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Snacking and BMI linked to double effect of brain activity and self-control

July 23 2012

Snack consumption and BMI are linked to both brain activity and self-control, new research has found.

The research, carried out by academics from the Universities of Exeter, Cardiff, Bristol, and Bangor, discovered that an individual's brain 'reward centre' response to pictures of food predicted how much they subsequently ate. This had a greater effect on the amount they ate than their conscious feelings of hunger or how much they wanted the food,

A strong brain response was also associated with increased weight (BMI), but only in individuals reporting low levels of self-control on a questionnaire. For those reporting high levels of self-control a stronger brain response to food was actually related to a lower BMI.

This study, which is now published in the journal *NeuroImage*, adds to mounting evidence that overeating and increased weight are linked, in part, to a region of the brain associated with motivation and reward, called the nucleus accumbens. Responses in this brain region have been shown to predict weight gain in healthy weight and obese individuals, but only now have academics discovered that this is independent of conscious feelings of hunger, and that self-control also plays a key role.

Following these results, academics at the University of Exeter and Cardiff have begun testing 'brain training' techniques designed to reduce the influence of food cues on individuals who report low levels of self-control. Similar tests are being used to assist those with gambling or

alcohol addiction.1

Dr Natalia Lawrence of Psychology at the University of Exeter, lead researcher in both the original research and the new studies, said: "Our research suggests why some individuals are more likely to overeat and put on weight than others when confronted with frequent images of snacks and treats. Food images, such as those used in advertising, cause direct increases in activity in brain 'reward areas' in some individuals but not in others. If those sensitive individuals also struggle with self-control, which may be partly innate, they are more likely to be overweight. We are now developing computer programs that we hope will counteract the effects of this high sensitivity to food cues by training the brain to respond less positively to these cues."

Twenty-five young, healthy females with BMIs ranging from 17-30 were involved in the study. Female participants were chosen because research shows females typically exhibit stronger responses to food-related cues. The hormonal changes during the menstrual cycle affect this reaction, so all participants were taking the monophasic combined oral contraceptive pill. Participants had not eaten for at least six hours to ensure they were hungry at the time of the scan and were given a bowl containing 150 g (four and a half packets) of crisps to eat at the end of the study; they were informed that crisp intake had been measured afterwards.

Researchers used MRI scanning to detect the participants' brain activity while they were shown images of household objects, and food that varied in desirability and calorific content. After scanning, participants rated the food images for desirability and rated their levels of hunger and food craving. Results showed that participants' brain responses to food (relative to objects) in the nucleus accumbens predicted how many crisps they ate after the scan. However, participants' own ratings of hunger and how much they liked and wanted the foods, including crisps, were unrelated to their crisp intake.

More information: This study was funded by the Wales Institute of Cognitive Neuroscience.

What this study shows:

-- Brain responses to food images vary considerably between individuals.
-- Brain responses to food images but not conscious feelings of hunger or desire to eat predict subsequent crisp consumption.
-- Individuals' reported levels of self-control influence whether this brain response is associated with a higher or lower BMI.

What this study does NOT show:

-- Brain responses to food cues cause overeating.
-- The associations reported here are true in everyone – only healthy young women were included.
-- Whether our brain response and levels of self-control are learned or innate.

Provided by University of Exeter