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The goal conflict model: a theory of the hedonic regulation of eating behavior

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Early theories of overweight and obesity (psychosomatic theory, externality theory, and boundary model of eating) assume that individuals with obesity overeat because their ability to recognize internal hunger and satiation cues is impaired. According to the boundary model of eating, this reduced sensitivity is a consequence of their consistent attempts to control (i.e., restrain) their food intake to keep to their diet. As long as they can focus on their food intake, they can be successful in their eating restraint. However, if their control motivation or ability is compromised (e.g., by strong emotions), they overeat. According to the goal conflict model of eating, restrained eaters overeat, because they enjoy eating. However, because they also want to avoid weight gain, their eating enjoyment goal is in conflict with their goal to control their weight. Although weight control is their focal goal, extended exposure to palatable food stimuli increases the cognitive accessibility of their eating enjoyment goal, until it becomes the dominant motive resulting in overeating. This model cannot only account for all empirical findings of research conducted to test the boundary model (including findings inconsistent with that model), but makes also novel predictions that have been supported by empirical research using methods of cognitive psychology.

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Introduction

If researchers had ever asked overweight individuals or individuals with obesity why they gave in to the temptation to eat more than they had originally intended, they would probably have been told that it tasted too good to stop. Instead of examining this simple explanation, psychological theories of overweight and obesity proposed different and more complex explanations for overeating among individuals with obesity. The general assumption was that these individuals were less sensitive to hunger or satiation cues (the 'differential sensitivity hypotheses') and that their eating was activated by cues unrelated to hunger or satiation such as anxiety and stress [1,16] or by eating related external stimuli [16,37•]. In this article, I argue that the reduced responsiveness to hunger and satiation cues is not due to a lack of ability to recognize such cues, but to a more powerful motive governing the food intake of people with a weight problem, namely eating enjoyment. This is the central assumption of the goal conflict model of eating [41•-43]. After presenting that model, I review research conducted to test and support it and discuss implications of the model for eating control.

Restrained eating and the breakdown of self-regulation

The differential sensitivity hypothesis was most succinctly formulated by Schachter et al. [38] in their externality theory of eating, which stated, "*that internal state is irrelevant to eating by obese, and external food-relevant cues trigger eating for such people*" (p. 97). This conclusion was originally based on the findings of studies by Stunkard and Koch [44] and Schachter et al. [38]. Using a gastric balloon, Stunkard and Koch had found that gastric motility was related to self-reports of hunger in normal weight but not in individuals with obesity. And preloading some of their obese and normal-weight participants with roast beef sandwiches before asking them to taste different types of crackers, Schachter et al. [38] observed that the preload reduced the amount of crackers eaten by normal-weight participants, but had no effect on the amount eaten by obese participants. There are problems with both studies: gastric motility appears to play a minor role as a hunger signal and the specific preload effects reported by Schachter et al. [38] have never been replicated with obese participants (for a review, [41]).

The boundary model of eating of Herman and Polivy [15]• has been developed to explain the apparent insensitivity of individuals with obesity to internal hunger and satiety cues. They argued that most individuals with obesity are trying

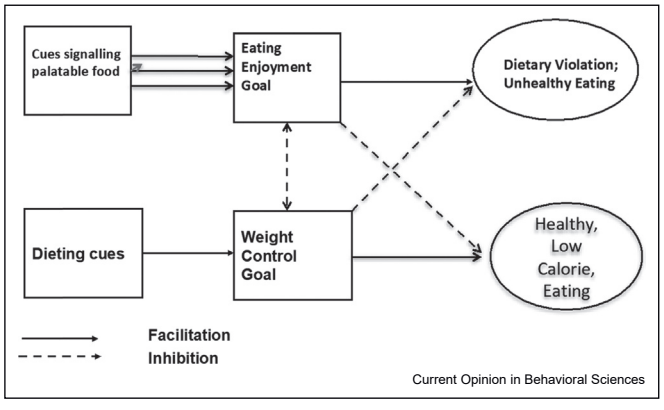
to control (restrain) their eating by using diet rules that imposed an artificial calorie limit on their daily consumption. Because they are therefore frequently forced to disregard hunger cues, the model assumes that their ability to recognize internal hunger and satiation cues becomes impaired. This has the consequence that restrained eaters become more and more dependent on cognitively controlling their eating. As long as they are able and motivated to concentrate on this cognitive control, they are quite capable to keep to their diet boundary. However, if their motivation or ability to restrict their food intake is impaired through emotional distress or actual or perceived dietary violation, they will overeat.

