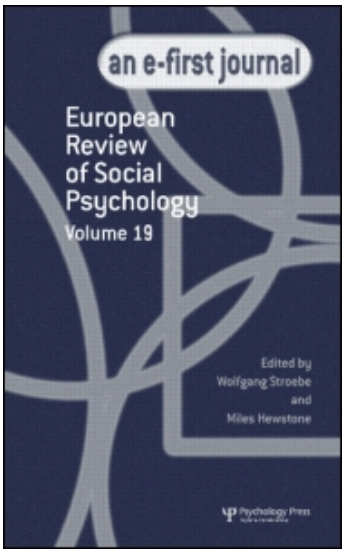

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Understanding dieting: A social cognitive analysis of hedonic processes in self-regulation

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Understanding dieting: A social cognitive analysis of hedonic processes in self-regulation

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The present paper introduces a novel approach to understanding failures of self-regulation in chronic dieters. Traditional approaches to this problem have focused on consciously controlled processes of eating regulation, such as the realisation that one has overeaten, or the experience of food cravings. We argue, however, that dieters' problem might rather lie in their sensitivity to the hedonic aspects of food and the resulting inhibition of their dieting goal. We present a goal-conflict model that integrates recent findings on hedonic sensitivity in eating regulation with social cognition research on nonconscious goal pursuit. We show that the perception of attractive food triggers hedonic thoughts about food in chronic dieters and leads to the inhibition of their dieting goal. These processes make subsequent overeating more likely, while bypassing dieters' conscious awareness. We discuss how our model can accommodate earlier research findings in this area, and we consider its implications for dieting behaviour and for our attempts to resist temptations more generally.

Social psychologists have long been interested in the way that people strive for their personal goals in the presence of attractive diversions. In many domains of life it is of vital importance to be able to overcome one's first impulses to give in to such temptations, in order to reach more abstract, higher-order goals. One domain where such efforts at self-regulation are particularly relevant for many people is the domain of eating and dieting behaviour. It is often necessary, for example, to forgo the pleasures of an attractive chocolate cake or an additional piece of pizza in order to be able to reach or maintain a healthy body weight.

One of the earliest researchers to address this issue from a social psychological point of view was Stanley Schachter, who suggested that the

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problem of obese people might lie in their increased responsiveness to environmental cues triggering eating behaviour (Schachter, 1968). Since Schachter's seminal work in this area, however, most research on this issue has paid surprisingly little attention to environmental influences on the regulation of eating. In the present chapter we will propose a model of dieting behaviour that again attributes crucial importance to environmental cues, and that uses recent social cognitive methods to elucidate especially the nonconscious processes that translate such influences into behaviour. But let us first examine why dieting is an issue that receives so much attention from researchers in psychology.

Although obesity was already an object of research in Schachter's time, body weight is today an even greater and growing concern in Western societies. The prevalence of overweight and obesity has increased markedly over the last decades, and in many industrialised countries, more than half of the population is now considered too heavy (Flegal, 2005; Fry & Finlyey, 2005; Hedley et al., 2004; C. L. Ogden et al., 2006; Rennie & Jebb, 2005). Such figures are alarming in themselves, but they are especially striking if one considers that obesity has been recognised as a health condition associated with increased risk of cardiovascular diseases, hypertension, some kinds of cancer, diabetes, and other health problems (Mokdad et al., 2003; Must et al., 1999). At the same time, overweight and its more severe form, obesity,[1] are associated with increased body dissatisfaction (for a review, see Schwartz & Brownell, 2004), and overweight and obese people are the subject of strong bias and discrimination (see Puhl & Brownell, 2001, for an overview; Teachman, Gapinski, Brownell, Rawlins, & Jeyaram, 2003). Thus, overweight and obesity are conditions with severe health consequences as well as negative social implications.

From this one might infer that most people should be motivated to control their weight to avoid the negative consequences of being too heavy. Indeed, just as the prevalence of overweight and obesity has increased, so has the popularity of weight-loss diets and the number of people trying to regulate their weight by dieting (Kruger, Galuska, Serdula, & Jones, 2004; Mann et al., 2007). Recent data show that 24% of men and 38% of women in the US were trying to lose weight in 1998, most commonly by consuming fewer calories and eating less fat (Kruger et al., 2004). Another study reports that more than half of the study population were using weight control behaviours at the time of measurement (Neumark-Sztainer et al., 2000). However, although such efforts at weight regulation are often initially

[1]A person's degree of overweight or obesity can be determined via the body mass index (BMI), which is calculated by dividing the body weight (in kilograms) by the squared height (in metres). While a BMI between 18.5 and 24.9 is considered normal weight, a BMI of 25 or higher indicates overweight, and a BMI of 30 or higher, obesity (World Health Organisation, 2000).

successful, most dieters do not maintain their weight loss in the long term (Elfhag & Rossner, 2005; Jeffery et al., 2000; see Mann et al., 2007, for a review). On the contrary, dieters often regain more weight than they initially lost, once the diet programme is finished (Mann et al., 2007). In line with such findings, chronic dieters do not manage to actually eat less than non-dieters in either natural or laboratory settings (Kruger et al., 2004; Martin et al., 2005; Stice, Fisher, & Lowe, 2004), and they tend to gain weight in the long term (e.g., Klesges, Isbell, & Klesges, 1992; Lowe et al., 2006; Stice, 1998). Apparently, dieters cannot resist the temptations of attractive, high-calorie food. What makes it so difficult to refrain from eating such foods, even if one knows that they interfere with long-term health goals?

Recently there has been a growing recognition that the abundance and easy availability of attractive, energy-dense foods might contribute significantly to the modern "obesity epidemic" (e.g., J. O. Hill & Peters, 1998; Wadden, Brownell, & Foster, 2002). Indeed, numerous studies show that dieters are highly responsive to the presence of such attractive foods, and experience cravings and lapses of restraint when they are confronted with them (e.g., Fedoroff, Polivy, & Herman, 1997; Stirling & Yeomans, 2004). This suggests the need to study the effect of environmental food cues on the psychological processes governing eating behaviour. Viewing eating behaviour as the result of the interplay between characteristics of the individual and the environment makes it a truly social-psychological research area. At the same time, recent developments in social psychology suggest that much of human behaviour is triggered by subtle environmental cues and guided by unconscious mental processes, so that we are often not aware of the factors that cause our behaviour (Aarts, Gollwitzer, & Hassin, 2004; Bargh, 1990). This opens the intriguing possibility that attractive food cues prime in dieters certain concepts that make it more likely that they will overeat, without them being aware of these influences.

