



The Effects of Dietary Exposure on Hedonic (Liking) Responses in Rats

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Introduction

- People consume foods they like, or enjoy; the high-fat and high-sugar foods typically consumed could lead to obesity.¹
- While liking and wanting are key factors in food choice², it is proposed that liking is not enough to drive food choice. Wanting is also critical.³
- In humans, obesity is characterized by greater wanting, but no differences in liking.⁴
- However, in rodents, development of obesity altered both liking and wanting.⁵
- An investigation of the role of diet on liking found that a junk-food diet did not alter the liking of sugar in Sprague Dawley rats. However, junk-food fed rats who gained weight showed reduced liking.⁶
- The current study aimed to determine the effect of long-term exposure to high-fat (HF) and high-sugar (HS) diets on dietary preferences and the wanting and liking of fat and sugar.

Methods

Subjects: 36 Male Sprague-Dawley rats
Diet manipulation (all groups had access to the same number of calories per day):

- HF: 60% rat chow and 40% Crisco
- HS: 60% rat chow and 40% powdered sugar icing
- C: 100% rat chow



Devaluation Task

- **Satiation:** Rats were satiated on one type (fat or sugar) of pellet
- **Choice Task:** Rats were given a non-reinforced choice between a previously fat-associated lever and a previously sugar-associated lever

