



# Predictors of impulsive choice behavior



Aaron Smith, Tiffany Galtress and Kimberly Kirkpatrick

KANSAS STATE UNIVERSITY

## Introduction

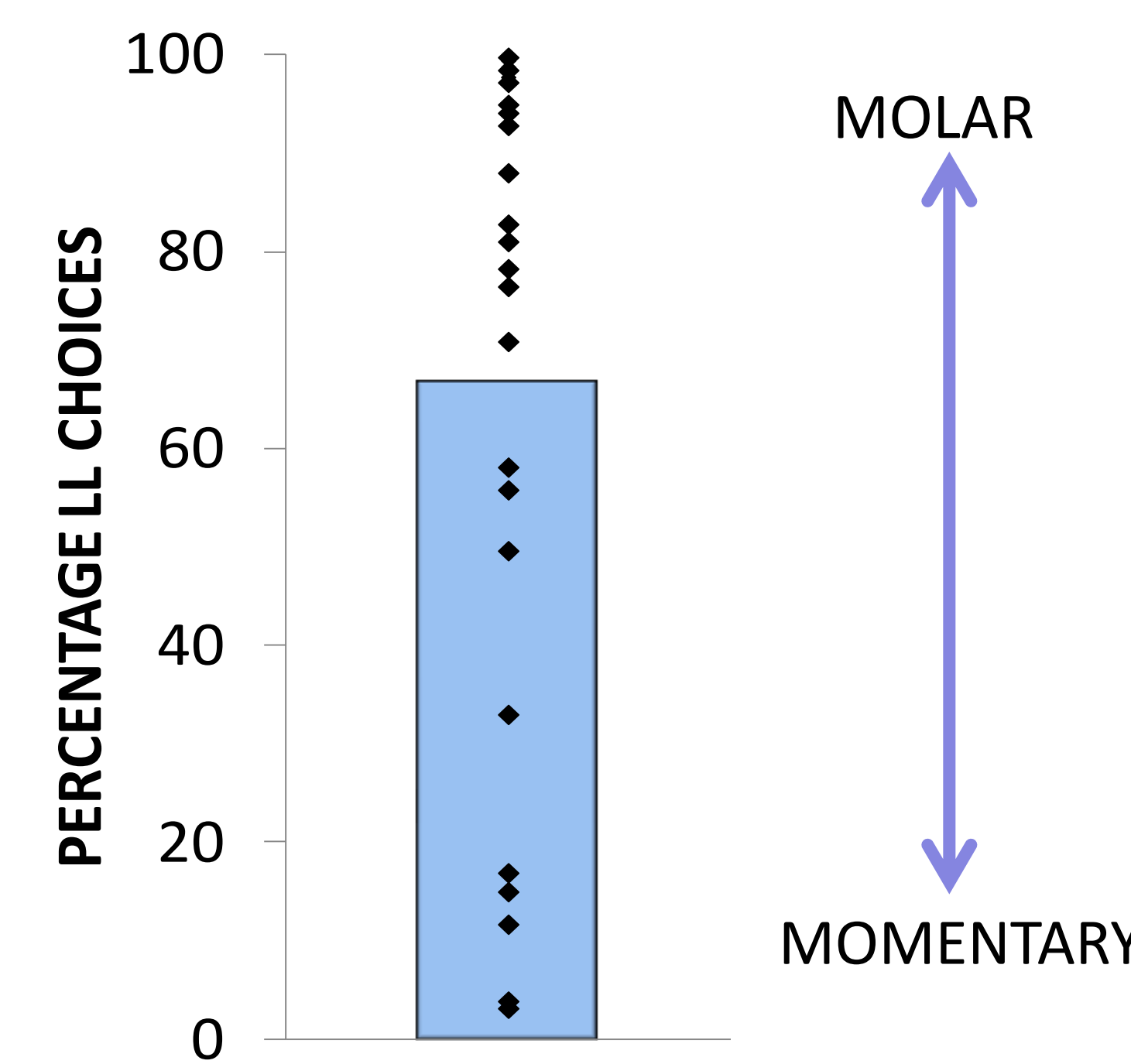
Molar maximizing leads to choices that yield the most efficient reward delivery over a longer time frame, whereas momentary maximizing leads to choices that yield greater reward in the short term, yet over time may be less efficient in maximizing reward. To assess differences in molar vs. momentary maximizing in an impulsive choice task, rats were trained to choose between a smaller-sooner (SS) reward of 1 pellet after 10 s versus a larger-later (LL) option of a 2 pellets after 30 s (**Baseline Choice**). A 120-s inter-trial interval (ITI) was given between subsequent choice trials. Momentary maximizing of reward would result in a preference for the SS option, which resulted in a high local rate of reinforcement. However, taking the ITI into account, molar maximizing by choosing the LL option was the most efficient strategy in terms of maximizing reward over the session. This study aimed to assess molar versus momentary maximizing and also determine whether the likelihood of exhibiting either choice strategy could be moderated by a change in motivational state (**Choice with Satiety**), or predicted by other behavioral tasks that measured response efficiency (**Differential Reinforcement of Low Rate**) and motivation to work for different magnitudes of reward (**Progressive Ratio**).

