Females in the forefront: The effects of a temporal intervention on impulsive choice in Sprague Dawley rats
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INTRODUCTION

• Impulsive choice: Preference for a smaller-sooner (SS) outcome when a later-later (LL) outcome is advantageous in terms of reward rate
• More impulsive male Sprague Dawley rats exhibited poorer discrimination between temporal durations, and greater aversion to longer reward delays
• Time-based neurocognitive interventions improved self-control (i.e., reduced impulsive choice) and increased male rats’ timing precision
• There has been little research on female rats’ impulsive choice and timing behavior, as well as neurocognitive intervention effects on these phenomena
• Experimental goals: Determine the effect of a time-based neurocognitive intervention on impulsive choice and timing behavior in female rats

METHODS

• 24 experimentally-naïve female Sprague Dawley rats

DATA ANALYSIS

Impulsive Choice

• Measure:
  - SS vs. LL choices ($SS = 0; LL = 1$)
• Statistical Analysis:
  - Generalized linear mixed effects models
  - Distribution: binomial; Link: logit
• Analytical Approach:
  - Determined best random-effects structure
  - Then, determined best fixed-effects structure added to random-effects structure
• Model Selection:
  - Akaike Information Criterion (AIC)
• Final Model:
  - Fixed Effects: Intercept, Group*, Pre/Post, Group*SS Delay*Session, Pre/Post*SS Delay*Session
  - Random Effects: Intercept, Session, Pre/Post*SS Delay

Interval Timing

• Measure:
  - Response rate (responses per minute) in peak trials
• Curve Fitting Analysis:
  - $r + A\phi(\mu, \sigma)$
  - $r$: Baseline (operant) level of responding
  - $A$: Scaling parameter
  - $\phi(\mu, \sigma)$: Gaussian probability density function
• Derived Measures:
  - Peak time (accuracy): $\mu$
  - Peak spread (precision): $\sigma$
  - Peak rate: Value of equation at $\mu$
  - Peak coefficient of variation: $\sigma/\mu$
• Statistical Analysis:
  - Linear regression
  - Predictors: Group, Pre/Post, SS Delay for SS and LL levers
  - Measures: Peak time, spread, rate, coefficient of variation (CV)

RESULTS

• Post-intervention LL choice increased in Intervention, decreased in Control Group
• Half of the intervention rats made more LL choices post-intervention, whereas the control rats were more mixed
• Greater pre-intervention sensitivity to SS delay

• Increased timing precision (decreased spread) post-intervention in both groups
• Larger post-intervention increase in LL peak rate in Intervention Group

DISCUSSION

• Females show a significant intervention effect, demonstrating generality of the time-based intervention across the sexes
• However, unlike male rats, the females did not display increases in timing precision (spread) post-intervention
• The results indicate that the time-based intervention in female rats may act more on motivational mechanisms, such as delay tolerance rather than specific core timing processes

REFERENCES


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