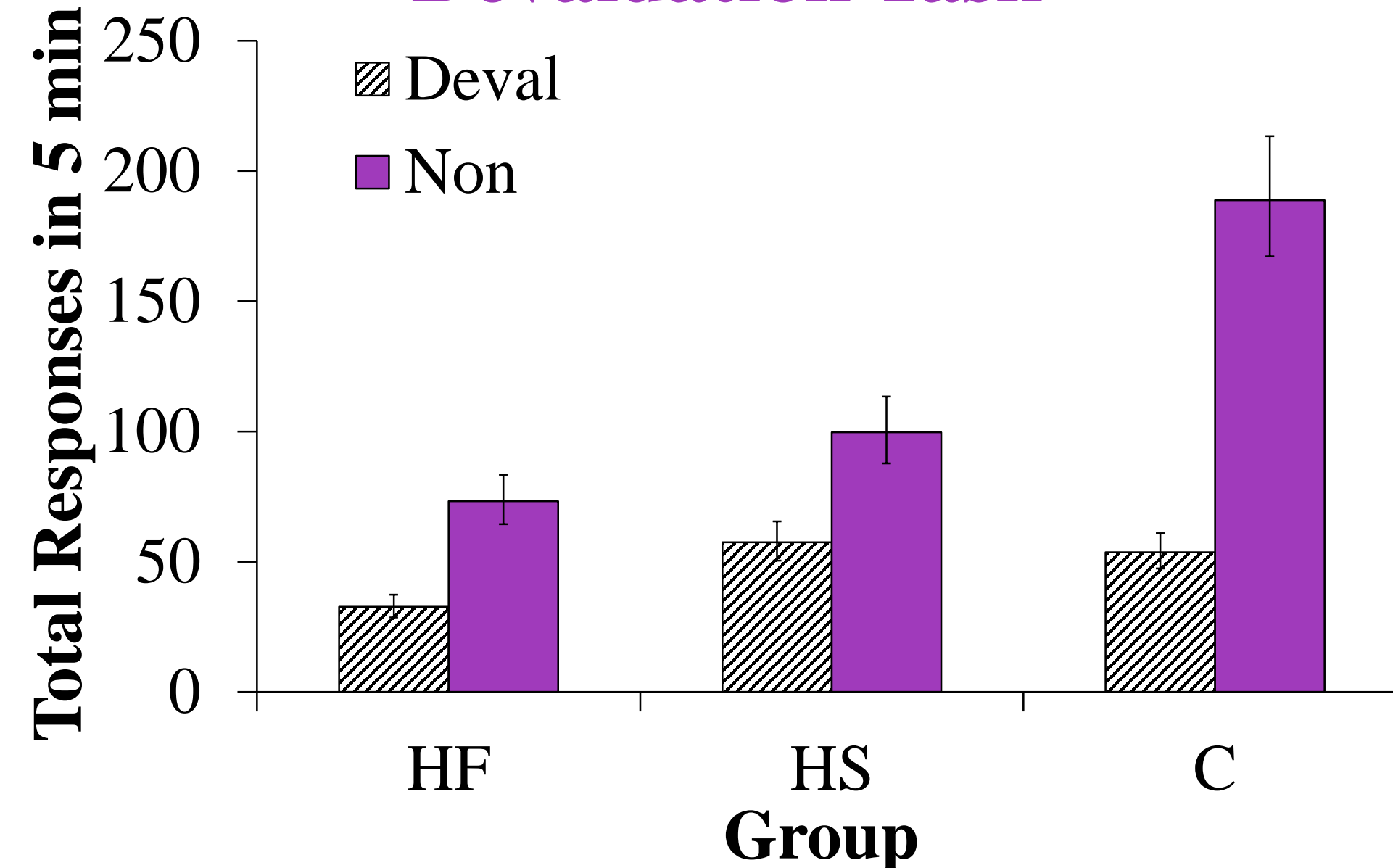
Preference Task

- **Exposure (Test 1):** Rats had access to 1 g of sugar (powdered sugar) and 1 g of fat (Crisco) for 10 min
- **Testing (Test 2-3):** Rats had access to 3 g sugar (powdered sugar) and 3 g fat (Crisco) for 1 min

Taste Reactivity Task

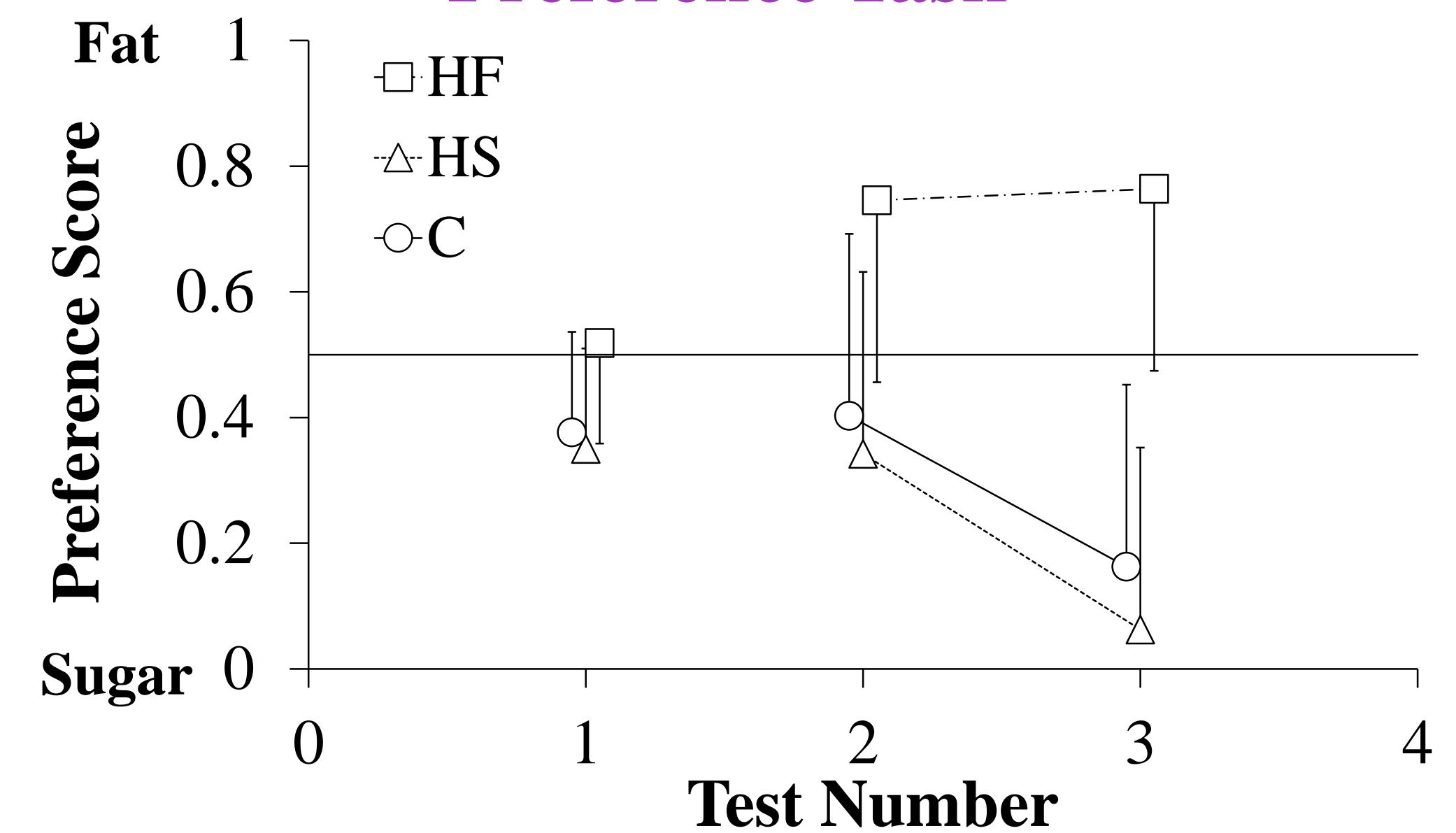
- 1mL of sucrose and corn oil solutions were infused into the mouth of the rodent through an intraoral fistula over 1 min. The proportion of time the rats spent performing hedonic (liking) responses in 60 s was measured
 - Sucrose concentrations: .01M, .1M, 1M
 - Corn oil concentrations: .06%, 1%, 32%