There is a great deal of empirical research supporting the assumption that restrained eaters — identified with the Restrained Eating Scale (RS) of Herman and Polivy [14] — do overeat when their cognitive control has been impaired by strong emotions or by violations of their diet boundary [41]. Strong emotions were typically aroused by threatening participants with an extremely negative experience (e.g., expectation of painful electro shocks [32,38] or an extreme stress experience [17,22]). The violation of restrained eaters' diet boundaries has usually been induced by asking them to preload with some forbidden food (e.g., milkshakes) before a taste test, in which the interest was not the taste ratings but the amount eaten. In the first study of this kind [12], the preload reduced the amount eaten by unrestrained eaters, but increased eating among restrained eaters. Although this exact pattern has not always been replicated, most studies using the RS found a restrained by preload interaction on amount eaten (for a review, see [41]).

The goal conflict model of eating offers a different interpretation of these findings. According to this model, the problem of restrained eaters in controlling their consumption is due to a conflict between two goals, the goal to control their weight (weight control goal) and the goal to enjoy palatable food (eating enjoyment goal). Weight control is the goal restrained eaters' want to reach, because it is associated with valued outcomes such as health, fitness, and a slim figure. The pursuit of the weight control goal typically leads to the inhibition of the eating enjoyment goal (Figure 1). However, even though restrained eaters attempt to pursue a weight control goal, exposure to stimuli activating eating enjoyment (e.g., the sight or smell of palatable food) can increase the cognitive accessibility of the mental representation of eating enjoyment and result in the suppression of the weight control goal. Thus, according to the goal conflict model, restrained eaters are able to recognize internal cues of hunger or satiation, but they often overeat, because some food temptation led them to inhibit their eating control goal. It is important to note that the eating enjoyment goal does not only reflect liking of palatable food but also wanting it (Berridge, 1995; [36]). As I describe below, priming restrained eaters with palatable food elicits hot cognitions of how good a particular food item would taste. In other research, we also demonstrated that food primes draw the attention of restrained but not of unrestrained eaters [31]. Because the pursuit of weight control is effortful in the presence of stimuli promising eating enjoyment, the goal conflict model would also predict that cognitive load (e.g., as a result of strong emotions) would result in overeating.

The preloads used in tests of the boundary model typically involve palatable food (e.g. milkshakes). The goal-conflict model attributes the preload finding to priming, which increases the cognitive accessibility of

Figure 1



The goal-conflict model of eating (Adapted from [43]).Schematic illustration of the goal-conflict model of eating used to explain the eating behavior of restrained eaters. Diet cues prime the weight- control goal and lead to healthy eating by inhibiting the conflicting eating-enjoyment goal and unhealthy eating responses. In contrast, palatable food cues (that are more prevalent than dieting cues in food-rich environments)) prime the eating-enjoyment goal and lead to unhealthy eating by inhibiting the weight-control goal and healthy eating responses.

the eating-enjoyment goal. Because palatable preloads do not need to be consumed to prime eating enjoyment, the model can also explain findings that are inconsistent with the boundary model, namely that simply seeing or smelling palatable food without eating it (i.e., without violating a diet boundary) can also result in overconsumption by restrained eaters (e.g. [7•,8]; Jansen & van den Hout, 1991).

Our model is consistent with the Behavioral Susceptibility Theory of Wardle and colleagues [2,21••]. They proposed that individuals, who are genetically predisposed to be highly responsive to food cues (smell, sight, and taste) and who enjoy food, are likely to overeat in food-rich environments and therefore have a tendency to become overweight or obese [21]. They demonstrated this association in two large samples of children [3]. Although their model also assumes the presence of weaker internal satiety signals, the items used to measure satiety signals could simply be an indication of lack of eating enjoyment (e.g. my child leaves food on his/her plate at the end of a meal). A study with twin pairs aged 8–11 years established the heritability of enjoyment food and satiety responsiveness [3•,46].

Experimental tests of the goal conflict model

Although it is important to demonstrate that a new model can account for all the findings that have been conducted to test the previous model — even those inconsistent with that model — the new model also has to make novel predictions that cannot be derived from the old model [35]. Our model is based on theories of nonconscious goal pursuit (e.g. [4,18,39]), which assume that goals are knowledge structures that can be activated by cues in the environment without the individual being aware that any knowledge structure has increased in cognitive accessibility. Because questions assessing either of the two goals would have acted as primes that increased the cognitive accessibility of that goal, goal conflicts cannot be studied with the questionnaires. Furthermore, as Nisbett and Wilson [28] pointed out in their classic article on "Telling more than we can know: Verbal reports of mental processes", people are unlikely to know why they yielded to temptation on some particular instance and why they succeeded to resist on another occasion. Fortunately, cognitive psychologists have developed a rich set of methods that allowed us to test our theory. For reasons of space restriction, I will focus here on tests of the two most fundamental predictions of the model, namely (1) that exposure to palatable food will stimulate eating enjoyment in restrained eaters and (2) that stimulation of the eating-enjoyment goal will result in a suppression of the eating-control goal.

