

Food for thought: How the brain reacts to food may be linked to overeating

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The reason why some people find it so hard to resist finishing an entire bag of chips or bowl of candy may lie with how their brain responds to food rewards, leaving them more vulnerable to overeating.

In a study with [children](#), researchers found that when certain regions of

the [brain](#) reacted more strongly to being rewarded with food than being rewarded with money, those children were more likely to overeat, even when the child wasn't hungry and regardless of if they were overweight or not.

Shana Adise, a [postdoctoral fellow](#) at the University of Vermont who led the study while earning her doctorate at Penn State, said the results give insight into why some people may be more prone to overeating than others. The findings may also give clues on how to help prevent obesity at a younger age.

"If we can learn more about how the brain responds to food and how that relates to what you eat, maybe we can learn how to change those responses and behavior," Adise said. "This also makes children an interesting population to work with, because if we can stop overeating and obesity at an earlier age, that could be really beneficial."

Previous research on how the brain's response to food can contribute to overeating has been mixed. Some studies have linked overeating with brains that are more sensitive to food rewards, while others have found that being less sensitive to receiving food rewards makes you more likely to overeat.

Additionally, other studies have shown that people who are willing to work harder for food than other types of rewards, like money, are more likely to overeat and gain weight over time. But the current study is the first to show that children who have greater [brain responses](#) to food compared to money rewards are more likely to overeat when appealing foods are available.

"We know very little about the mechanisms that contribute to overeating," Adise said. "The scientific community has developed theories that may explain overeating, but whether or not they actually

relate to food intake hadn't yet been evaluated. So we wanted to go into the lab and test whether a greater brain response to anticipating and winning food, compared to money, was related to overeating."

For the study, 59 children between the ages of 7 and 11 years old made four visits to the Penn State's Children's Eating Behavior Laboratory.

During the first three visits, the children were given meals designed to measure how they eat in a variety of different situations, such as a typical meal when they're hungry versus snacks when they're not hungry. How much the children ate at each meal was determined by weighing the plates before and after the meals.

On their fourth visit, the children had fMRI scans as they played several rounds of a game in which they guessed if a computer-generated number would be higher or lower than five. They were then told that if they were right, they would win either money, candy or a book, before it was revealed if they were correct or not.

The researchers found that when various regions of the brain reacted more to anticipating or winning food compared to money, those children were more likely to overeat.

"We also found that the brain's response to food compared to money was related to overeating regardless of how much the child weighed," Adise said. "Specifically, we saw that increased brain responses in areas of the brain related to cognitive control and self control when the children received food compared to money were associated with overeating."

Adise added that this is important because it suggests there may be a way to identify brain responses that can predict the development of obesity in the future.

Kathleen Keller, associate professor of nutritional sciences, Penn State, said the study—recently published in the journal *Appetite*—backs up the theory that an increased brain response in regions of the brain related to rewards is associated with eating more food in a variety of situations.

"We predicted that kids who had an increased response to food relative to [money](#) would be the ones to overeat, and that's what we ended up seeing," Keller said. "We specifically wanted to look at kids whose brains responded to one type of a [reward](#) over another. So it wasn't that they're overly sensitive to all rewards, but that they're highly sensitive to food rewards."

Keller said the findings give insight into how the brain influences eating, which is important because it could help identify children who are at risk for obesity or other poor eating habits before those habits actually develop.

"Until we know the root cause of [overeating](#) and other [food](#)-related behaviors, it's hard to give good advice on fixing those behaviors," Keller said. "Once patterns take over and you overeat for a long time, it becomes more difficult to break those habits. Ideally, we'd like to prevent them from becoming habits in the first place."

More information: Shana Adise et al, Is brain response to food rewards related to overeating? A test of the reward surfeit model of overeating in children, *Appetite* (2018). [DOI: 10.1016/j.appet.2018.06.014](#)

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