

It's Just a Bite!

Daily intake of sweet and fatty snacks changes brain circuits

Obesity is a major problem in the United States and throughout the world. It is thought that diets high in fat and sugar promote weight gain, but the exact mechanism isn't clear. How does our food change what we want to eat? Are these desires innate, due to weight gain, or due to the food itself? Are our brains rewired based on the foods we eat? A calorie is a calorie. Weight control is simple, calories in vs. calories out. Right? Or is it?

Abstract

Western diets rich in fat and sugar promote excess calorie intake and weight gain; however, the underlying mechanisms are unclear. Despite a well-documented association between obesity and altered brain dopamine function, it remains elusive whether these alterations are (1) pre-existing, increasing the individual susceptibility to weight gain, (2) secondary to obesity, or (3) directly attributable to repeated exposure to western diet. To close this gap, we performed a randomized, controlled study (NCT05574660) with normal-weight participants exposed to a high-fat/high-sugar snack or a low-fat/low-sugar snack for 8 weeks in addition to their regular diet. The high-fat/high-sugar intervention decreased the preference for low-fat food while increasing brain response to food and associative learning independent of food cues or reward. These alterations were independent of changes in body weight and metabolic parameters, indicating a direct effect of high-fat, high-sugar foods on neurobehavioral adaptations that may increase the risk for overeating and weight gain.

This is a very interesting randomized, controlled study that took normal-weight individuals and randomly assigned them to consume either a high-fat, high-sugar shake (HF/HS) or a low-fat, low-sugar (LF/LS) shake twice a day for 8 weeks. Each shake was 80 calories. HF/HS shakes were 41% fat and 46% carb (sugar), and LF/LS shakes were 17% fat and 29% carb so far from low sugar. Neither intervention had a different effect on body weight or metabolic parameters. They found that daily consumption of an HF/HS snack decreased preference for low-fat foods while simultaneously increasing brain response to an HF/HS milkshake. These effects were observed in the absence of changes in fatness and metabolic markers in these healthy-weight individuals, which indicates that the food had a direct effect on rewiring brain reward circuits. Like addictive drugs, habitual exposure to HF/HS food can drive neurobehavioral changes that may increase the risk for subsequent overeating and weight gain before any changes in adiposity have occurred. There is evidence that brain rewiring is occurring when we eat high-fat, sugary foods, similar to what happens with addictive drugs. Like an addict, this rewiring changes our desires and promotes the consumption of sugary, fat-laden foods.

At the end of the study period, there was a preference from the HF/HS group for high-fat foods so frequent exposure to HF/HS snacks alone can alter physiology to create risk in people who are at a healthy weight and have normal metabolism by reducing their preference for healthier food options while simultaneously enhancing neural reward responses to palatable food which is high in fat and sugar.

These findings are important because they partially remove the blame from the individual and move it to the environment (the food itself). Even healthy-weight individuals with minimal or no genetic trait risks, when exposed to an unhealthy diet because of a lack of access to healthy foods, will incur adaptations that promote overeating. Those with genetic risk might be even more susceptible. What is concerning is that only 160 calories a day the high-fat, high-sugar food was enough to change physiology and food desires in people starting at a normal weight and having normal metabolic parameters. Remember, 160 calories are not very much (1.5 snack-size candy bar or 2 girl scout cookies). Eating this type of snack, even though it doesn't seem like much, may be sabotaging our metabolism.

Edwin Thanarajah et al., Habitual daily intake of a sweet and fatty snack modulates reward processing in humans, Cell Metabolism (2023), <https://doi.org/10.1016/j.cmet.2023.02.015>.

