



# Measurement of impulsive choice in rats:

## I. Preliminary assessment



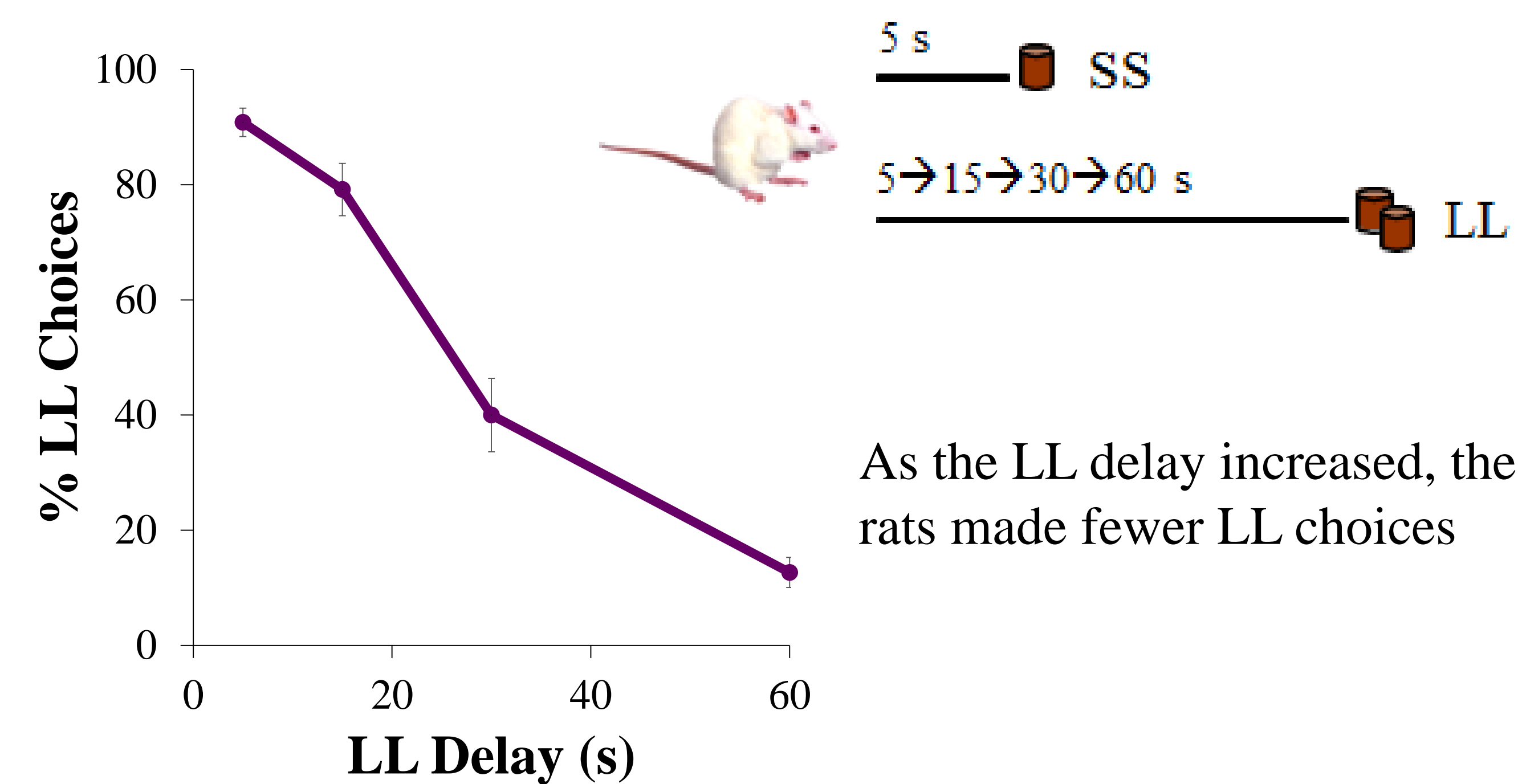
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### Introduction

