were switched to a progressive-ratio schedule of reinforcement.
- Rats were then required to make an increasing number of responses to the empty sipper to gain access to the alcohol solutions (0, 2, 10, 66%).

## Voluntary, Oral Alcohol Self-Administration

- Presentation of each alcohol solution was counterbalanced daily for all animals.

### PHASE 1: Self-Administration Training

- Three, 20-trial sessions; Mean ITI 90s
- S1 (Empty) Max duration 15 s
- S2 (Alcohol) Max duration 10 s after first response



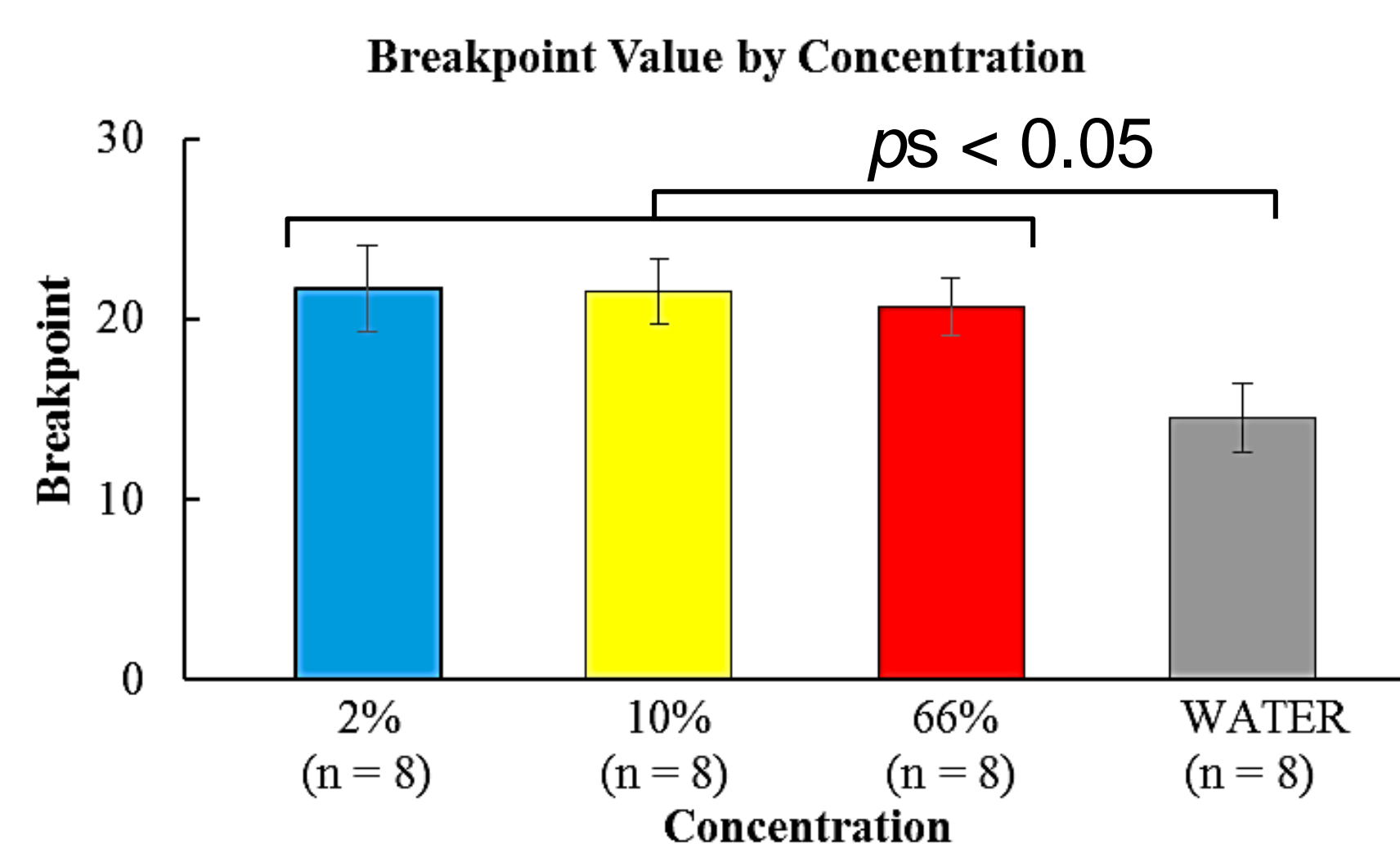
### PHASE 2: Progressive-Ratio Alcohol Self-Administration

- Nine sessions
- S1 (Empty) Max duration 15 s on first trial only
- S2 (Alcohol) Max duration 10 s after completing step requirement
- After first trial, increasing step requirement: step=4
  - First trial, 1 response required; Second trial, 1+4 responses required...
- When a rat failed to reach the next step requirement, or stopped responding to S1 for 10 consecutive minutes, the session terminated.
- Breakpoint: the number of responses made on the last completed trial.

