

How does exercise reduce the intake and preference for high fat, high sugar foods?

People gain weight because they eat too much food, particularly food with a lot of fats and sugars, and do not use the calories gained from food. In this case the energy intake is higher than energy expenditure and it is called a positive energy balance state. When the positive energy balance state goes on for a prolonged period of time, people become obese. Obesity often causes a lot of other health conditions such as type 2 diabetes, cancer, and cardiovascular diseases. Physical activity such as walking, yoga and Tai-Chi or exercise such as running, swimming, and dancing has been shown to be beneficial for improving these health conditions. We know that regular exercise can help some people use more calories to create a negative energy balance state (energy expenditure > energy intake) and eventually lose weight and improve type 2 diabetes. However, we still don't know how exercise does this.

One of the possibilities is that exercise may change people's diet choice making them eat less food that contains a lot of calories. These foods normally contain a lot of fats and sugars and overconsuming them is bad for controlling our blood sugar levels and leading to diabetes. The question is can exercise make people eat less of high fat, high sugar foods? Data from National Weight Control Registry, which monitors food intake and activity levels of people who have maintained at least 30 lbs weight loss for over one year, indicate that diet fat composition is significantly decreased with increased physical activity or exercise. We used running wheel model to see if this is also true in rats. When a rat is provided with a running wheel, it will run voluntarily. When rats are provided with running wheels, a low calorie diet, and a diet with high fats and sugars, they choose to run, eat the low calorie diet, and avoid the high calorie diet. Thus, it is consistent with the human data. The next step is to figure out why.

Running can be considered as a physical stress. Such challenge can activate the so-called hypothalamic-pituitary-adrenal (HPA) axis. When the HPA axis is activated, the release of stress hormones such as corticotropin releasing hormone (CRH) and glucocorticoids are increased. The most well-known glucocorticoid is cortisol in humans and corticosterone in rats. Cortisol is known to facilitate coping with stress challenge by increasing the amount of readily useable energy (blood glucose) in the body and suppressing the immune system.

The study first shows that running rats have reduced intake and preference to the high caloric diet and these effects are associated with significantly higher levels of circulating corticosterone. The researchers then ask the question of can elevated corticosterone without running also produce a robust reduction in intake and preference to a high caloric diet? To that end, rats were provided with corticosterone in their drinking water and choices of a low fat and a high fat and high sugar diet. In this condition, corticosterone levels are increased and overall food intake and weight gain is reduced, like what has been seen in the wheel running condition. However, unlike running rats, corticosterone drinking rats showed high preference to the high caloric diet. These results are

consistent with the phenomenon in some individuals whom stress decreases their appetite and body weight. Furthermore, the results suggest that increased stress hormone alone is not sufficient to reduce intake of fatty foods. Physical activity or exercise is a critical component for switching diet choice. Scientists are conducting further experiments to determine what happens in the brain during exercise to change diet choice and maintain healthy body weight.

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[Corticosterone administration in drinking water decreases high-fat diet intake but not preference in male rats.](#)

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