



Diet-induced impulsivity: The effect of high-fat and high-sugar diets on the mechanisms of impulsive choice



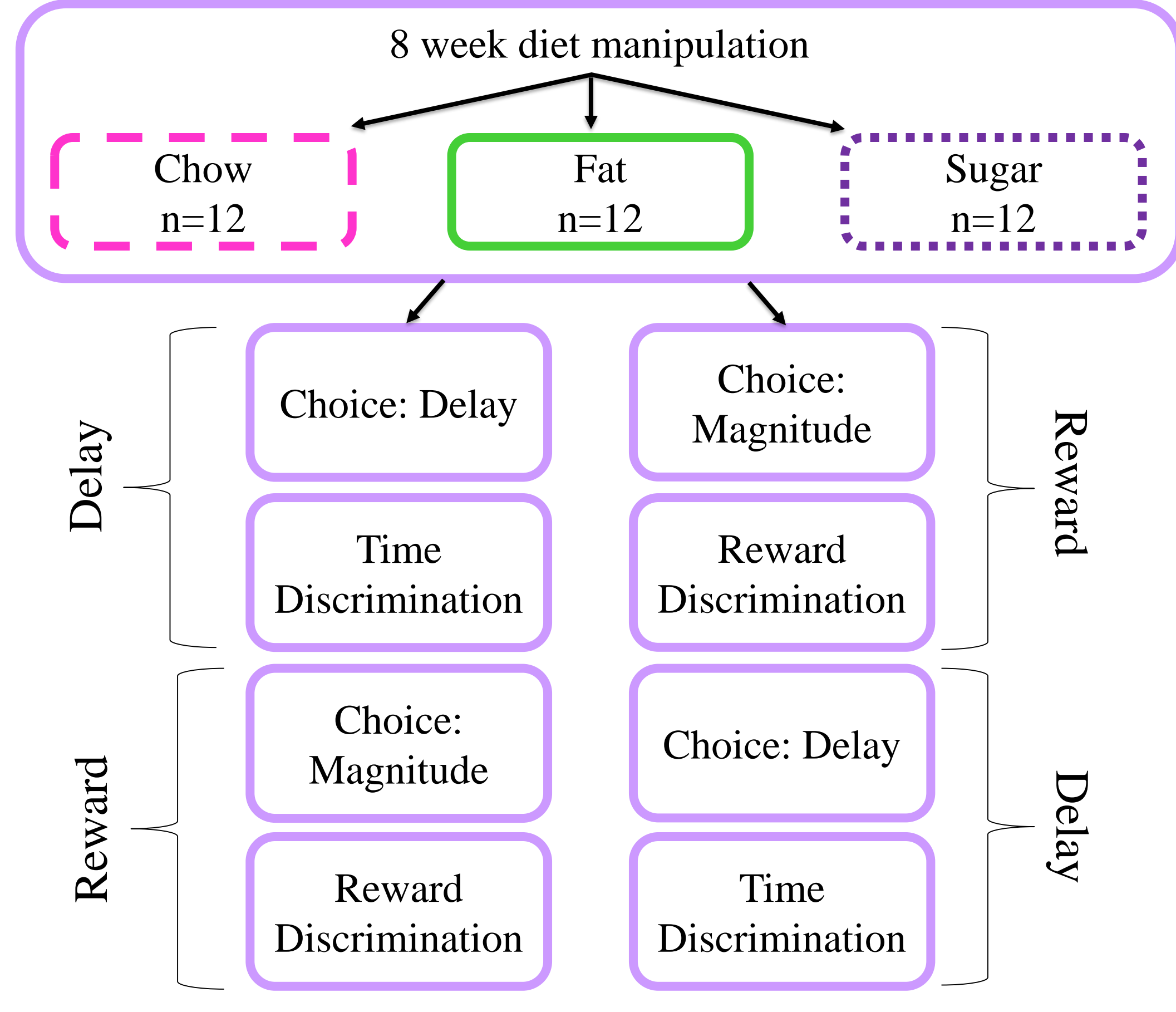
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Introduction