In this chapter we will combine these two developments—the recognition that environmental food cues might interfere with dieting behaviour, and recent research on nonconscious processes underlying behaviour—to examine the difficulties that dieters experience in the pursuit of their good intentions. More specifically, we will lay out a goal-conflict model of eating behaviour that uses theoretical concepts from social cognition research (e.g., Aarts, 2007; Custer & Aarts, 2005a, 2005b; Kruglanski et al., 2002) to explain the findings on dieters' increased responsiveness to food cues, as well as their difficulties in eating regulation in food-rich environments. We will review a set of studies that use a variety of social-cognitive methods to support this theory by examining dieters' cognitive processes in the regulation of eating behaviour. For example, in one set of studies we used subliminal priming of palatable food words to simulate the impact of environmental food stimuli on restrained eaters and employed a lexical

decision task to assess changes in cognitive accessibility of thoughts about dieting (Stroebe, Mensink, Aarts, Schut & Kruglanski, 2008a). In addition we will discuss how this new approach can explain earlier findings in the domain of eating regulation; for example why some individuals overeat under cognitive load or when experiencing strong emotions. First, however, we will discuss earlier theories on this topic and examine how these account for difficulties in eating regulation.

HOMEOSTATIC THEORIES OF OBESITY

Most earlier theories for understanding the problem of obesity are based on the assumption that eating behaviour is regulated homeostatically in response to signals of hunger and satiety, and that this mechanism of homeostatic regulation is disturbed in overweight and obese individuals (Bruch, 1961; Herman & Polivy, 1984; Kaplan & Kaplan, 1957; Schachter, 1971).

Early theories

One of the first psychological approaches to obesity was proposed by Kaplan and Kaplan (1957), who suggested that overeating in overweight individuals occurs because these individuals do not regulate their food intake in response to physiological signals of hunger, but rather in response to conditioned cues for eating (such as lunchtime or dinnertime), or because their eating is a conditioned response to psychological distress. Thus, Kaplan and Kaplan (1957) proposed learning mechanisms to explain why some individuals eat in response to conditioned external cues rather than as a means to reduce their homeostatic hunger. In a related theory Bruch (1961), too, attributed the development of overweight to the insensitivity to internal cues for hunger. She argued that, due to early childhood experiences, some individuals have not learned to distinguish sensations of hunger from other states of arousal, so that they have a tendency to react with eating in response to anxiety or other strong emotions, which increases the chances of becoming overweight.

The idea of differential responsiveness to internal and external cues for eating was developed further by Schachter and colleagues after their apparent failure to find evidence of a responsiveness to internal cues in the food intake of overweight participants (Schachter, Goldman, & Gordon, 1968). In their classic study, Schachter and colleagues (1968) examined the effects of manipulated fear and satiation on the number of crackers eaten in an alleged taste test. Anxiety was manipulated by leading respondents to expect to receive either a weak or a strong electric shock. Satiation was manipulated by having research participants either eat or not eat roast beef sandwiches (i.e., a so-called preload) before the taste test. Whereas both fear

and the preload reduced the food intake of normal weight participants, it had no effect on the amount of crackers eaten by individuals who were overweight. Since overweight individuals appeared to be insensitive to internal cues in regulating their eating, Schachter and colleagues suggested that the eating behaviour of these individuals is strongly affected by "the circumstances of eating" (Schachter, 1968, p. 753). Thus, according to this externality theory, while the eating behaviour of normal-weight individuals is triggered by the internal homeostatic cues of hunger, the eating of overweight people is a response to external cues such as the time of day, the sight, smell or taste of food, or other people eating (Schachter, 1968, 1971).

A number of innovative studies by Schachter and his colleagues supported this assumption, showing for example that the amount of ice cream that overweight individuals ate in a taste test was strongly related to how much they liked it, but not to their level of deprivation (Nisbett, 1968; see also Goldman, Jaffa, & Schachter, 1968). Moreover, obese individuals were more reactive to time cues to determine their eating behaviour (Goldman et al., 1968; Schachter & Gross, 1968). Thus, these studies by and large provided support for the theory that, in contrast to normal-weight people, the eating behaviour of obese people is more strongly determined by external cues than by internal cues for eating (see Leon & Roth, 1977; Rodin, 1980; Ruderman, 1986, for overviews see Stroebe, 2008; Stroebe, Papies, & Aarts, 2008b).

The boundary model of eating

Herman and colleagues (Herman & Mack, 1975; Herman & Polivy, 1980) built on this externality theory when they suggested that it might not be overweight per se, but rather the attempt to reduce one's weight by dieting that makes some individuals overly responsive to external food-related cues and, at the same time, less sensitive to internal cues of hunger and satiety. The notion of "restrained eating" (Herman & Mack, 1975) was introduced to describe such individuals who chronically try to restrict their food intake and control their weight by dieting, but appear to be more characterised by their lapses than their actual restraint.

Herman and Mack (1975) developed the Restraint Scale (RS) to assess the degree of self-imposed restriction of food intake. The revised version of this scale consists of a 10-item self-report questionnaire (Herman & Polivy, 1980), with 6 items measuring the construct Concern for Dieting (e.g., "Do you often diet?", "Do you have feelings of guilt after overeating?") and 4 items measuring Weight Fluctuations ("What is your maximum weight gain within a week?", "In a typical week, how much does your weight fluctuate?"). Most research on restrained eating has used the aggregate score of both scales, although it has been suggested that restrained eating

may not be a unidimensional construct (Gorman & Allison, 1995; Ruderman, 1983), and that the cognitive component of attempting to diet might best be captured by the Concern for Dieting subscale (van Strien, Breteler, & Ouwens, 2002).

The differences between the eating behaviour of restrained and unrestrained eaters were later explained by Herman and Polivy (1984) in their boundary model of eating. They argue that biological pressures work to maintain consumption above some minimum level (the "hunger boundary") and below some maximum level (the "satiety boundary"); between these boundaries is an area of "biological indifference", where psychological factors have a strong influence on food consumption. Since restrained eaters chronically try to override their hunger for the sake of dieting, they become insensitive to internal cues of hunger and satiety, so that the zone of "biological indifference" is wider in restrained than in unrestrained eaters. At the same time, restrained eaters try to control their eating behaviour cognitively by adhering to self-set dieting rules. They impose a so-called diet-boundary on themselves to limit their consumption before they have reached their satiety boundary. Thus, for the regulation of their eating behaviour, restrained eaters do not rely on internal homeostatic cues, but rather make use of more consciously controlled processes. Unrestrained eaters, on the other hand, are less concerned with their body weight and are therefore assumed to regulate their food intake by relying on internal homeostatic cues like hunger and satiety. Although they did not use this terminology, Herman and Polivy's boundary model is basically a dual process theory of eating, with eating behaviour of unrestrained eaters assumed to be an automatic process, whereas eating behaviour of restrained eaters is conceived as a cognitively controlled process.

