The growing epidemic of childhood obesity highlights the need to identify neurobiological mechanisms that might predispose children to gain excess weight. We used functional magnetic resonance imaging (fMRI) to characterize brain responses to visual food cues before and after a meal in obese and normal weight children.

We investigated the hypothesis that in critical satiety-related brain regions, obese children do not reduce activation by high-calorie food cues after eating relative to normal weight children, indicative of a blunted central satiety response.

**METHODS**

Participants. Normal weight (BMI<85th p) and obese (BMI>95th p) children age 9-11y (Table 1). Subjects did not have any major medical problems, diabetes, diet restrictions, or drugs, and were not on drugs known to alter appetite.

Study Procedures. Subjects arrived fasted and received a standardized breakfast (10% of daily caloric need, by BMI<50). Starved formula, Figure 1). Three hours later, subjects underwent a 248 MRT scan while viewing images of high-calorie foods, low-calorie food and non-food objects (Figure 3), then consumed a meal (maccanoni & cheese) 30% of daily caloric need, had a 248 MRT scan, and finally an ad libitum buffet to determine consumed kilocalories and macronutrients. Hunger and fullness were assessed by visual analog scales (VAS).

fMRI Analysis. Regions of Interest (ROIs) included the ventral and dorsal striatum, amygdala, insula, ventral frontal segmental area (VTA) and medial orbitofrontal cortex (mOFC) (Figure 4). Mean voxelwise participant-level parameter estimates were calculated within ROIs, then a global average across all regions was determined. Higher y values indicate greater activation to high- vs. low-calorie food cues. Metadata data are shown in graphs.

**RESULTS**

Ad libitum food intake and macronutrient choice did not differ between obese and normal weight children.

After a meal, brain activation to images of high-calorie food was higher in obese compared to normal weight children.

**CONCLUSIONS**

- Post-prandial brain response to high-calorie visual food cues was greater in obese compared to normal weight children despite similar subjective satiety responses by visual analog scales.
- The fMRI studies provide new insights into the neurobiological basis of child obesity and obesogenic eating behaviors.
- The greater activation by palatable food cues after eating detected by fMRI in brain regions that regulate reward and appetite in obese children could indicate a blunted central satiety response.

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