To test the first prediction, we used the probe-recognition task of McKoon and Ratcliff [26]. This task assesses the spontaneous activation of specific concepts during text comprehension. Participants were presented with sentences immediately followed by a probe word and had to decide whether the probe word had been part of the sentence (Experiment 1, [30]). For example, participants had to read the sentence 'Bill is eating a piece of apple pie' followed by a probe word that had not been part of the sentence (e.g. tasty). They had to decide as fast as possible whether the word was in the sentence. In control sentences, neutral food was being eaten. This allowed us to test whether spontaneous activation of thoughts about the 'hot' features of the food was more likely to be stimulated upon exposure to palatable food in restrained than unrestrained eaters [30]. We hypothesized that restrained eaters who are, for example, exposed to the word 'pizza' (or to a real pizza) will be more likely than unrestrained eaters to automatically imagine how good a slice of that pizza would taste. If the description of an apple pie being eaten triggers the thought 'tasty' in restrained, but not in unrestrained eaters, then restrained eaters will take longer to make the decision that 'tasty' was not part of that sentence. This prediction was supported.

To test the second prediction that exposure to eating-enjoyment cues will result in an inhibition of dieting thoughts in restrained but not in unrestrained eaters, we primed restrained and unrestrained eaters subliminally with words reflecting eating enjoyment (e.g. palatable, delicious) or words associated with eating enjoyment (e.g. ice cream, chocolate). We then measured their response time in recognizing eating-control concepts (e.g. dieting, weight loss) with a lexical decision task [42]••. Control participants were primed with eating-unrelated, neutral words. In support of predictions, we found that eating enjoyment but not neutral primes increased the response time to dieting concepts of restrained but not of unrestrained eaters.

Although these studies demonstrate that priming of eating enjoyment reduces the cognitive accessibility of the eating-control goal in restrained eaters, we did not assess whether this type of priming would also result in overeating. However, there are numerous studies that support this assumption. For example, Fedoroff and colleagues [7] exposed half of their research participants with the smell of pizza being baked, before they were asked to eat pizza in an alleged taste test. Compared with participants, who had not been exposed to such smells, exposure to pizza smells increased pizza consumption in restrained, but not unrestrained eaters. Comparable findings were reported by Jansen and van den Hout (1991). These findings are inconsistent with the boundary model, because simply smelling palatable food does not breach the diet boundary. Further, tests of the goal-conflict model have been reviewed in Stroebe et al. [43] and Stroebe [41].

The role of eating restraint in preventing obesity

According to the boundary model, at least in its original form, the problem of individuals with obesity in controlling their eating is paradoxically a result of their reliance on cognitively controlling their eating. In fact, Polivy and Herman [34] even propagated 'undieting' as a program to help people stop dieting. In contrast, the goal-conflict model assumes that the cognitive control of their food intake helps restrained eaters to control their weight. If one assumes that people's enjoyment of eating palatable food is the cause of their weight problem, then cognitive control of their eating is the obvious solution to prevent overeating.

There is empirical support for this assumption. Although eating restraint and BMI have typically been found to be positively correlated (e.g. [23]; Ruderman, 1983), there is evidence from longitudinal studies that initial weight gain longitudinally predicted eating restraint [5,19,24]. When people realized that they were putting on unwanted weight, they began to engage in restrained eating. However, only some restrained eaters appear to be successful in controlling their weight. Success has been measured with the Perceived Self-Regulatory Success in dieting scale (PSRS), which asks restrained eaters whether they are successful in watching their weight and in losing extra weight [9,25]. The fact that in contrast to the RS, the PSRS correlates negatively with BMI ($r = -0.41$; [25]), suggests that the self-perception of these successful restrained eaters is valid. That these successful restrained eaters experience less food craving and are also less impulsive than their unsuccessful counterparts lends further support to the assumption that some restrained eaters are successful in controlling their weight [25,45]. Unfortunately, these findings also suggest that many restrained eaters fail in their aim to control their weight. This may explain why rates of overweight and obesity are not declining in the United States or in England, even though nearly half the population in these countries reports to have attempted losing weight in the past year [11,33]. Using the restraint scale of the Dutch Eating Behavior Questionnaire, De Ridder et al. [6] reported even that more than 60% of the Dutch population could be categorized as restrained eaters.

Conclusions

People with weight problems appear indeed less sensitive to hunger and satiation cues and anxiety or stress tends to increase their risk of overeating. However, according to the goal- conflict model of eating, they do not overeat because they are unable to recognize internal cues of hunger or satiation, but because they disregard these cues in order to enjoy eating palatable food. Given the delicate balance between these two goals in restrained eaters and the fact that in our food-rich environments, people are permanently exposed to stimuli signaling the presence and availability of palatable food, it is perhaps not surprising that restrained eating is not a certain path to weight control or even weight loss.

Conflict of interest

There is no conflict of interest.

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