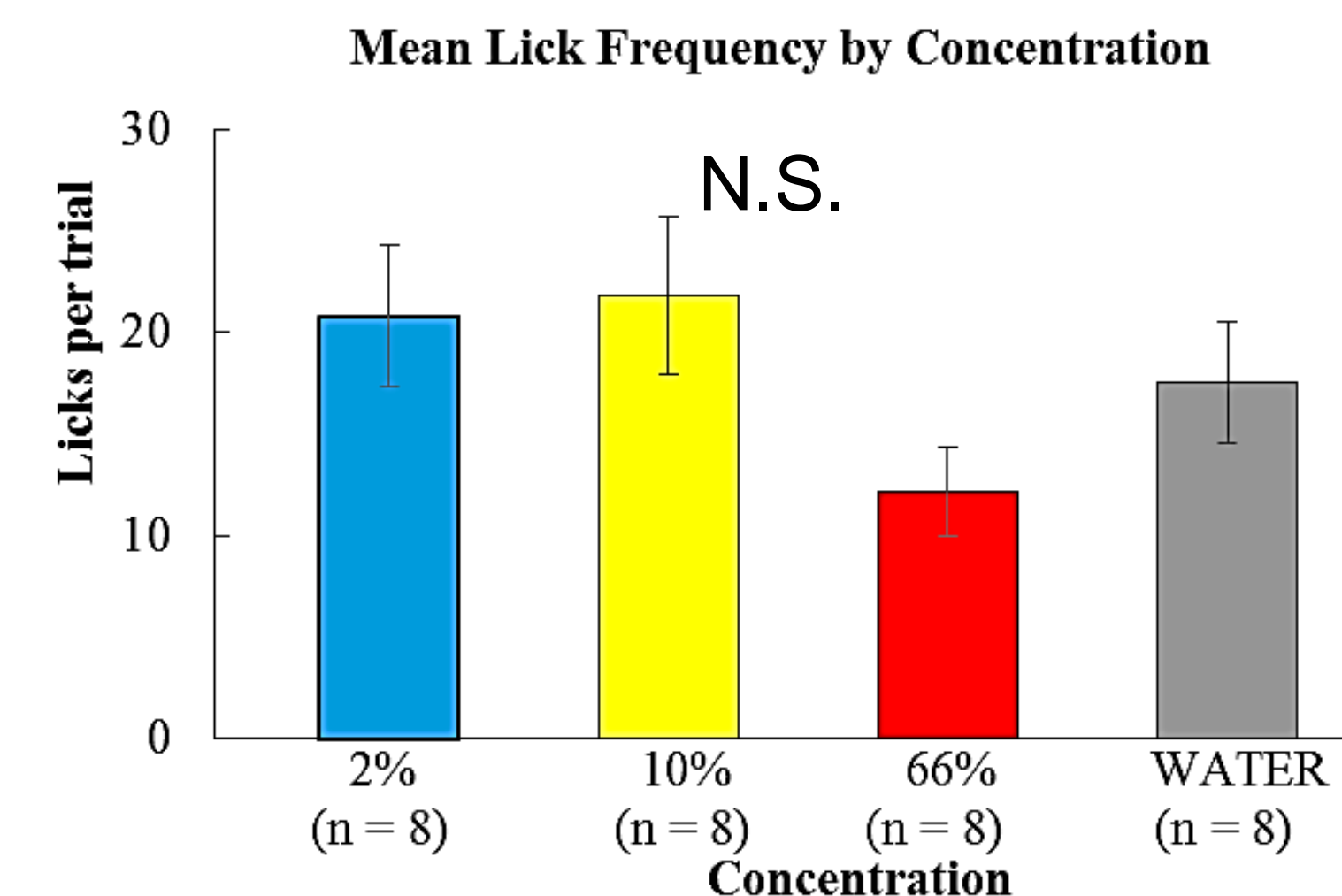
### PHASE 3: Progressive-Ratio Water Self-Administration

- Three sessions
- Same conditions as Phase 2. All animals received access to water for three consecutive sessions to assess for the reward value of water.

### Breakpoint to S1



### Mean Licks to S2



## Results

- Breakpoints were similar across alcohol concentrations, though, rodents exhibited less response effort for 0% (water).
- Mean lick frequency to S2 was similar for 0, 2, and 10% alcohol, and lower for high concentration, 66% alcohol.

## Conclusions

- Alcohol has rewarding value relative to water.
- Surprisingly, alcohol concentrations ranging between 2 and 66% have similar reward value.
- Studies have shown that a non-selective orexin-1 receptor antagonist, SB-334867, can decrease alcohol consumption (Anderson et al., 2014).
- Future research will explore doses of SB-334867 with the goal of decreasing alcohol self-administration under progressive ratio conditions.

## References

- Anderson, R., Becker, H., Adams, B., Jesudason, C., & Rrick-Kehn, L. (2014). Orexin-1 and orexin-2 receptor antagonists reduce alcohol self-administration in high-drinking rodent models. *Frontiers in Neuroscience*, 8, 33.
- Jupp, B., Krivdic, B., Krstew, E., & Lawrence, A.J. (2011). The orexin-1 receptor antagonist SB-334867 dissociates the motivational properties of alcohol and sucrose in rats. *Brain Research*, 1291(1), 54-59.
- National Institute on Alcohol Abuse and Alcoholism. (2017). Alcohol use disorder. Retrieved February 2019 from <https://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/alcohol-use-disorders>