

# Generalizability of a Fixed-Interval Intervention Effects on Impulsive Choice in Rats

Carrie Bailey<sup>1\*</sup>, Andrew T. Marshall<sup>2</sup>, Jennifer R. Peterson<sup>3</sup>, Aaron Schnegelsiepen<sup>1</sup>, Sarah L. Stuebing<sup>1</sup>, & Kimberly Kirkpatrick<sup>1</sup> <sup>1</sup>Kansas State University, <sup>2</sup>University of California, Irvine, <sup>3</sup>University of Alaska, Fairbanks

#### **INTRODUCTION** RESULTS Impulsive choice refers to choosing a smaller, sooner **Order:** LL Delay $\rightarrow$ LL Magnitude **Order:** LL Magnitude $\rightarrow$ LL Delay reward (SS) over a larger, later reward (LL) when the LL reward is the more advantageous option.<sup>1</sup> Impulsive choice involves trade-offs between reward delay and reward magnitude.<sup>2</sup> **≁**FI Higher rates of impulsivity are associated with ADHD, 0.8 0.8 Choices) Choices) ••·ND substance abuse, and gambling in humans.<sup>3,4</sup> It is important to develop neurocognitive interventions to 0.6 0.6 address disorders that involve heightened impulsive (LL Proportion (LL choice. Proportion 0.4 0.2 0.4 Precursor study: **←**FI Rats exposed to a fixed-interval (FI) time-based 0.2 •••ND intervention which involved extensive exposure to the SS and LL delays resulted in decreased impulsive

choice lasting a 9-month period

- Purpose: Assess the generalizability of the FI time-based intervention across LL delay and magnitude choice tasks.
- Hypotheses:
- If the time-based intervention is selective in affecting delay processes, then the intervention should generalize to an LL delay task.
- If the time-based intervention produces a general improvement in choice behavior, then the results should generalize to both LL delay and LL magnitude tasks.

## METHODS

- Animals: 36 experimentally-naïve male Sprague-Dawley
- Rats were randomly assigned into two groups, fixed interval intervention or the no delay control group
  - Fixed interval (FI)
    - SS: 10s, 1 pellet (60s ITI)
    - LL: 30s, 2 pellets (60s ITI)
  - No Delay (ND)
    - SS: No delay, 1 pellet (70s ITI)



### LL Delay (seconds)

Figure 1. Initial testing on LL delay task. Both the FI and ND groups decreased their LL choices as the LL delay increased. The FI group made more LL choices, showing positive effects of the intervention in delay sensitivity and increasing self-control at the longer LL delays.





Figure 2. Initial testing on LL magnitude task. Both the FI and ND groups increased their LL choices as the LL magnitude increased. The FI group made more LL choices, indicating that the intervention decreased reward magnitude sensitivity and improved self-control at the smaller LL magnitudes.



• LL: No delay, 2 pellets (90s ITI)

- To assess generalizability of the intervention, all rats completed two impulsive choice tasks
  - LL Delay Manipulation
    - SS: 10s, 1 pellet
    - LL:  $15s \rightarrow 30s \rightarrow 45s$ , 2 pellets
  - LL Magnitude Manipulation
    - SS: 10s, 1 pellet
    - LL: 30s, 2 pellets  $\rightarrow$  3 pellets  $\rightarrow$  4 pellets

LL



#### LL Magnitude (pellets)

Figure 3. Testing on LL magnitude task following LL delay task. Both the FI and ND groups increased their LL choices as the LL reward magnitude increased The FI group made more LL choices than their ND counterparts, but there was no significant intervention effect.

**CONCLUSIONS** 

**Task 1:** The FI intervention increased LL choices in the first

task that the animals experienced for both LL delay and LL

magnitude and delay tasks suggests that the FI intervention is

addressing a general choice mechanism, this effect appears to

magnitude tasks are experienced. This suggests that there is a

magnitude manipulations, replicating previous findings.

Though the generalizability of the intervention to both

be dependent upon the order in which the delay and

significantly affected by the intervention.

failure to transfer across multiple tasks.

**Task 2:** Their choice behavior in the second task was not

Figure 4. Testing on LL delay task following LL magnitude task. Both the FI and ND groups decreased their LL choices as the LL delay increased. The FI group tended to make fewer LL choices and showed a steeper slope indicating increased sensitivity to delay following the magnitude task.

### REFERENCES

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\*cturpen@ksu.edu