The disinhibition effect

The fact that restrained eaters exert conscious cognitive control over their eating behaviour makes them more vulnerable to the impact of so-called disinhibitors which temporarily diminish their tendency to restrain their intake. Two kinds of disinhibiting factors have been emphasised: the consumption of high-calorie food, and the experience of strong emotions. The classic finding that prompted much research on the disinhibition effect in restrained eaters was reported by Herman and Mack (1975) and deals with the first of these factors, the consumption of high-calorie food. Emulating the paradigm developed by Schachter et al. (1968), Herman and Mack (1975) asked their participants to rate the taste of different ice creams under conditions of no preload or after consumption of either one or two milk shakes. It was found that unrestrained participants regulated their consumption of ice-cream following the intake of the milkshakes, eating less

ice-cream when they had also consumed a milkshake, and eating even less after consumption of two milkshakes. However, the restrained participants behaved differently. While they ate less ice-cream than unrestrained eaters in the no-milkshake condition, they increased their consumption after a preload of one or two milkshakes; this was called "counter-regulation". As an explanation for this curious finding, Herman and Mack (1975) argued that the consumption of the milkshakes made it impossible for restrained eaters to keep to their diet, so that they decided to temporarily forget about their diet altogether and eat as much as they liked—the "what-the-hell" effect (Herman & Polivy, 1984). By violating the self-imposed diet boundary, the preload thus functioned as a disinhibitor for the eating behaviour of restrained eaters.

Herman and Mack's original study (1975) inspired a large amount of research to replicate the effect of a preload on the eating behaviour of restrained eaters and to identify other potential disinhibitors. However, the initial finding that dieters increase their consumption after a preload could not systematically be replicated. The overall picture that emerges from the preload studies is that while unrestrained eaters generally reduce their consumption after a high-calorie preload, the consumption of restrained eaters does not vary systematically as a function of preload (Herman, Polivy, & Esses, 1987a; Hibscher & Herman, 1977; Jansen, Oosterlaan, Merckelbach, & van den Hout, 1988; Ouwens, van Strien, & van der Staak, 2003; Polivy, 1976; Ruderman & Christensen, 1983; van Strien, Cleven, & Schippers, 2000; Westenhoefer, Broeckmann, Munch, & Pudel, 1994). However, the pattern of counter-regulation seems to be especially likely to occur when the preload has a high hedonic value; thus when it is tasty or perceived to be high in calories, or both (Knight & Boland, 1989; Polivy, 1976; Spencer & Fremouw, 1979; Woody, Costanzo, Liefer, & Conger, 1981).

In addition to the fact that the boundary model's central prediction concerning the effect of a preload has received only mixed support, there is also no empirical evidence for the hypothesised "what-the-hell" cognitions underlying this effect (Jansen et al., 1988; see also Boon, Stroebe, Schut, & Jansen, 1998). Thus, in those cases where an effect of preload on subsequent consumption has been found, it is not clear what actually makes restrained eaters overeat. Similar to the preload effects, mixed findings have been reported as to restrained eaters' insensitivity to hunger cues (e.g., Herman, Polivy, Lank, & Heatherton, 1987b; J. Ogden & Wardle, 1990), and there is no evidence that restrained eaters have a higher satiety boundary (Tepper, 1992). These findings suggest that restrained eating and boundaries of hunger are largely independent components of eating behaviour.

More consistent effects have been found in studies investigating the effects of stress and strong emotions, which have been proposed by Herman and Polivy (1984) as another potential disinhibiting factor, because they

"render the diet boundary irrelevant or at least ineffective" (p. 152), thus making restrained eaters less motivated to keep to their diet. Overall, these studies have shown that restrained eaters eat more when depressed, anxious, or stressed than when in a neutral mood, while unrestrained eaters rather decrease their eating in such states (e.g., Baucom & Aiken, 1981; Heatherton, Herman, & Polivy, 1991; Herman et al., 1987b; Mitchell & Epstein, 1996; for a review, see Greeno & Wing, 1994). These effects are explained by Herman and Polivy in terms of "more urgent concerns" (1984, p. 152) that lead restrained eaters to ignore their diet boundary.

Later studies have investigated the effect of the availability of psychological resources on the regulation of eating behaviour and provided a different explanation for dieters' overeating under strong emotions, namely that the emotion-induced overeating might be due not to the experience of specific emotions, but rather to the more general effect that self-regulation is impaired when cognitive or psychological resources are limited (Muraven & Baumeister, 2000; Vohs & Heatherton, 2000). In line with this explanation, several studies have shown that restrained eaters overeat on palatable food when placed under cognitive load (Bellisle & Dalix, 2001; Boon, Stroebe, Schut, & Ijntema, 2002; Lattimore & Caswell, 2004; Ward & Mann, 2000; see Macht, 2008, for an overview). Boon and colleagues (2002), for example, imposed a cognitive load on half of the participants while they were completing a taste test with ice-cream which was presented as either very palatable ("extra creamy"), or calorie-reduced ("contains 30% less calories"). When the ice-cream was described as "extra creamy", restrained eaters ate the same amount of ice-cream as unrestrained eaters when cognitive load was low, but they consumed much more than unrestrained eaters when cognitive load was high. No such effect was observed for the "calorie-reduced" ice-cream.

These findings confirm that cognitive load impairs restrained eaters' efforts at dieting. However, overeating occurs only when the available food is perceived as high in hedonic value (e.g., "extra creamy"). The perceived hedonic value of a food item represents the meaning of a stimulus in terms of pleasure, which is one of the basic evaluative dimensions for the categorisation of stimuli in our environment (Tesser & Martin, 1996). We suggest that the findings reported above show that once their dieting efforts are overruled, restrained eaters' eating behaviour is guided by this hedonic value of the food: when the food is not seen as hedonically relevant, restrained eaters do not eat more than unrestrained eaters.

Conclusion

Although the boundary model seemed to fit well with the original preload studies and has subsequently inspired a large number of studies, it has

limited explanatory power for understanding the problem of dieters' misregulation of eating (for reviews, see Stroebe, 2008; Stroebe et al., 2008b). No consistent evidence has been found for restrained eaters' insensitivity to cues of hunger and satiety, for actual overeating in response to preloads, or for the "what-the-hell-effect" as the proposed mechanism underlying this overeating. While the model's predictions concerning the effect of strong emotions on eating behaviour have largely been supported, these findings might well be due to the availability of psychological resources for self-regulation. When resources are low, the behaviour of restrained eaters in the presence of palatable food seems to be guided most by the hedonic aspects of the food, which overrule the impact of the dieting goal. This conclusion is well in line with recent developments in research on dieting behaviour, where the role of hedonic aspects of food is receiving increased attention, and researchers have begun to systematically examine the role of pleasure in the regulation of eating behaviour.

THE HEDONIC VALUE OF FOOD

Scientific and anecdotal evidence suggests that eating is to a large part driven by hedonic responses to food. People are more inclined to eat food that they find palatable (e.g., Bobroff & Kissileff, 1986; Eertmans, Baeyens, & van den Bergh, 2001; Pliner & Mann, 2004), and terminate eating when the experienced palatability of the food has temporarily diminished (Hetherington & Rolls, 1996; for a review, see Yeomans, 1998). Pinel and colleagues (Pinel, Assanand, & Lehman, 2000) argue that the most important factor determining the incentive value of food is its anticipated taste. Humans generally have a preference for sweet, fatty, and salty tastes, as these can be indicators that a food is rich in energy, vitamins, and minerals (Pinel et al., 2000). Thus, such foods are generally experienced as palatable (i.e., tasty). However, there are individual variations in taste preferences (Brunstrom, 2004), and in the present chapter we also refer to the hedonic value of food to convey the more general notion that certain foods can be pleasurable to certain individuals under particular circumstances (see also Yeomans, 1998).