## Method

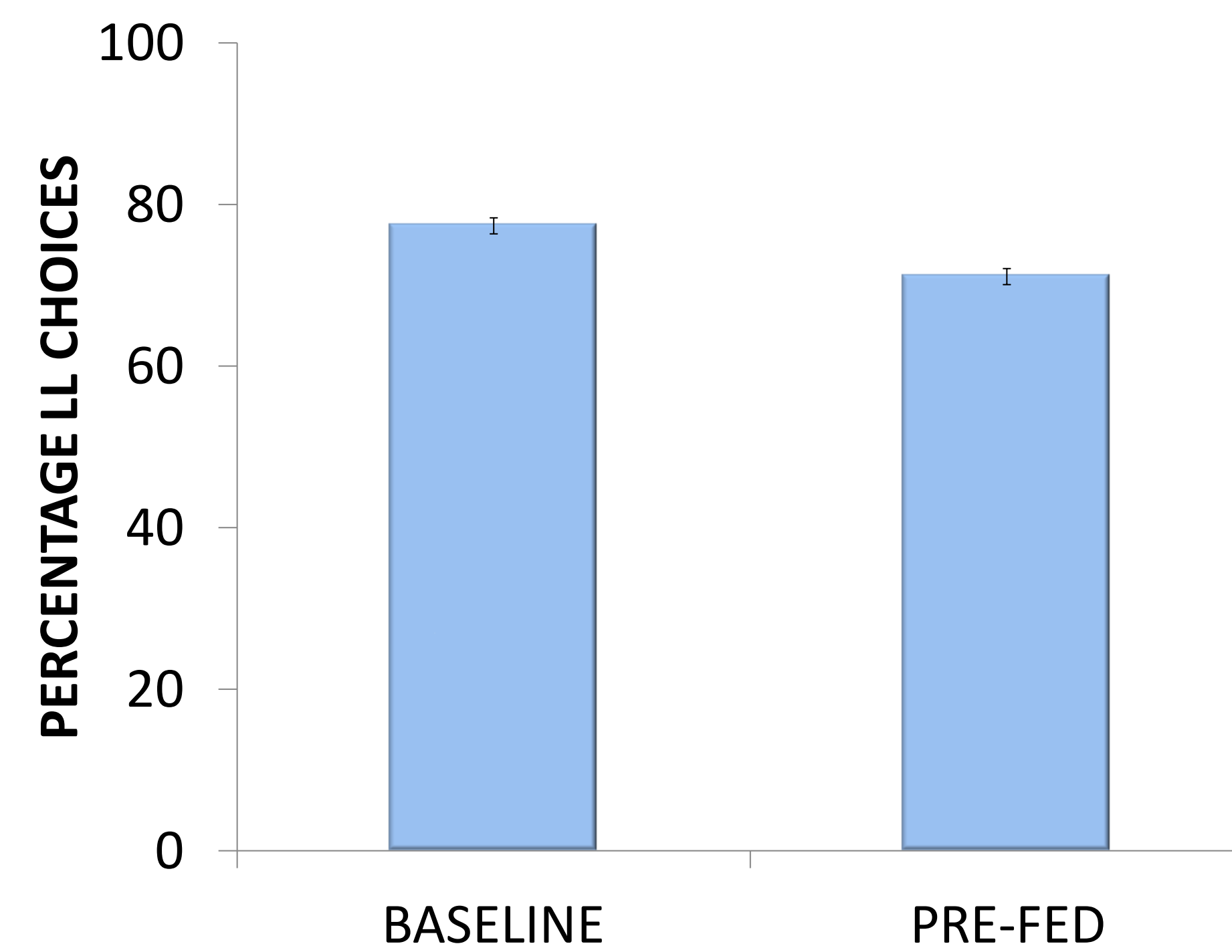
TASK	DESCRIPTION
Baseline Choice	SS: 10 s, 1 pellet vs. LL: 30 s, 2 pellets
Differential Reinforcement of Low Rate	DRL 10 s (n = 8) DRL 30 s (n = 8) DRL 10 s and DRL 30 s (n = 8)
Choice with satiety	Baseline Choice → Pre-feeding Choice
Progressive Ratio	PR 3, 1 pellet → PR 3, 4 pellets