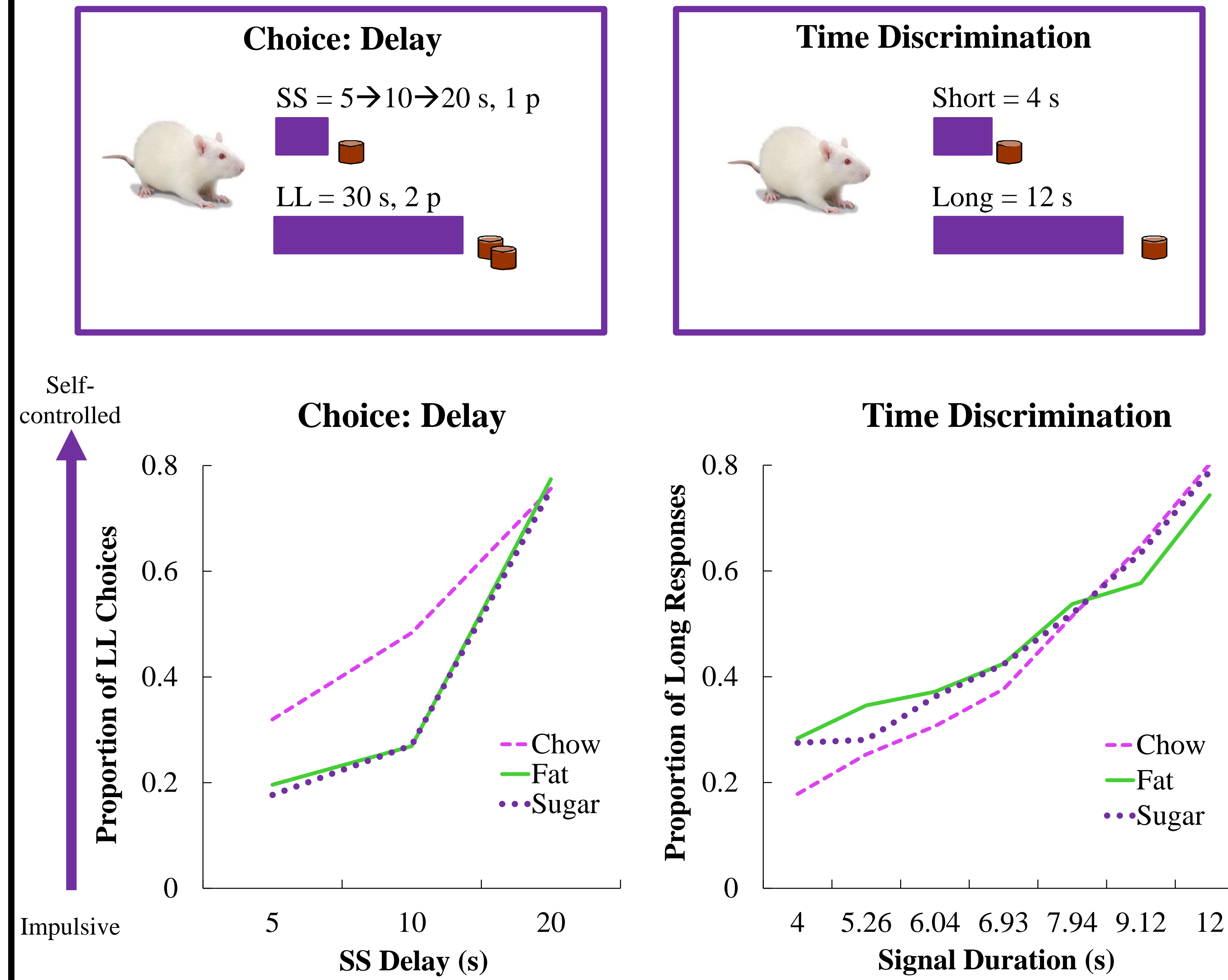
- Impulsive choice is implicated as a possible factor leading to the obesity epidemic
 - People who are obese make more impulsive decisions¹
 - People who eat diets high in fat and sugar are more impulsive²
- Rodent models, which demonstrate causal effects of diet on behavior, have shown that diets high in fat or sugar induce impulsive behavior³, as indicated by a preference for the smaller-sooner (SS) reward over the larger-later (LL) reward. This may explain the relationship between obesity and impulsive choice
- Time and reward discrimination deficits have been implicated as mechanisms leading to impulsive behavior.⁴ However, the direct effects of diet on time and reward discrimination are unknown
- Current study: Determine the effect of long-term exposure of high-fat and high-sugar diets on the mechanisms of impulsive choice to determine deficits that could be targeted in behavioral interventions

Methods

- Subjects: 36 male Sprague Dawley rats
- 8 week diet manipulation
 - Chow: 100% rat chow
 - Fat: 60% rat chow and 40% Crisco
 - Sugar: 60% rat chow and 40% powdered sugar
- Behavioral testing
 - Two impulsive choice tasks (delay and magnitude) to test the effect of diet on impulsive choice
 - Two discrimination tasks (time and reward discrimination) to test the effect of diet on the mechanisms of impulsive choice
- Data analysis: multilevel logistic regression



