Social Influences on Food Intake in Rats

Sarah Ahmed & Susan E. Swithers
Purdue University

Abstract
Eating behaviors and food intake in humans can be socially influenced. In this study, we examined the social influence of food intake in rats. Two different breeds of rats were used, diet-induced obese (DIO) and diet-resistant (DR). Rats were housed in pairs (DIO-DR, DIO-DIO, or DR-DR) with the same gender. After eight weeks on the high-fat chow diet, data showed that weight gain was different in males and females and there was a social influence. DR male rats paired with DR male rats gained more weight than when paired with DIO rats. DIO male rats did not show statistically significant differences in weight gain when same and different groups were compared. Females did not show statistically significant results in either variable.

Introduction
Several studies have also found that social interactions have effects on food choices on humans and also on rats. Galef & Whisken says that when one the observer rat sees the demonstrator rat eating an unfamiliar diet, the observer’s intake of that diet will increase later. The “social influence on rats’ food intake” is greater if the food about which social information has been acquired is unfamiliar that if it is.” (2006). According to Galef & Whisken, after being socially exposed to a certain food and developing a preference for it, the rat will evaluate that food and compare to other foods in its environment and eventually, the individual taste will overcome the social influence (2001).

In humans, sedentary lifestyles are major cause of obesity. Due to this inactive lifestyle, energy expenditure increases, body weight increases, and health quality in general decreases. Though there is not much physical activity, bodies have other systems to burn calories. One method is nonexercise activity thermogenesis, or NEAT, physical activity that is not considered exercise. Because it burns calories, NEAT is more common in lean subjects than obese, and is correlated with resistance to weight gain (Levine et al., 2005). In animals, spontaneous physical activity, SPA, is equivalent to NEAT. Differing levels of SPA were used to breed two different types of rats, DIO, diet-induced obese, and DR, diet-resistant. DIO rats are more prone to obesity. They are shown to gain weight rapidly when placed on a high-fat diet. DIO rats are less prone to obesity and they are more physically active (Levin et al., 1997).

Hypothesis
After 30 days on the high-fat chow diet DR rats paired with DIO rats would gain significantly more weight than in DR rats and DIO rats in both same and different pairings, both in males and females.

Methods
In this study, we started with 60 Sprague-Dawley rats, 30 males and 30 females. Fifteen rats of each sex were diet-induced obese rats and the other 15 were diet-resistant. At arrival, they were housed individually in wire racks and were given regular chow and water. Body weights were checked once daily. After one week, body fat composition was determined using NMRs. Then, the rats were randomly housed in pairs: male DIO-DR, male DIO-DIO, male DR-DR, female DIO-DR, female DIO-DIO, and female DR-DR. Cages were two times the size of the first cage. The rats’ diets were high fat chow, with no activities or food options. In this experiment, rats were in small cages with just one other rat, water, and two water bottles. Rats were weighed daily and chow location was documented and mapped on paper. Location was documented to see whether one of the rats was hoarding the chow and not allowing the other rat to eat. Four weeks after starting the rats on high-fat chow, NMRs were conducted again, finding updated body fat compositions. Chow location documentation was discontinued due to no visible pattern in chow location, but weighing continued. In the seventh week, one rat was euthanized, so there were 59 subjects remaining, 30 male and 29 female. NMRs were conducted a third time during the eighth week and again, weighing continued.

Results
Contrary to our hypothesis, which stated that both male and female DR rats would gain the most weight when paired with DIO rats, results showed that weight gain was different in males and females. The only significant results showed that DR male rats paired with DR male rats gained more weight than when paired with DIO rats. DIO male rats did not show statistically significant differences in weight gain when same and different groups were compared. Females did not show statistically significant results in either variable. In the experiment, each cage was given more than enough food for two rats, so there was no competition over food and lack of chow was not a variable, and because of the locations, one rat did not block the cups or chow either, but may have claimed it and taken control over it. One limitation of the study is that rats were in cages with just one other rat, not exposing them to other environmental factors that they would have been exposed to in a non-lab setting. In a natural environment, rats are influenced by more than just one other rat, have more food options, and have more ways to exert physical activity. In this experiment, rats were in small cages with just one other rat, water, and high fat chow, with no activities or food options.

Discussion

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