Recent theorising on the mechanisms underlying eating behaviour thus converges on the idea that eating is to a large part driven not by a homeostatic mechanism to reduce hunger, as was previously assumed, but rather by processes that involve the anticipation of the hedonic properties of food (Finlayson, King, & Blundell, 2008; Lowe & Butryn, 2007; Pinel et al., 2000; Yeomans, 1998). Moreover, hedonic processes in eating have also been suggested to play a key role in overeating and obesity. In support of these arguments, recent neurological evidence suggests that there is a brain system for the hedonic regulation of eating that responds to cues about

palatability and is separate from the more homeostatic system that controls eating in response to physiological needs (Blundell & Finlayson, 2004; Lowe & Levine, 2005; Yeomans, Blundell, & Leshem, 2004). Moreover, there is evidence that there are stable individual differences with regard to the sensitivity of the hedonic system for eating regulation, which could be grounded in a differential sensitivity of the dopamine system (Blundell et al., 2005; Finlayson, King, & Blundell, 2007; Lowe & Butryn, 2007; Yeomans et al., 2004). This implies that some individuals will be more sensitive to cues about the hedonic properties of food than others, and it has been suggested that an increased hedonic sensitivity could be related to difficulties in eating regulation and overweight (Mela, 2006; Yeomans et al., 2004).

Recently researchers have begun to try to capture these individual differences in hedonic sensitivity and assess their relation to eating behaviour. Initially it seemed plausible to assume that individuals who have difficulties regulating their weight have a more positive evaluation of palatable, high-fat food than others, and therefore eat too much of it. However, empirical evidence does not support this straightforward position. Research on the differences between obese and normal weight participants suggests that these groups do not differ with respect to their "liking" of palatable food (Mela, 2006). One could argue, however, that explicitly asking obese participants for their liking of palatable, high-fat food items might bias them towards more negative responses due to social desirability concerns. But even when assessed with implicit measures of attitudes, which measure evaluations unobtrusively and thus are said to represent a person's "true attitude", there is no evidence that obese people evaluate palatable food more positively. On the contrary: when measured implicitly, obese people's evaluations of high-fat, palatable food seem to be even more negative than those of normal-weight people (Roefs & Jansen, 2002; Roefs et al., 2005b).

A similar picture emerges concerning restrained and unrestrained eaters' evaluations of high-fat, palatable food. Restrained eaters do not indicate more positive attitudes towards such food than unrestrained eaters when explicit measures are used (Fedoroff et al., 1997; Stroebe et al., 2008a), and comparable results are obtained with implicit measures of evaluations.

In our own study of this issue (Papies, Stroebe, & Aarts, 2008c), we measured restrained and unrestrained eaters' implicit evaluations of food pictures in an affective priming task (Fazio, Jackson, Dunton, & Williams, 1995). Participants were presented with colour photographs of palatable (e.g., pizza, ice-cream), neutral (e.g., lettuce, soup), and unpalatable food (e.g., cooked cabbage, blood sausage) that were selected on the basis of a pilot test in our sample of participants. After the presentation of a food picture, either a positive or a negative "smiley" symbol (☺ vs ☹) appeared on the screen, and participants were asked to categorise this stimulus as quickly and as accurately as possible as positive or negative. If the picture of

a palatable food is evaluated positively, it should trigger a positive reaction and therefore facilitate the correct response to a positive smiley (a congruent response) and slow down the response to a negative smiley (an incongruent response). An unpalatable food, on the other hand, should speed up the response to a negative smiley (congruent) and slow down the response to a positive smiley (incongruent). Responses to smileys after neutral food pictures should lie in between. We hypothesised that restrained eaters hold particularly strong positive evaluations of palatable food, so that the effect of the food pictures on their reaction times should be more pronounced than for unrestrained eaters.

Results showed that congruent responses were faster than incongruent responses, with responses following neutral pictures lying in between these values. This indicates that palatable food was evaluated more positively than unpalatable food. However, contrary to our hypothesis, there were no differences between restrained and unrestrained eaters. Thus, while restrained eaters displayed a clear preference for palatable food over unpalatable food, this effect was not more pronounced than in unrestrained eaters—if anything, it was even more pronounced in the unrestrained eaters. Using other measures of implicit evaluations, Roefs and colleagues obtained similar results (Roefs, Herman, MacLeod, Smulders, & Jansen, 2005a). Taken together, these studies strongly suggest that restrained eaters do not evaluate palatable food more positively than unrestrained eaters. Thus, the crucial difference between restrained and unrestrained eaters does not lie in their basic evaluation of palatable food. Rather, it might be found on a more specific level—in the hedonic value attributed to the palatable food.

Food cravings

When considering hedonic processes in the regulation of eating behaviour, a potentially useful distinction can be made between the evaluation of a palatable food, and the degree to which its hedonic characteristics elicit the motivation to actually engage in eating it (Mela, 2006; see also Robinson & Berridge, 2000). Thus the critical issue for eating regulation and overweight might not be the degree to which a person holds a positive evaluation of a certain food, but the degree to which the person actually wants to eat that food, as this might be a better predictor of behaviour (Robinson & Berridge, 2000). The experience of the motivation to eat has mostly been studied by examining the occurrence of food cravings, which are defined as the intense desire to eat a specific food item (Weingarten & Elston, 1990) and are therefore related specifically to the hedonic properties of food. Several questionnaires have been developed to directly assess food cravings (e.g., Cepeda-Benito, Gleaves, Williams, & Erath, 2000), and these have been used to study whether dieters experience more cravings than non-dieters.

While some studies report a clear association between dieting behaviour and cravings (e.g., Gendall, Sullivan, Joyce, Fear, & Bulik, 1997; Nijs, Franken, & Muris, 2007; Pelchat, 1997; Polivy, Coleman, & Herman, 2005), other studies find a weak or no such relationship (e.g., A. J. Hill, Weaver, & Blundell, 1991; Rodin, Mancuso, Granger, & Nelbach, 1991; Weingarten & Elston, 1991). Some researchers have proposed cravings to be the mechanism linking a heightened sensitivity to food rewards to overweight. Burton, Smit, and Lightowler (2007) found that experienced food cravings mediate the relationship between a strong responsiveness to external food cues and body mass index (BMI). Franken and Muris (2005) predicted in a similar fashion that cravings might be the causal link between reward sensitivity and higher BMI, but they did not find evidence for this mediating role of cravings.

To illustrate the motivational force that cravings for food can exert on the individual, it is interesting to note that the same brain areas are activated when a person experiences cravings for food as in cravings for addictive drugs (Pelchat, Johnson, Chan, Valdez, & Ragland, 2004), and the same neurotransmitter systems are involved (Pelchat, 2002; see also Volkow & Wise, 2005). Thus there is some evidence that attractive food exerts a strong motivational pull on restrained eaters, which they sometimes experience as explicit food cravings. However, the exact relationship between restrained eating, cravings, and overeating is not yet clear.