Devaluation Task



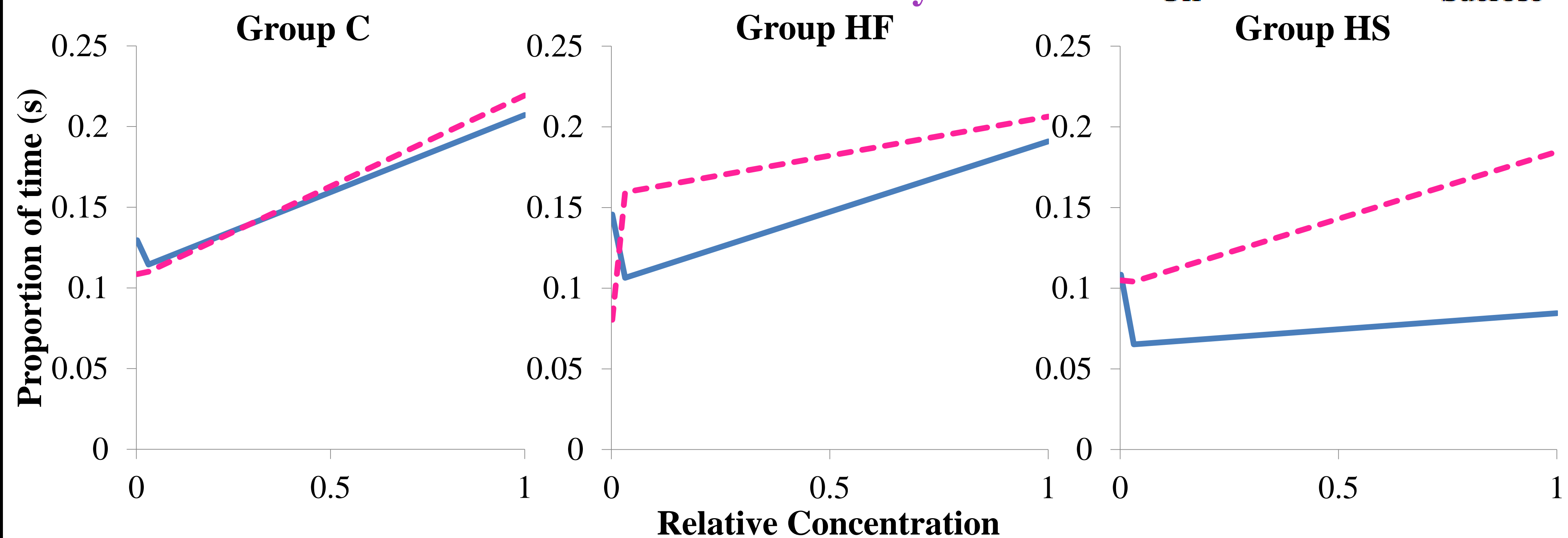
The mean responses to the devalued and non-devalued lever during a 5-min extinction test. Groups HF and HS lever pressed fewer times overall, suggesting they wanted the rewards less and were less motivated to work for the rewards. However, both diet groups showed an intact devaluation response.

Preference Task



The mean preference score for the exposure (Test 1) and test trials (Test 2-3). Groups HS and C preferred sugar more than fat during the test trials, most likely due to an inherent preference for sugar. However, Group HF preferred fat more than sugar, indicating an alteration of inherent food preference.

Taste Reactivity Task



The proportion of time rats spent performing hedonic responses in 60 s to varying oil and sucrose concentrations show Group C had a similar liking for oil and sucrose solutions. Groups HF and HS did not significantly differ in their liking of the oil and sucrose solutions, even though there was a trend towards higher liking for sucrose.

Discussion

- Groups HF and HS showed lower overall incentive motivation to work for food in the devaluation task, but showed intact devaluation.
- While Group HF showed a preference for fat in the preference test, Group HS did not show enhanced preference for sugar in comparison to Group C. This suggests the strong innate preference for sugar may be difficult to amplify.
- Groups HF and HS did not differ significantly from Group C in their liking of sucrose, which may suggest that other factors, such as wanting, play a bigger role in the overconsumption of unhealthy foods.
- Long-term exposure to diets high in fat and sugar impaired incentive motivation and altered food preferences, both of which could cause potential challenges for behavioral interventions needed to treat obesity.

References

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