## Results

**Figure 1.** The impulsive choice task revealed a wide range of choice behavior with evidence of a preference for molar maximizing (high LL choice) and momentary maximizing (low LL choice) in individual rats (diamonds)



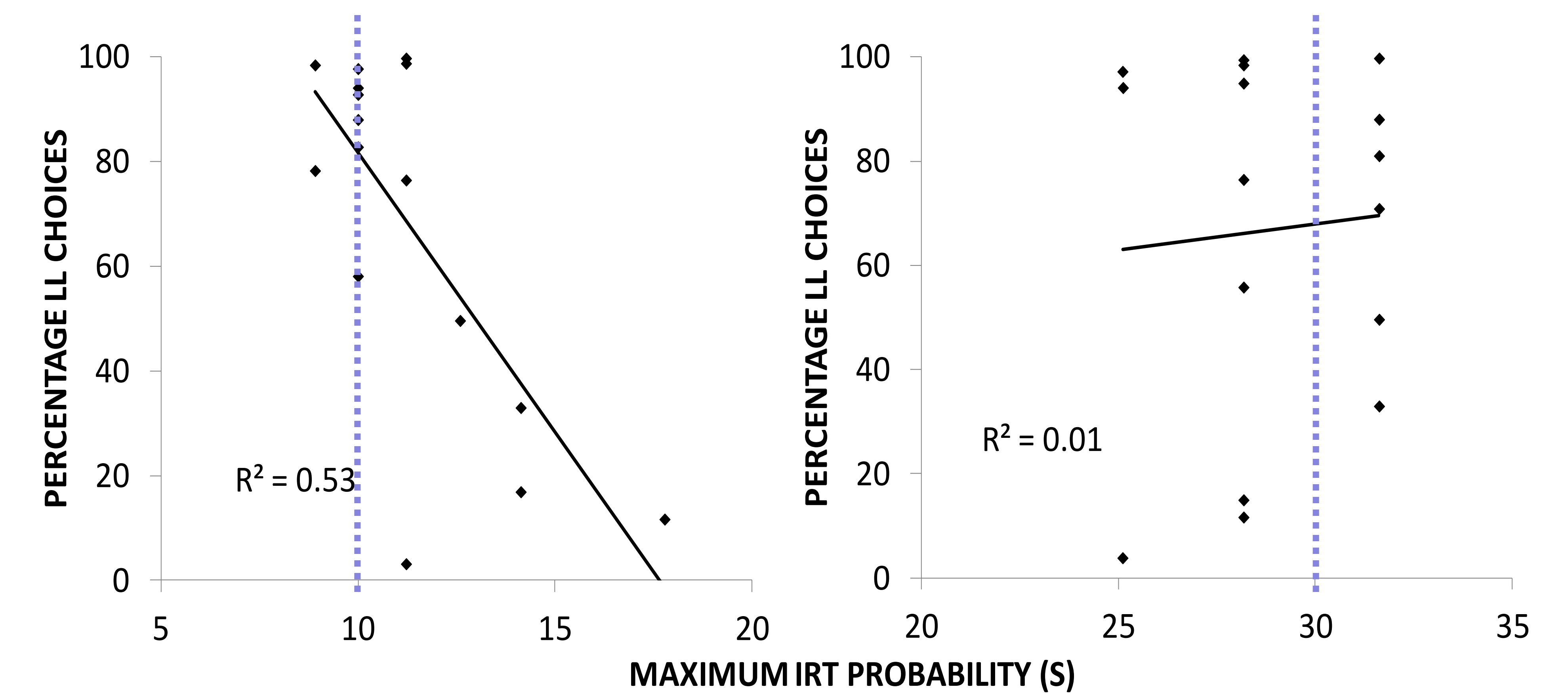
**Figure 2.** Pre-feeding prior to the session increased momentary maximizing, shown through a decrease in LL choices



## Conclusion

Choice behavior was moderated by motivation levels within the choice task and predicted by performance on other related behavioral tasks: Reducing motivational state increased momentary maximizing, whereas efficient responding for reward and greater incentive motivation to work for large reward predicted molar maximizing.

**Figure 3.** Rats that produced more efficient inter-response times (IRT) on the DRL 10-s schedule were more likely to show molar maximizing in the impulsive choice task (left panel). There was no correlation between response efficiency on the DRL 30-s schedule and choice behavior (right panel)



**Figure 4.** Rats that showed greater increases in motivation to work for an increased reward magnitude (measured by a discrimination ratio of breakpoints on the PR schedule with 1 vs. 4 pellets) were more likely to show molar maximizing in the impulsive choice task