We suggest several possible reasons for these mixed findings. First of all, in the craving studies alluded to earlier participants were asked to self-report the frequency of experiencing cravings in their daily lives. However, it might be difficult to accurately report one's cravings in retrospect while one is not currently experiencing them (cf. Loewenstein, 1996), which might lead dieters to underestimate how often they experience cravings. In addition to this problem, concerns about the social desirability of controlling one's food intake might also lead to under-reporting of food cravings. This might be especially pronounced in dieters, so that the association of dieting with cravings may appear weaker in such studies than it really is. Finally, we suggest that rather than looking at cravings and motivation to eat as a general phenomenon in dieters, it might be more informative to look at cravings and other appetitive responses to food when one is actually confronted with it. After all, these are the situations in which the hedonic aspects of food are most salient, while at the same time it is important for dieters to curb their motivation to eat. Therefore, we will now briefly discuss a number of studies that examined restrained eaters' appetitive responses when they were actually confronted with attractive food. These studies suggest that restrained eaters' hedonic responses in such situations might actually play a crucial role in their overeating.

The hedonic impact of food cues

Several experimental studies have confirmed that the exposure to palatable food cues elicits in restrained eaters stronger appetitive responses than in unrestrained eaters. Compared to unrestrained eaters, restrained eaters have been found to respond with increased salivation to the exposure to attractive food cues (Brunstrom, Yates, & Witcomb, 2004; Klajner, Herman, Polivy, & Chhabra, 1981; LeGoff & Spigelman, 1987; Tepper, 1992). Other studies have shown that imagining liked food triggers increased self-reported food cravings in restrained eaters (Fedoroff et al., 1997; Harvey, Kemps, & Tiggemann, 2005), and the exposure to the smell or the sight of palatable food leads to stronger cravings and overeating in restrained compared to unrestrained eaters (Fedoroff et al., 1997; Fedoroff, Polivy, & Herman, 2003; Jansen & van den Hout, 1991; Rogers & Hill, 1989). Fedoroff and colleagues (2003) showed that restrained eaters' increased cravings were related to increased intake, but only when the food that participants were smelling during the exposure condition was the same food that they sampled during the test phase of the experiment. A related study by Stirling and Yeomans (2004) nicely illustrates the appetitive pull that attractive food exerts on restrained eaters. In this study participants received a bag of chocolate candies to keep for 24 hours, and the experimenter instructed them not to consume any of it. Restrained eaters reported more difficulty in not eating the chocolate than did unrestrained eaters, and they actually secretly ate some of it, while unrestrained eaters had no such difficulty in complying with the instructions (see also Polivy et al., 2005).

These studies show in a variety of ways that restrained eaters react to attractive food cues with increased eating and with other kinds of motivational responses geared towards eating. Even without the prior consumption of a preload, or the experience of stress or strong emotions, restrained eaters were triggered to overeat on high-fat, palatable food. In a sense, the studies suggest that the mere thought or presence of palatable food can act as a disinhibitor of restrained eaters' eating behaviour. Speaking in terms of the boundary model (Herman & Polivy, 1984), the diet boundary is rendered ineffective exactly at the moment when it is most needed, namely in the presence of attractive but forbidden food.

These findings raise an interesting possibility concerning the mechanisms underlying restrained eaters' overeating. Based on the findings that restrained eaters react with appetitive responses and overeating to the actual or even imagined presence of attractive food, we propose that a hedonic motivation with respect to food and eating might be the driving force behind their eating behaviour in these situations. In addition, we argue that the activation of such hedonic responses upon the exposure to food cues might switch off the competing dieting goal in the minds of restrained eaters,

making it less likely that this goal will influence restrained eaters' behaviour. This two-step process might be the psychological mechanism that translates increased sensitivity to the hedonic aspects of food into actual behaviour. We integrated these ideas into a goal-conflict model of eating behaviour, which we will now discuss in more detail.

THE GOAL-CONFLICT OF RESTRAINED EATERS

The goal-conflict model of restrained eating is grounded in recent research on nonconscious goal pursuit, which examines the processes by which external cues can trigger behaviour without the intervention of conscious thought. Indeed, much of our everyday behaviour occurs without much conscious thought or intention (e.g., Bargh, 1990), and even the pursuit of goals can occur in such an automatic fashion, in response to environmental cues or the behaviour of other people (e.g., Aarts & Dijksterhuis, 2000; Aarts et al., 2004; Custers & Aarts, 2005a). Research on nonconscious goal-pursuit is based on the assumption that goals are represented and stored in mind as desired states that can readily be retrieved by external cues (Bargh, 1990).

Several lines of research have examined how behavioural goals can be triggered by environmental cues and guide cognitive and behavioural processes supporting goal pursuit. Custers and Aarts (2005b, 2007b) have shown that the exposure to information that renders a desirable state more accessible in mind can motivate an individual to pursue it, for example by increasing behavioural effort at attaining the goal. Moreover, priming goal-relevant information can attune subsequent cognitive processes to facilitate the pursuit of that goal, such as activating means instrumental for reaching that goal (Aarts & Dijksterhuis, 2000; Custers & Aarts, 2007a), perceiving instrumental means as being bigger than non-instrumental means (e.g., perceiving a glass of water to be higher when thirsty, Veltkamp, Aarts, & Custers, 2008), and evaluating these means more positively (Ferguson & Bargh, 2004). These processes make it more likely that instrumental means will be selected for the pursuit of a goal, thereby enhancing the chances of goal achievement.

Of particular relevance for our goal-conflict model of restrained eating is the finding that the instigation of a goal can lead to the inhibition of conflicting goals, as these might interfere with the pursuit of the focal goal (Aarts, Custers, & Holland, 2007; see also Shah, Friedman, & Kruglanski, 2002). In a recent study examining this issue Aarts and colleagues (2007; Experiment 2) unobtrusively primed participants with the goal of studying while measuring the mental accessibility of the goal of socialising by means of a lexical decision task. Results showed that activating the goal of studying outside awareness led to the inhibition of the goal of socialising, but only when this goal was rendered accessible as the result of a previous priming

procedure. Thus, when the goal of studying was instigated, the previously accessible goal of socialising was inhibited, thereby actively decreasing the contribution of the socialising goal in overt action and facilitating the pursuit of the goal of studying. Interestingly, when the goal of socialising had first been co-activated with negatively valenced words in order to make the pursuit of this goal temporarily less desirable, this inhibition effect did not occur. Thus, when the competing goal was made less desirable, it was less likely to interfere with the pursuit of the study goal, thereby rendering its inhibition unnecessary. This study illustrates the functional mechanism of inhibition of potentially conflicting goals, which serves to facilitate the successful pursuit of a focal goal.

