Obesity and brain function: an MEG study

Vahe Poghosyan[1], Khalid M. AlAmri[2], Sufana A. Almashhadi[3], Stephanos Ioannou[4]

[1]Department of Neurophysiology, National Neuroscience Institute, [2]Obesity, Endocrinology and Metabolism Center, [3]Research Unit, National Neuroscience Institute, King Fahad Medical City, [4]Department of Physiological Sciences, Alfaisal University, Riyadh, KSA

King Fahad Medical City
مدينة الملك فهد الطبية

Background

Obesity presents a significant public health problem, with brain playing a central role in its promotion and maintenance. In obese, brain responds abnormally to food cues, instigating obesogenic behavior. Brain's reward system is particularly affected. However, the specific underlying neural mechanisms and the exact involvement of reward system are poorly understood.

Objectives

We aimed to study in detail brain mechanisms of food cue processing in obese vs. normal-weight individuals and test the following hypotheses:

Hypothesis 1: In obese, abnormal reward response to food cues occurs automatically and preconsciously.

Hypothesis 2: Baseline reward response to food cues will predict the outcome of weight loss intervention.

Methods

We used magnetoencephalography (MEG) to record and advantageously analyze brain responses to high- and low-calorie food, and nonfood items, in 24 obese patients, who were prescribed lifestyle changes, and 24 normal-weight controls.
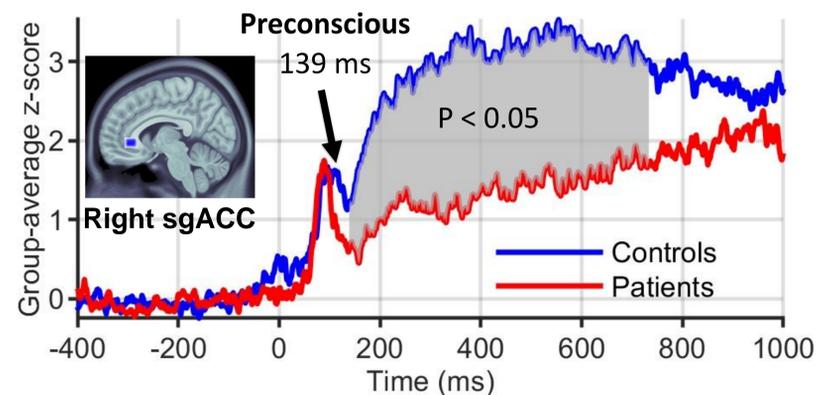
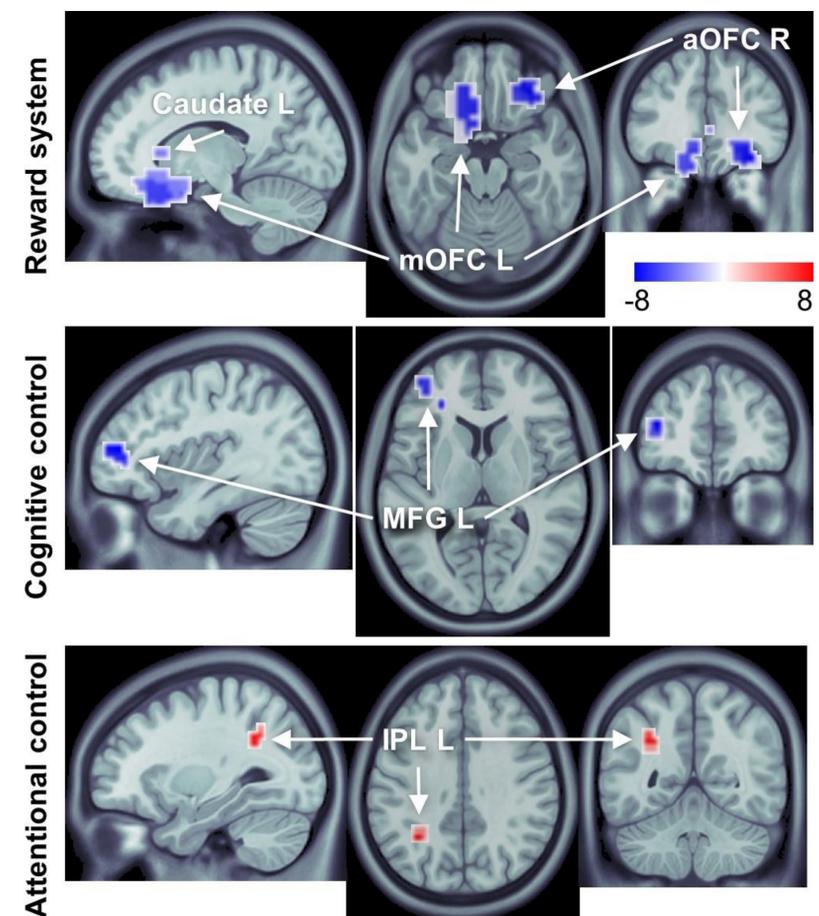**Stimuli**. Examples of images shown to the subjects.

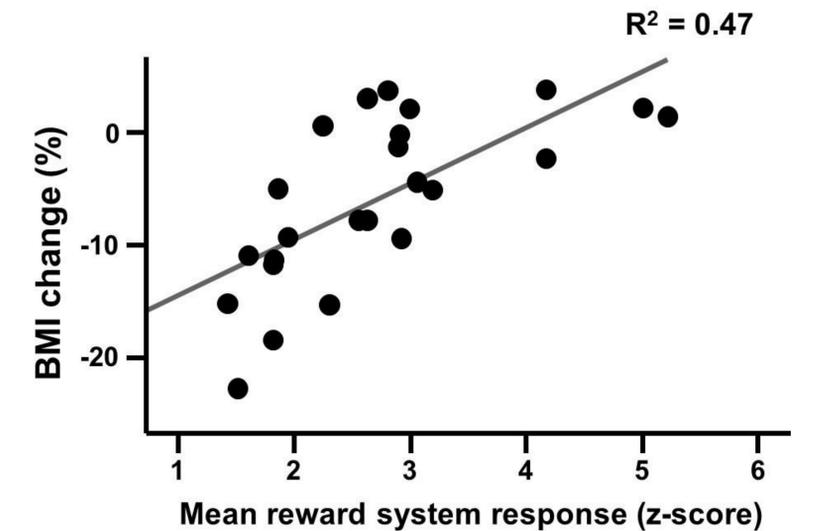High-calorie food   Low-calorie food   Nonfood

Results

Altered preconscious reward processing in obesity

Key brain networks affected in obesity

Baseline brain reward response predicts weight loss after six months in treatment

Conclusions

- We identified, for the first time with a millisecond time resolution, the large-scale dynamics of brain reactivity to food cues in obese vs. normal-weight.
- Brain networks of reward, cognitive control and attentional control are dysfunctioning in obesity.
- We have confirmed both our hypotheses.
- Overall, these findings have significantly advanced our understanding of the brain basis of obesity.

Translational Potential

Our findings can facilitate the development of novel intervention strategies for obesity, including tailored cognitive-behavioral and pharmacological therapies.

Acknowledgment

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