In search of the basis of successful maintenance of weight loss$^{1,2}$

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As the prevalence of obesity continues to rise in many countries and an increasing number of people attempt to lose weight, there is an increasing urgency for the identification of strategies to achieve successful, long-term maintenance of weight loss. Most therapeutic trials of drugs or dietary approaches can show mean weight losses of $\approx 10\%$ over a 6-mo period, which can then be sustained for $\leq 2\,$ y, but the range of weight loss and of long-term success varies markedly within the groups studied, and little information is available to explain this variability. The US National Weight Control Registry has been gathering information for $> 15\,$ y on persons who are successful in maintaining weight loss and has shown that those who are successful at maintaining weight loss (successful weight-loss maintainers; SWLs) work harder to limit their food intake and increase their physical activity than do those who fail to maintain their weight loss (1). The article by McCaffrey et al (2) in this issue of the Journal seeks to identify aspects of brain activation in response to food-related visual stimuli that distinguish SWLs from obese persons who fail to maintain any weight loss that they may have achieved.

Obesity arises through an imbalance between energy intake and energy expenditure. The reduced need for physical activity in the modern, westernized lifestyle is clearly able to contribute to this imbalance by reducing energy expenditure, but a major contribution to the increasing problem of obesity is inappropriate food intake—ie, an energy intake that exceeds energy requirements. The reversal of the problem of obesity requires a reduction in energy intake below energy requirements for a prolonged period, and then maintenance of this weight loss can only be achieved if the formerly obese person’s eating behavior does not revert to its previous state. A concern that frequently arises is whether this eating behavior is intrinsic or acquired, and thus whether it can be easily reversed after weight loss. A comparison of SWLs with unsuccessful weight losers allows some of these concerns to be addressed. The present study by McCaffrey et al (2) recruited 18 normal-weight, 16 obese, and 17 SWL subjects to assess their functional magnetic resonance imaging (fMRI) responses to visual stimuli. Three types of photograph were used: foods with a high energy content, foods with a low energy content, and nonfood objects that served as the control. The responses were assessed by determining the fMRI BOLD (blood oxygen level–dependent) response, which is dependent on an increase in blood flow (ie, oxygenated blood content) in specific brain regions in response to the high- or low-energy food photos compared with the control photos. A previous study used a similar approach to compare responses of obese and nonobese subjects, with obese subjects showing increased responses to pictures of high-energy foods compared with the normal-weight controls in many brain areas that had been proposed as mediating the motivational effects of food cues (3). Another study described a similar approach to show increased activation in the dorsal striatal area [as well as in many of the areas identified by Stoeckel et al (3)] in obese compared with nonobese women in response to pictures of high-energy foods (4). It was suggested that this indicated an increased level of reward anticipation in obese individuals, and that they had developed habits related to these foods that were separated from feelings of hunger and satiety.

The present study by McCaffrey et al (2) develops this further by looking at the responses of formerly obese individuals who have maintained a near normal weight for a prolonged period of time, in an attempt to identify a possible biological/neurologic basis for this success. The SWLs showed greater activation of frontal regions of the brain and areas of the visual cortex than did obese or normal-weight subjects, which would be consistent with a greater inhibitory control in response to food cues exerted by these subjects. Although this could be an important contributor to the success these individuals achieve with their weight-loss maintenance, it needs to be established whether this is an intrinsic characteristic or whether it has been acquired as part of their “behavioral reprogramming” during their weight loss. The US National Weight Control Registry is a valuable resource but is also highly selected. The registrants are predominantly female and white, and it is not clear how effective the strategies that are used by these individuals would be in achieving and maintaining weight loss in a general obese population. It would also be important to undertake similar studies of brain activation responses to food pictures in obese individuals before and while they actively lose weight to determine whether the response can

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be altered in the short term. Of particular interest would be the use of this approach to identify possible biological/neurologic differences between different weight-loss strategies: for example, does cognitive behavioral therapy alter the pattern of brain activation response to pictures of high-energy foods? This could then form the basis of the development of evidence-based techniques to promote changes in attitudes toward foods and the associated behaviors needed to underpin successful weight-loss maintenance.

McCaffrey et al (2) have made an important contribution by studying subjects who have successfully maintained their weight loss over a long period of time and who have shown some differences in brain activation in response to visual cues. The fact that these responses differ from obese and normal-weight subjects is interesting, but it remains to be determined whether this is because of intrinsic differences in these individuals or because of the strategies adopted to lose weight and maintain the loss. One other issue that requires further consideration and the development of more complex experimental approaches is as follows: the fMRI BOLD response simply identifies areas of the brain that receive an increase in blood flow during the task. This technique does not show the associated neural activity or any behavioral response, and thus the functional correlates of these fMRI differences are not known. Thus, it remains to be determined how these fMRI responses are related to actual differences in eating behavior.

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REFERENCES