Our goal-conflict model of restrained eating is built on these findings on the nature of nonconscious goal pursuit. We propose that restrained eaters hold two conflicting goals with regard to food: the goal of eating good food, and the goal of controlling their weight (Kruglanski & Stroebe, 2005; Stroebe, 2002, 2008; Stroebe et al., 2008a). Both are highly desirable for restrained eaters, but while the first goal is hedonically based and will lead to the consumption of attractive food, the latter is aimed at controlling the intake of such food in order to prevent weight gain. Thus, the goal of eating attractive food is often incompatible with the goal of controlling one's weight, leading to a potential goal-conflict.

The goal-conflict model suggests that, due to restrained eaters' repeated attempts at weight control, their dieting goal is chronically (though not necessarily consciously) accessible in mind. As a result, this goal will normally dominate restrained eaters' food-related cognitions and behaviour, and will curb the influence of the conflicting goal of eating good food. This changes, however, when restrained eaters are confronted with external cues of palatable food. We suggest that restrained eaters' problems in eating regulation might begin with the fact that they are more sensitive to the hedonic properties of food. Due to this increased hedonic sensitivity, the perception of palatable food triggers in restrained eaters a hedonic motivation towards food, which is a goal-directed orientation towards eating hedonically relevant (often palatable) food. As the motivation of eating the attractive food is then triggered, restrained eaters' cognitive processes will be geared towards pursuing this goal and, importantly, conflicting goal representations will be inhibited (Aarts et al., 2007). Thus, when the hedonic goal of enjoying good food is activated by the perception of palatable food, restrained eaters will inhibit the mental representation of the dieting goal. As a result of this two-step process, their subsequent cognitive and behavioural processes will be dominated by the hedonic goal of eating good food rather than by their goal of controlling their body weight. Importantly, both the activation of the hedonic eating goal and the inhibition of the weight control goal can occur outside of conscious

awareness (Aarts et al., 2007; see also Danner, Aarts & De Vries, 2007, for a theoretical account and empirical demonstration of the functionality of nonconscious inhibitory processes in goal-directed behaviour).

Unrestrained eaters, on the other hand, are less sensitive to the hedonic properties of palatable food and therefore do not activate a hedonic motivation towards food when confronted with attractive food cues. As a result the motivational processes directed at the pursuit of this goal that characterise the cognition and behaviour of restrained eaters do not occur in unrestrained eaters.

The goal-conflict model provides a novel conceptual framework for understanding restrained eaters' appetitive responses to food and their frequent lapses of restraint (Fedoroff et al., 1997, 2003; Jansen & van den Hout, 1991). Restrained eaters' reactions towards attractive food are driven by the hedonic goal of eating it rather than by their goal of weight control, which will be reflected in, for example, increased attention to attractive food, as well as increased cravings and overeating. In this sense, our model extends recent findings that point towards a crucial role for hedonic processes in the regulation of eating behaviour in general, and in the development of overweight, more specifically (e.g., Lowe & Butryn, 2007; Yeomans et al., 2004). Moreover, it is grounded in recent social psychological knowledge on the role of nonconscious processes underlying human behaviour.

This approach to restrained eating differs crucially from most traditional models of health behaviour, which are based on the assumption that individuals' health behaviour is guided by conscious processes, such as the forming of conscious intentions based on beliefs (theory of reasoned action, Fishbein & Ajzen, 1975; theory of planned behaviour, Ajzen, 1991), or the conscious appraisal of health threats and their possible remedies (health belief model, Janz & Becker, 1984), to mention only a few. In these theories, individuals are assumed to consciously reflect on the goals they want to reach and devise behavioural plans in order to accomplish them. However, there is considerable evidence that we do not have introspective access to our mental processes, so that we might not always be conscious of the sources of our thoughts and behaviour (e.g., Blackmore, 2003; Nisbett & Wilson, 1977). Thus, a large part of human behaviour might not actually originate from such conscious plans and intentions (Wegner, 2002). This is a significant limitation for traditional models that are based on the assumption that health behaviour is mainly guided by conscious intent, and poses the challenge to consider nonconscious influences on health behaviour.

In order to best examine such nonconscious influences on behaviour, social cognition researchers have developed a wide range of implicit measures that tap cognitive processes rather unobtrusively and are therefore less susceptible to both demand characteristics and socially desirable responding (Fazio & Olson, 2003). This is especially relevant in the domain

of health behaviour, where participants might be tempted to let their responses reflect their socially desired, rather than their actual, behaviour. As an example, research on alcoholism and smoking has shown that implicit measures of cognition tap into different processes than explicit measures, and that they can greatly contribute to our understanding of addiction (e.g., Swanson, Rudman, & Greenwald, 2001; Wiers, Houben, Smulders, Conrod, & Jones, 2006). However, in the domain of eating and dieting only a rather small number of studies have employed implicit measures, albeit with promising results (e.g., De Houwer & De Bruycker, 2007; Ferguson, 2007; Roefs & Jansen, 2002; Seibt, Häfner, & Deutsch, 2007). Especially among restrained eaters, implicit measures might add greatly to our understanding of self-regulatory failures, since they might be unaware of the effect of food cues, and their responses might be especially sensitive to socially desirable responding.

In the next section we will describe the findings from a systematic research programme that used social cognitive methods to conduct a comprehensive test of the goal-conflict model and its predictions concerning restrained eaters' cognitive reactions to food cues. In the studies described here we used the Concern for Dieting scale of the Restraint Scale (Herman & Polivy, 1980) to identify restrained eaters, rather than the complete scale (van Strien et al., 2002). The Concern for Dieting scale is especially relevant for our goal-conflict model, as it captures the individual's chronic concern with weight loss and the cognitive element of attempts at weight control. In addition, this scale strongly correlates with experienced ambivalence towards food, which might be taken as an indication of a goal-conflict in these chronic dieters (Stroebe et al., 2008a). These findings led us to focus on Concern for Dieting as a measure of restrained eating in the studies reported here. In most of our studies we used participants' scores on this scale as a continuous predictor in regression analyses, and we refer to participants who scored relatively high on the scale (one standard deviation above the mean; see Aiken & West, 1991) as restrained eaters and to participants scoring relatively low on the scale (one standard deviation below the mean) as unrestrained eaters. Moreover, as in earlier studies, we administered the Restraint Scale at the end of the experiment, in order to prevent awareness of the dieting goal and of the importance of self-regulation towards specific food by completing the questionnaire before the dependent measure (Herman & Mack, 1975).

Hedonic thoughts about food

A central assumption of the goal-conflict model concerns the fact that the exposure to attractive food triggers in restrained eaters the hedonic motivation of eating it. In order to test this assumption we conducted a

set of studies in which we unobtrusively measured the spontaneous activation of hedonic thoughts about food in restrained and unrestrained eaters (e.g., Papies, Stroebe, & Aarts, 2007). If the perception of attractive food activates hedonic thoughts in restrained eaters, this might make it more likely that they will actually eat that food (Custers & Aarts, 2005, 2007b; see also Mischel, Cantor, & Feldman, 1996).

