Incentive Salience and High (HiS) or Low (LoS) Saccharin Preference: A Model for Drug Abuse Vulnerability.

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Background
• Vulnerability to drugs of abuse can be mediated by certain individual differences.
• Sweet preference has been highly associated with vulnerability to drugs of abuse. Human drug addicts show a higher preference for sweetened dietary substances compared to non-addicts. This relationship between sweet preference and addiction vulnerability has been modeled with rats selectively bred for high (HiS) and low (LoS) saccharin intake. 1, 3
• Another factor that contributes to drug abuse vulnerability is reward learning. Reward learning may be mediated by a phenomenon called incentive salience, which describes the process in which reward-related stimuli take on rewarding properties in and of themselves. 4
• Incentive salience has been modeled with rats using a classical conditioning procedure, in which rats are presented with a level prior to the delivery of a food pellet that is not contingent upon a lever press. 5
• A percentage of rats exhibit the development of incentive salience by displaying sign-tracking (ST) behavior in which they approach and bite the lever, while other rats show goal-tracking (GT) behavior in which they approach the food delivery receptacle during the lever extension. 1 Importantly, the ST rats show greater drug-seeking compared to GT rats. 1
• Since sweet preference and incentive salience are both factors that contribute to drug abuse vulnerability, we can hypothesize that incentive salience (ST) will be higher in HiS vs. LoS.

Objectives
• To test for sign (ST) and goal (GT) tracking behaviors between rats bred for high (HiS) and low (LoS) saccharin intake
• To test whether another individual difference in addiction vulnerability, sex, mediates ST vs. GT in the HiS and LoS animals
• To determine whether incentive salience and sweet preference may be mediated by similar neurobehavioral processes.

Method
Materials
• A classical conditioning chamber, like the one to the right, was used in order to test for ST and GT in rats.
• Rats were administered banana food pellets through the food receptacle in the chamber.
• Subjects in this study were adult male and female rats selectively bred for high (HiS) and low (LoS) saccharin intake.

Procedure
• All rats were housed in separate housing units and were fed ample food and water.
• Rats were given five banana flavored pellets each day prior to magazine training.
• Rats were placed into classical conditioning chambers after 2 days of magazine training, in which they then received banana flavored pellets in a food receptacle without any lever presentations.
• Next, rats began the conditioning phase of this study, which lasted seven days. In this phase, a session consisted of the presentation of an illuminated lever for 8-second prior to the delivery of a single food pellet. Rats underwent 25 trials per session.
• Instances when the rats poked their noses into the food receptacle (GT) or contacted the lever (ST) were recorded by Med-PC software.

Results

HiS Males

HiS Females

LoS Males

LoS Females

Conclusions
• All rats showed more GT vs. ST behavior.
• There were no differences between HiS and LoS rats in ST behavior.
• However, there were observed sex difference in incentive salience-related behaviors. Namely, females showed more ST compared to males.
• These results suggest that incentive salience and sweet preferences may be distinct mechanisms that both contribute to drug abuse vulnerability.
• Also, these results suggest that sex may mediate the development of incentive salience.
• Furthermore, sex hormones, such as progesterone and estrogen, have been shown to mediate addiction vulnerability and reward-learing, and future research may directly investigate how these gonadal hormones are involved in mediating the development of incentive salience. 6

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