- Impulsive choice underlies maladaptive behaviors such as gambling, substance abuse, and obesity
- Different procedures are used to assess choice behavior between a smaller-sooner (SS) versus a larger-later (LL) reward, with choices of the SS indicating impulsivity
- The procedures are all assumed to measure the same underlying construct, despite differences in task demands
- The current experiment compared Green & Estle (2003), Evenden & Ryan (1996) and Mazur (1987) procedures
- Rats were initially trained on Green & Estle (G&E)
- Then, they were trained with either Evenden & Ryan (E&R) or Mazur (M)

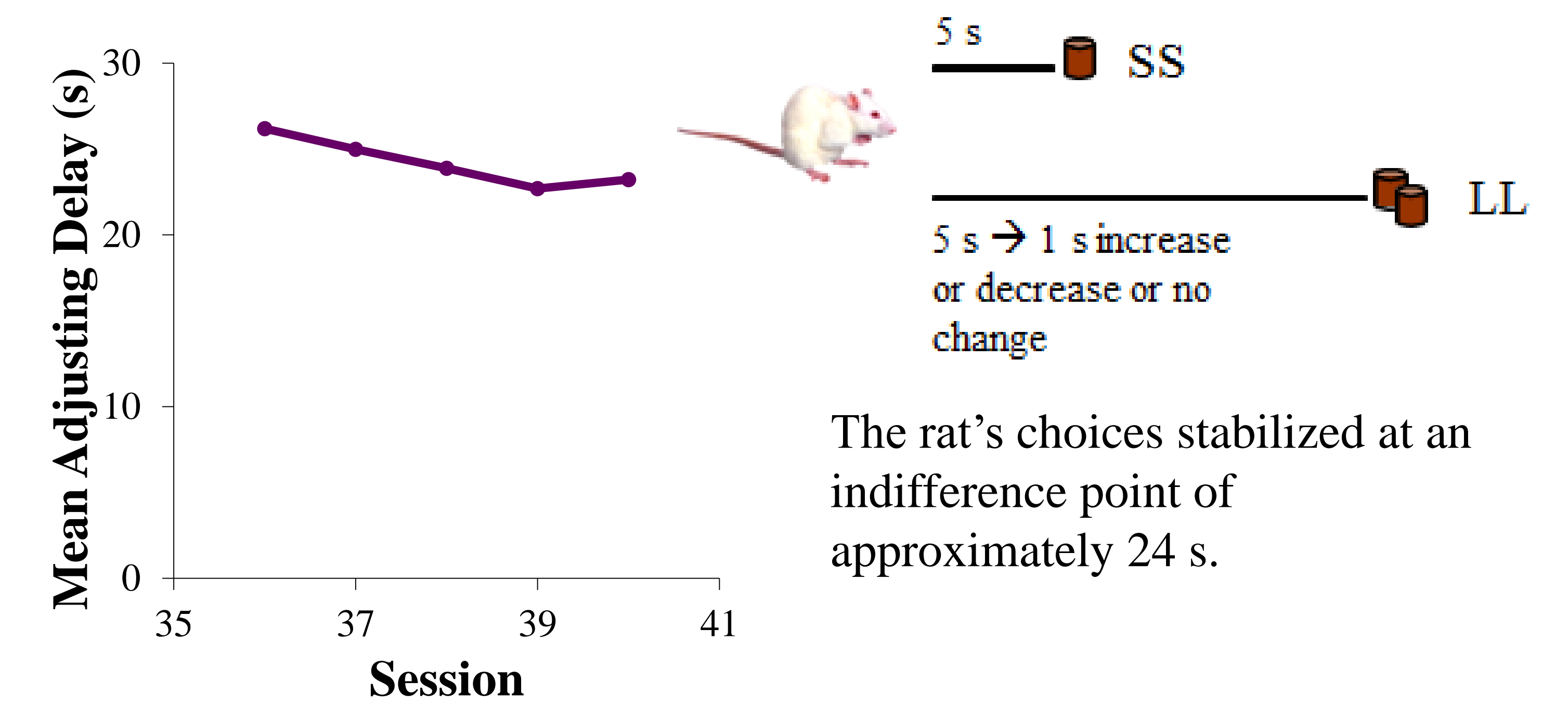
### Evenden & Ryan (E&R)