We first tested this idea in a study using the probe recognition paradigm (Papies et al., 2007, Study 1), which is borrowed from text comprehension research (McKoon & Ratcliff, 1986). In this paradigm participants read a sentence that is presented on the computer screen for a short time, for example for 2 seconds. Next, a single word (the so-called probe) is presented, and participants have to decide whether that word was part of the preceding sentence or not. This procedure is repeated with a number of different sentences, and the computer records participants' response latency and accuracy. In critical trials the probe word can be elicited by, or inferred from, the preceding sentence, although it was not explicitly part of it (e.g., "Peter picks up the big stone." – "heavy"). To the degree that the probe word represents a concept that can easily be inferred from the preceding sentence and was therefore rendered cognitively accessible by reading the sentence, it will be more difficult for participants to indicate that it had not been part of the sentence, resulting in longer reaction times and potentially more errors.

In our study, which was presented as a study on reading comprehension, participants (all Dutch University students) read 12 behaviour descriptions, which, for half of the participants, mentioned palatable food (e.g., "Ben is taking a handful of M&Ms from the bowl.") and for the other half, neutral food (e.g., "Sandra is taking a handful of raisins from the bowl."). Six of the behaviour descriptions described eating behaviour, and the other six described not-eating behaviour (e.g., "Bill is eating a big piece of apple pie." vs "Bill is giving away a big piece of apple pie."). These sentences were interspersed between 108 filler sentences. After reading a food-related behaviour description, participants were presented with a single word denoting typical hedonic aspects of food (e.g., tasty, delicious) and were asked to indicate whether this word had been part of the preceding sentence or not. The hedonic probes had not been part of the behaviour descriptions, but we expected that restrained participants' correct responses would be slowed down because hedonic thoughts are rendered accessible by the exposure to palatable food, and the increased accessibility interferes with indicating that the probe word was not part of the preceding sentence.

As hypothesised, results showed that restrained eaters took longer to indicate that hedonic food words had not been part of the behaviour descriptions, but only when these included palatable food, rather than neutral food (see Figure 1). Unrestrained eaters were not affected by the palatability of the food item. Somewhat unexpectedly, however, the

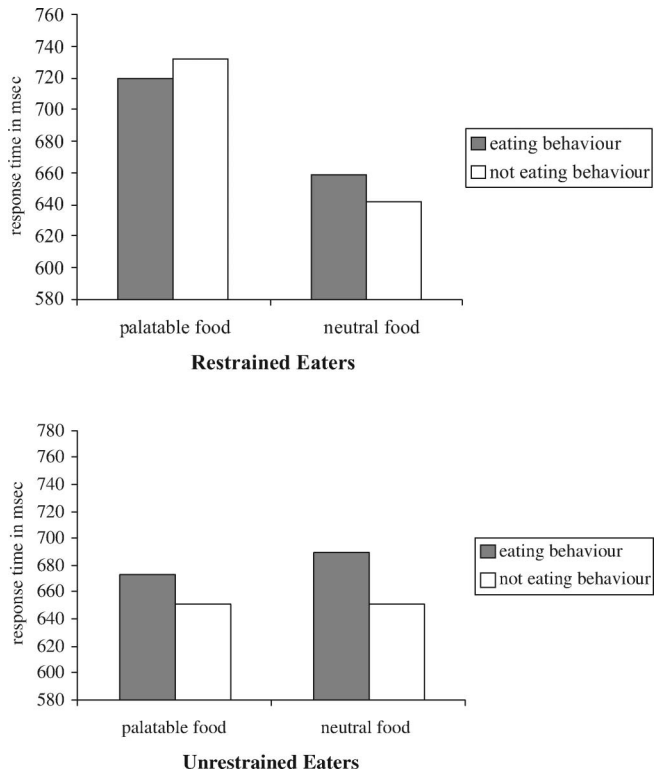

Figure 1. Mean response times in the probe recognition task as a function of the palatability of the food object and actor's behaviour for restrained eaters (one standard deviation above the mean, see Aiken & West, 1991) and unrestrained eaters (one standard deviation below the mean). Adapted from Papies et al., 2007, Study 1.

reactions of unrestrained eaters to hedonic probe words were slowed down when the preceding sentence involved eating, rather than not-eating behaviour, irrespective of whether palatable or neutral food was being eaten. Although we did not predict this effect would occur, this activation of hedonic thoughts in response to eating behaviour descriptions can be explained in terms of the logical inferences described by McKoon and Ratcliff (1986). Regardless of the food object being eaten, unrestrained eaters thought of "tasty" as the logical consequence of the actor's eating behaviour. In sum, this study provided a first indication that restrained eaters do indeed activate hedonic thoughts about food in response to the perception of palatable food items.

These findings were further corroborated in a second study (Papies et al., 2007), in which the activation of hedonic thoughts about food was assessed with a different paradigm that allowed us to measure the activation of

hedonic thoughts even earlier in the process—during the initial encoding of the behaviour descriptions (Long, Golding, & Graesser, 1992). Participants read the same behaviour descriptions as in the earlier study. After each food-related sentence they were presented with a hedonic target word (e.g., tasty, delicious) and asked to indicate whether this was an existing Dutch word or not (i.e., a lexical decision task). To the degree that processing the behaviour descriptions immediately activated hedonic thoughts, hedonic food words should be more accessible, reflected in shorter reaction times in the lexical decisions about these words.

The results confirmed our hypothesis that restrained eaters were faster to indicate that hedonic food words were existing Dutch words when they followed behaviour descriptions with palatable food compared to neutral food, while the palatability of the food items did not affect reaction times of unrestrained eaters (see Figure 2). Reaction times were not affected by whether the sentence involved eating behaviour or not-eating behaviour. Because the lexical decision task does not require participants to match the probe word with the preceding sentence, it reflects the spontaneous activation of hedonic thoughts during the initial encoding, rather than at retrieval of the behaviour description. From these studies we concluded that the exposure to palatable food activated in restrained eaters hedonic thoughts about food. Importantly, restrained eaters activated these hedonic thoughts without being instructed to do so and, most likely, they were also not aware of this process; the activation of hedonic thoughts occurred spontaneously (Hassin, Aarts, & Ferguson, 2005).

The findings from these studies suggest that restrained eaters spontaneously activate a hedonic motivation towards food when they perceive palatable food. The hedonic thoughts tapped in the present studies might be the cognitive process accompanying the appetitive responses that restrained eaters have been found to display in earlier studies when confronted with attractive food, such as increased cravings and salivation (Fedoroff et al., 1997; LeGoff & Spigelman, 1987). The fact that restrained eaters are easily enticed into thinking about food in terms of its pleasurable, ''hot'' qualities parallels the work on delay of gratification (Mischel et al., 1996; Mischel, Shoda, & Rodriguez, 1989). This has shown that thinking about stimuli in terms of their ''hot'', consummatory features makes it more difficult to resist them. Thus, restrained eaters' hedonic thoughts about food might make their overeating on attractive foods more likely. Similarly, the hedonic thoughts can be interpreted as the activation of the mental representation of the goal of eating the food, which would also make this behaviour more likely to emerge (Aarts et al., 2004; Bargh, 1990).