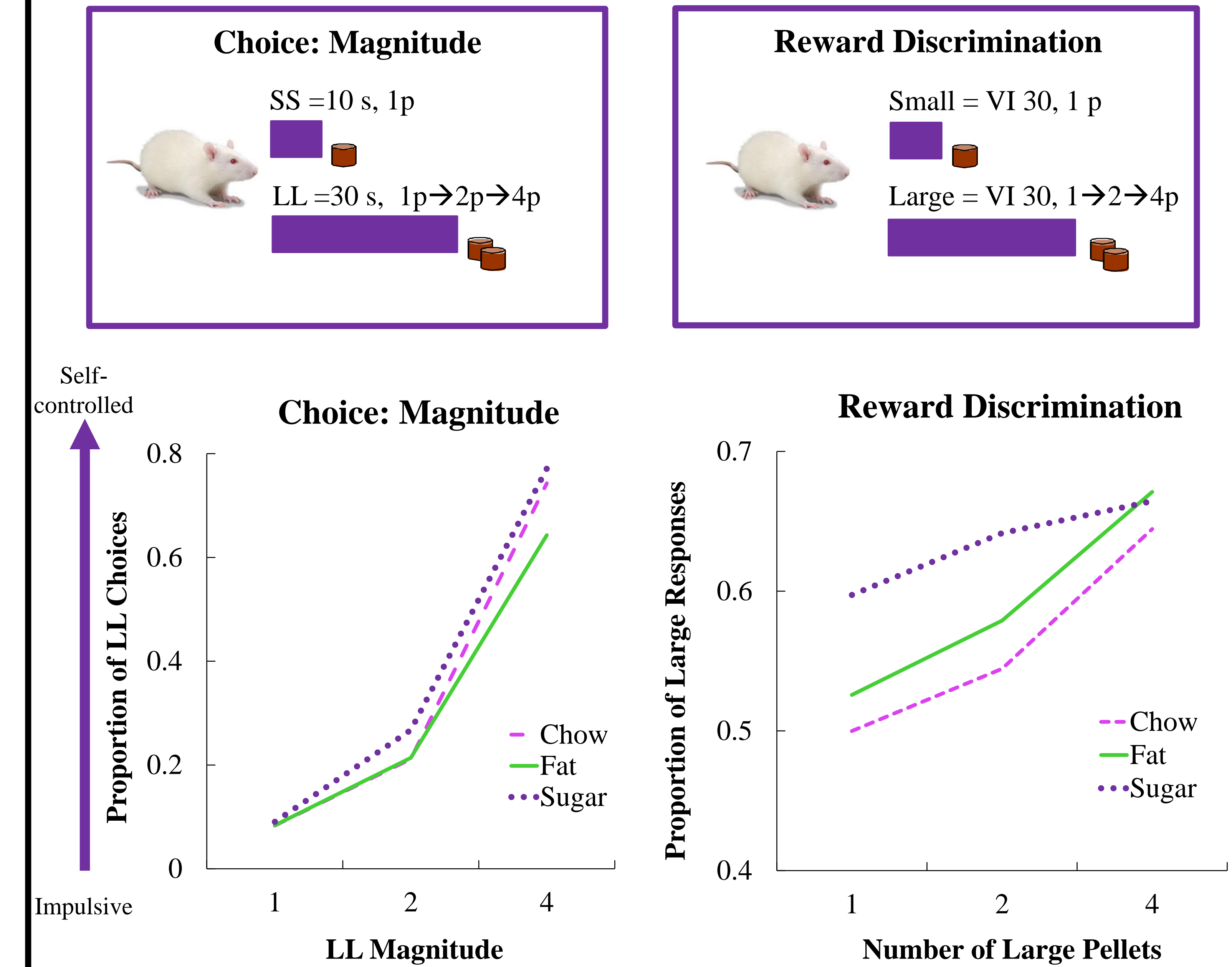
Delay



Results

- Impulsive Choice: Delay**
- High-fat and high-sugar diets led to more impulsive choices when the SS delay was 5 and 10 s.
- Time Discrimination**
- High-fat diet led to deficits in overall time discrimination ability.
 - High-sugar diets led to reduced sensitivity to shorter delays compared to chow rats.
- Summary:** Diet-induced impulsive choice seen on the delay task may be a result of timing deficits, particularly in the high-fat diet group.