- 12 male Sprague-Dawley rats
- 20 4-trial blocks each day
- 2 Forced Choice and 2 Free Choice per block
- LL delay increased *systematically* across blocks within each session



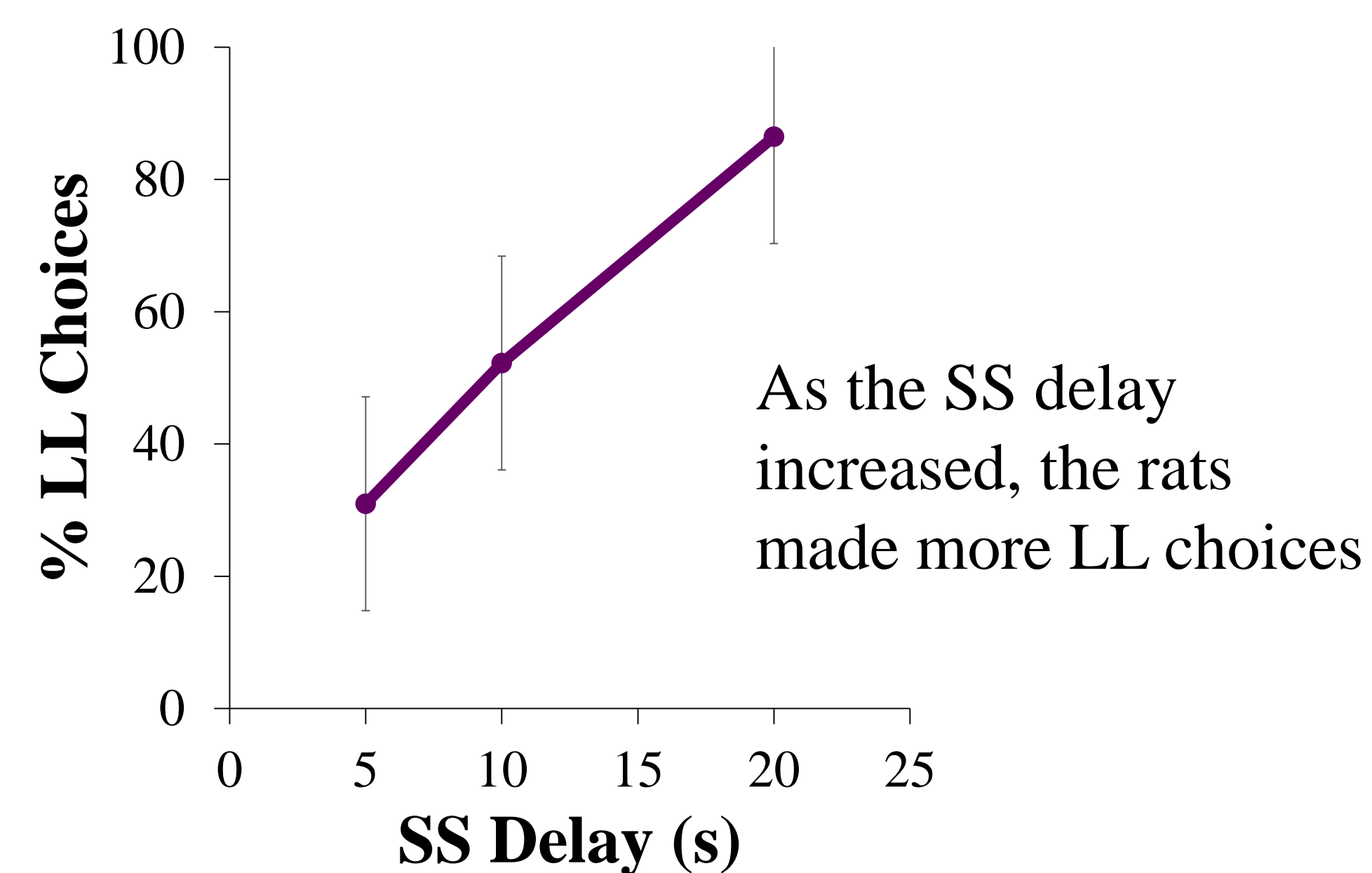
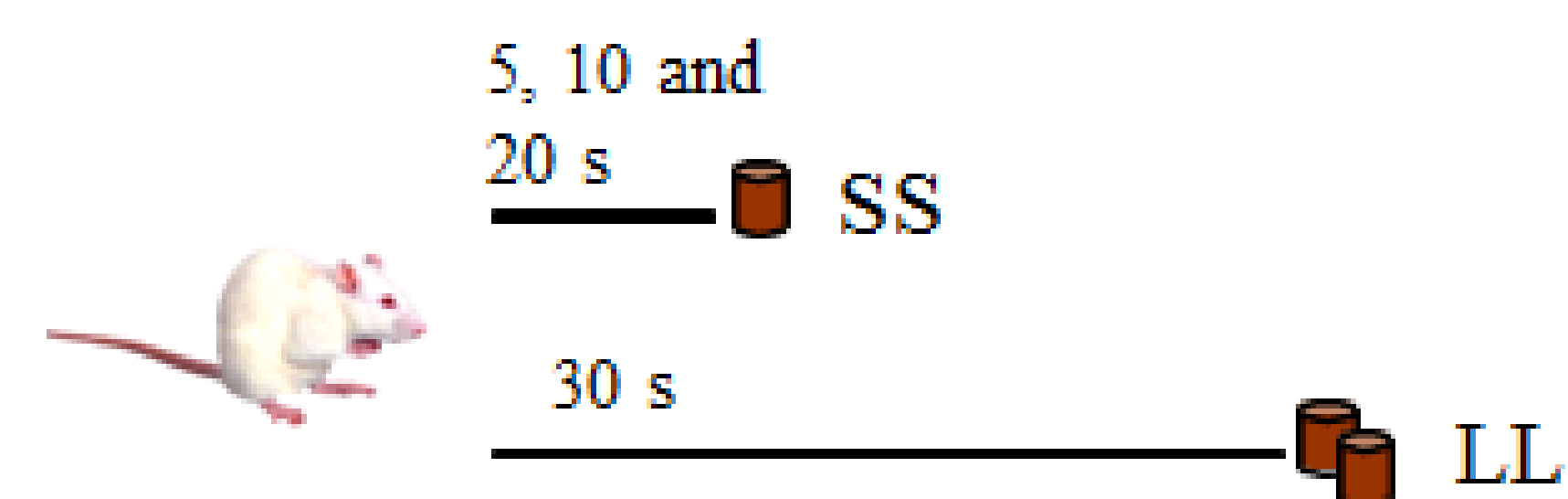
### Mazur (M)

