Brain responds differently to food rewards in bulimia nervosa

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Researchers at University of California San Diego School of Medicine have discovered differences in how the brain responds to food rewards in individuals with a history of bulimia nervosa (BN), an eating disorder characterized by frequent episodes of binge eating followed by efforts of purging to avoid weight gain. The findings further define specific brain mechanisms involved in eating disorders and could help lead to new treatment therapies.

Metabolic (hunger) and hedonic (reward) brain mechanisms both contribute to the regulation of eating. The findings, published July 10 in the *Journal of Abnormal Psychology*, address the question of whether binge eating in BN results from disruption of one or both mechanisms, or is the product of their interaction.

"Our study suggests that adults with bulimia nervosa may have elevated reward-related brain activation in response to taste. This altered neural response may explain why these individuals tend to remain driven to eat even when not hungry," said Alice V. Ely, PhD, principal author of the study in the Department of Psychiatry at UC San Diego School of Medicine.

The researchers looked at the insula, striatum, amygdala and anterior cingulate cortex—brain regions involved in evaluating taste signals and integrating them with body cues (such as hunger) to drive behavior.

"We found that the areas of the brain that differed in the two study groups were the left insula, putamen and amygdala, which determine how rewarding a taste might be and how emotionally important it is. That information is then sent to parts of the brain that motivate eating," said Ely.

Twenty-six individuals with a history of BN and 22 without participated in the study. To measure brain activity, the group was administered water and a sucrose solution every 20 seconds for about 13 minutes following either a 16 hour fast or a standardized breakfast.

"We wanted to see how their brains reacted to different tastes and hunger states," said Ely.

The group without a history of BN responded to taste more when they were hungry than when they were satiated, but the group with a history

of the disorder responded the same after eating as when hungry.

"Brain activation in the left amygdala was actually significantly greater in the group with a history of bulimia nervosa than in the control group when fed, indicating that taste response in these individuals may be insensitive to the effects of energy metabolism, exaggerating the value of food reward," said Ely. "If you're full and your brain is telling you to keep eating, it could contribute to loss of control."

Nearly 5 million females and 2 million males in America suffer from BN. Current treatment options, including cognitive and behavioral therapies, are effective for about 30 to 50 percent of patients.

"Our study results may contribute to identifying neural mechanisms that will open the door to the use of new medications or other brain-based behavioral treatments," said Ely. "This is promising and hopeful news to those who suffer from eating disorders."

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