Reward

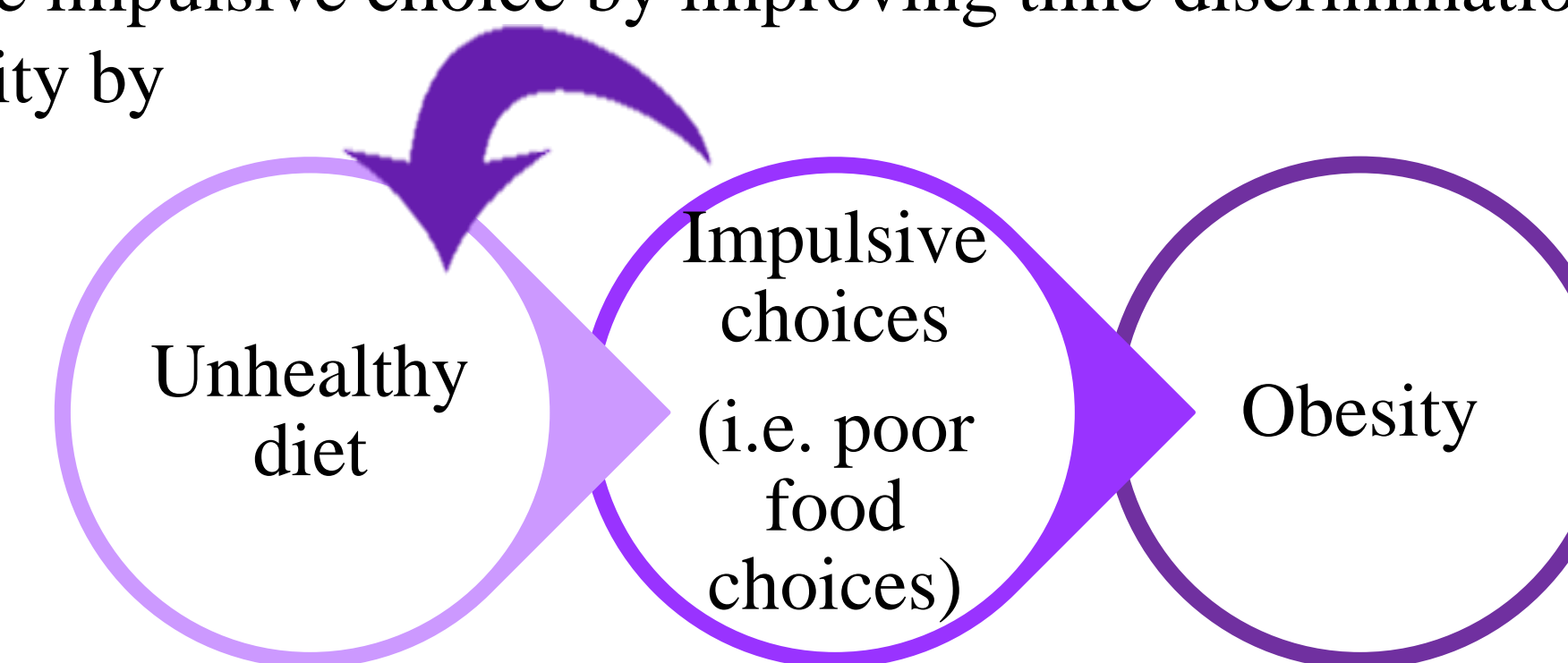


Results

- Impulsive Choice: Magnitude**
- The high-sugar diet led to more self-controlled choices when the LL magnitude was 2 and 4 pellets.
 - High-fat diets led to more impulsive behavior when the LL magnitude was 4 pellets.
- Reward Discrimination**
- High-fat and high-sugar diets led to an increase in preference for the larger reward.
- Summary:** Diet-induced impulsive choice was not seen on the magnitude task, and rats on a high-fat and high-sugar diet showed a preference for the larger reward

Discussion

- Diets high in fat and sugar induced impulsive behavior, likely due to deficits in time discrimination.
- Impulsive behavior was not induced by the high-sugar diet on the magnitude task, possibly due to increased preferences for the larger reward
- Despite the increased preference for the larger reward in the reward discrimination task, the high-sugar diet induced impulsive behavior on the delay task indicating the importance of time discrimination
- Time-based interventions have been shown to reduce impulsive choice by improving time discrimination⁵
- Behavioral interventions could be used to treat obesity by addressing the timing deficits that contribute to impulsive choice
- Promoting self-controlled choices may break the vicious cycle in which poor diet leads to impulsive, unhealthy food choices and potentially help reduce obesity rates



References

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