- 12 male Sprague-Dawley rats
- 20 4-trial blocks each day
- 2 Forced Choice and 2 Free Choice per block
- LL delay *adjusted* depending on the choices in each block



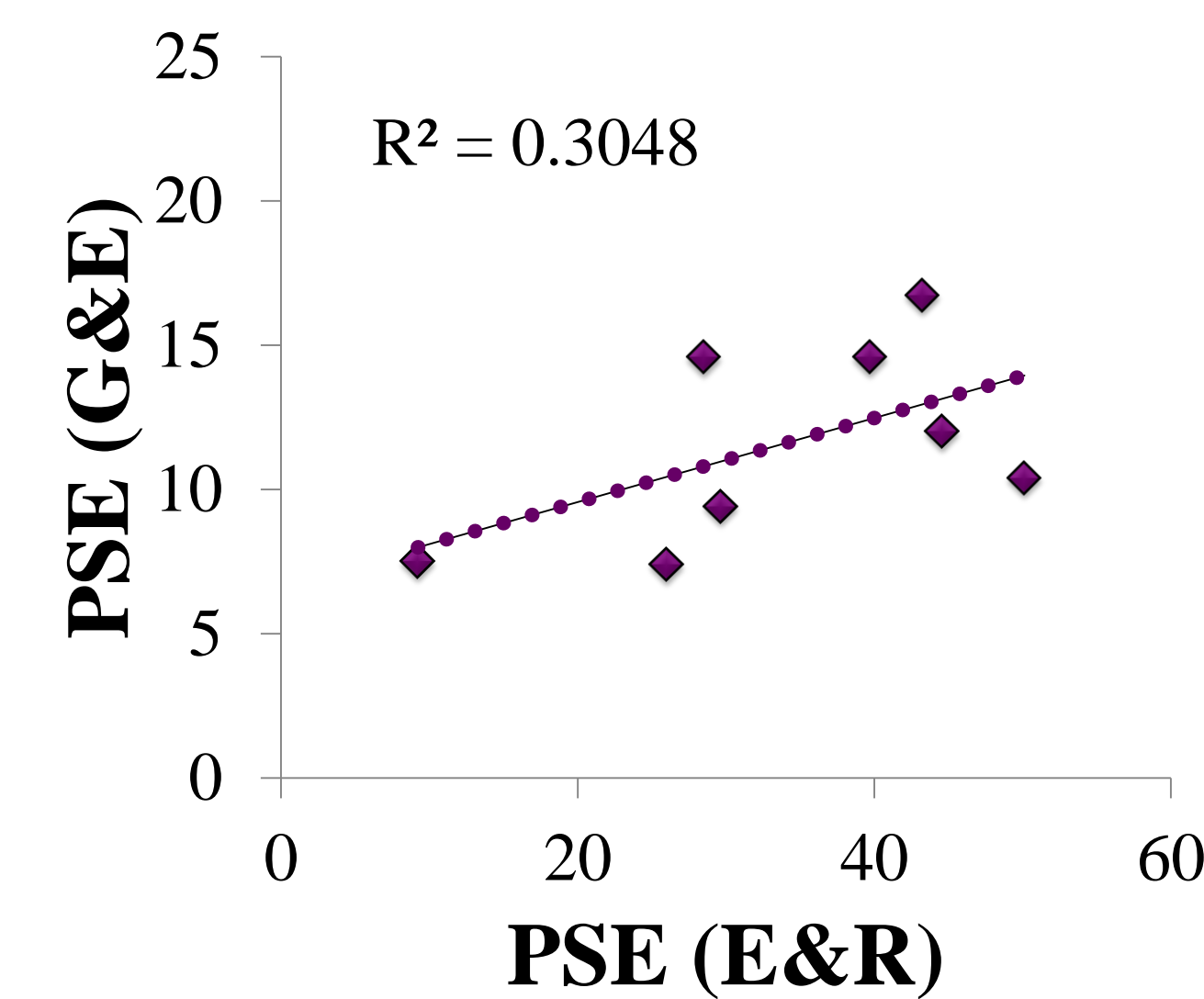
### Green & Estle (G&E)

- 24 male Sprague-Dawley rats
- 20 4-trial blocks each day
- 2 Forced Choice and 2 Free Choice per block
- SS delay increased *systematically* across phases

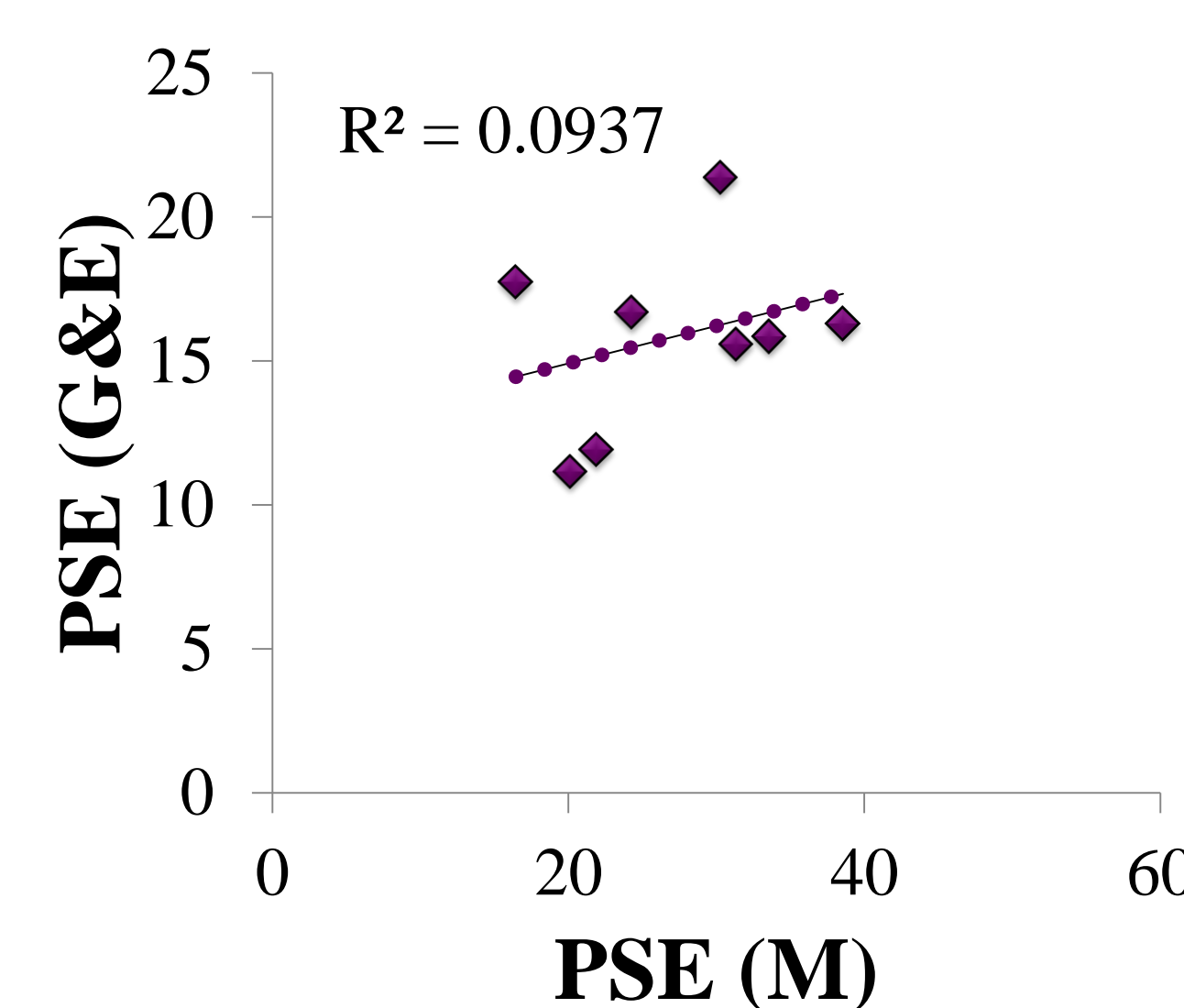


### Comparison of Procedures

#### G&E vs. E&R

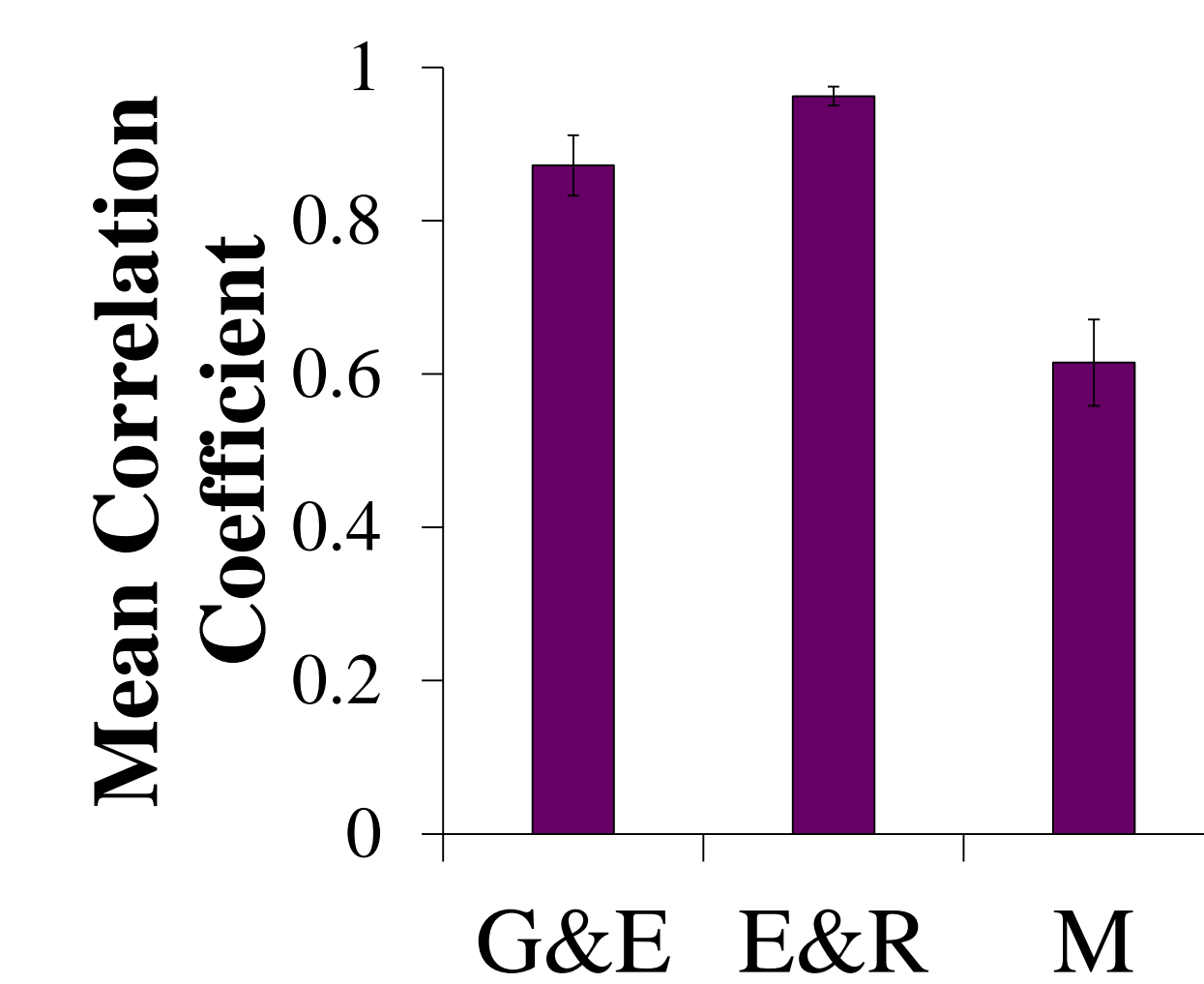


#### G&E vs. M



- A comparison of choice behavior across procedures used the point of subjective equality (PSE) for each rat
- The PSEs were positively correlated, and the two systematic procedures were significantly correlated
- M and E&R had higher mean PSEs than G&E

Median response time computation



- A median response time measure was correlated with the SS or LL delay on each trial
- Both systematic procedures had significantly higher correlations than the adjusting procedure

### Discussion

- The G&E procedure resulted in lower PSEs compared to the other two procedures
  - This may have been because the G&E procedure manipulated SS delay whereas the E&R and M procedures manipulated LL delay
- The two systematic procedures were more highly correlated at the individual differences level, suggesting greater shared task variance
- The difference in the correlation between LL or SS delay and median response time suggests that:
  - Rats on both systematic procedures tracked the delays to reward
  - Rats on the adjusting procedure did not track the LL delays as strongly, perhaps due to the frequent changes in delay
- Therefore, different mechanisms could be influencing choice and timing measurements across the three procedures
- Further research should examine factors that may lead to shared versus different processes (See Poster 44)

### References

Evenden, J. L., & Ryan, C. N. (1996). The pharmacology of impulsive behavior in rats: the effects of drugs on response choice with varying delays to reinforcement. *Psychopharmacology (Berlin)*, 128, 161-170.  
 Green, L., & Estle, S. J. (2003). Preference reversals with food and water reinforcers in rats. *Journal of the Experimental Analysis of Behavior*, 79(2), 233-242.  
 Mazur, J. E. (1987). An adjusting procedure for studying delayed reinforcement. In M. L. Commons, J. E. Mazur, J. A. Nevin & H. Rachlin (Eds.), *Quantitative analyses of behavior, Vol. 5. The effect of delay and of intervening events on reinforcer value* (pp. 55-73). Hillsdale, NJ: Erlbaum.

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