However, the activation of hedonic thoughts about food is also likely to contribute indirectly to overeating, by inhibiting the mental representation of the conflicting dieting goal. As the hedonic goal of eating good food is often incompatible with the goal of dieting, the activation of hedonic

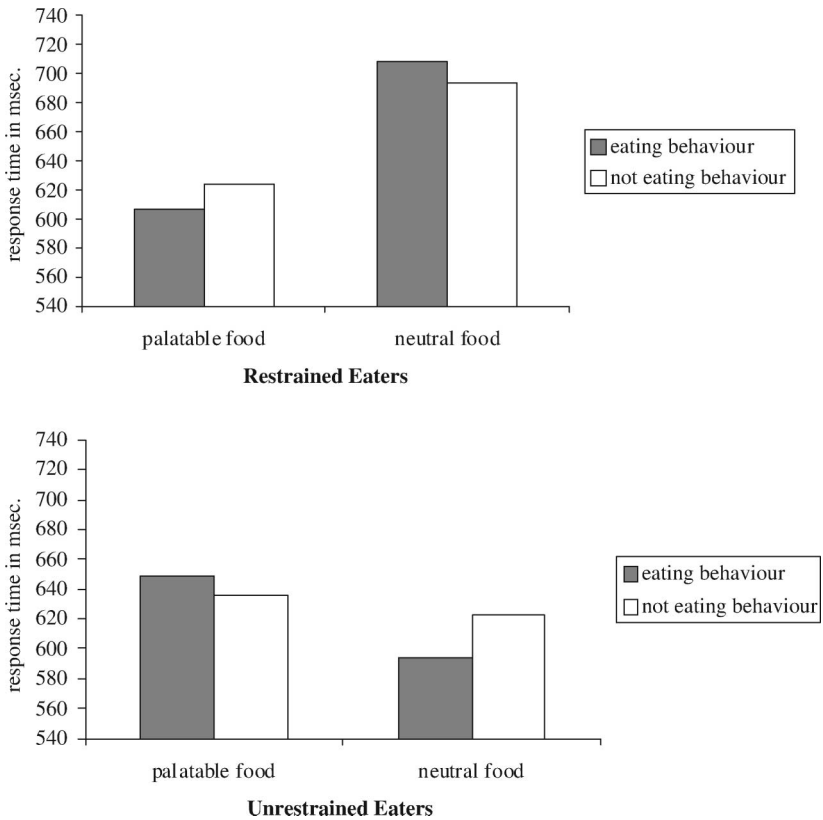

Figure 2. Mean response times in the lexical decision task as a function of the palatability of the food object and actor's behaviour for restrained eaters (one standard deviation above the mean, see Aiken & West, 1991) and unrestrained eaters (one standard deviation below the mean). Adapted from Papies et al., 2007, Study 2.

thoughts about food might lead to the inhibition of the conflicting dieting goal in restrained eaters, as outlined above (see Aarts et al., 2007). When the hedonic goal of eating good food is instigated by the perception of attractive food in the environment, the goal of weight control will be inhibited in order to reduce its potential for interference and facilitate the enactment of the goal of eating good food. This is the central idea of the goal-conflict model, which was examined in a second set of experiments.

Inhibition of the dieting goal

Two experiments were conducted to test whether activating hedonic thoughts about food in restrained eaters makes the mental representation

of their dieting goal temporarily less accessible (Stroebe et al., 2008a). Restrained and unrestrained eaters participated in a lexical decision task in which, among other words, diet-related target words (e.g., diet, weight) were presented on the computer screen. Participants were instructed to quickly and accurately indicate whether the presented words were existing Dutch words by pressing designated keys on the computer keyboard. Shorter reaction times in this task are presumed to reflect increased cognitive accessibility of the concept in question. However, in the present study we were interested not so much in the general accessibility of diet-related words in our participants, but rather in the effects of priming hedonic thoughts about food on the accessibility of diet-related words. Therefore we presented participants with words representing hedonic thoughts about food (e.g., tasty, delicious), or with neutral words (e.g., neither, over), shortly before the diet-related target words appeared on the screen. These primes were presented subliminally (i.e., for a duration of 23 ms) in order to prevent conscious processing (Bargh & Chartrand, 2000). This procedure enabled us to compare the reaction times for recognising diet-related words after hedonic primes and after neutral primes.

The results of this study showed that restrained eaters who were primed with hedonic food words took longer to recognise the diet-related words than did restrained eaters who were primed with neutral words. Reaction times of unrestrained eaters were not significantly influenced by the type of prime. A second study replicated these results and also showed that priming participants with attractive food words (i.e., pizza, cookies) had the same effect as priming hedonic thoughts directly: both kinds of primes slowed down the recognition of the diet-related words (see Figure 3). This suggests

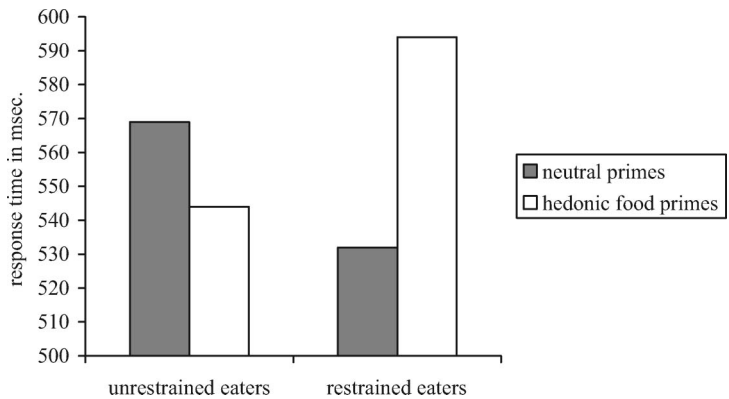

Figure 3. Restrained and unrestrained eaters' mean response times to diet targets after hedonic food primes or neutral primes in the lexical decision task (adapted from Stroebe et al., 2008a, Study 3).

that both hedonic thoughts and the perception of hedonically relevant food items inhibit the mental representation of the dieting goal in restrained eaters.

These studies provide support for the central tenet of the goal-conflict model that a hedonic goal with respect to food is incompatible with restrained eaters' dieting goal. Therefore when palatable food is encountered, restrained eaters automatically inhibit their dieting goal. The perception of palatable food thus disturbs the initial balance between restrained eaters' goal of eating good food and their dieting goal, with the result that the hedonic goal will be more accessible and will impact subsequent cognitive processes and, most likely, behaviour. In a related series of studies we aimed to investigate the effects of the exposure to attractive food on subsequent cognitive processes, specifically on attentional processes with regard to food.

Hedonically motivated attention to food

The studies on the goal-conflict model that have been described so far provide us with initial evidence that the exposure to palatable food triggers in restrained eaters a hedonic motivation towards food and leads to the inhibition of their dieting goal. As a result, restrained eaters' attention should be more attuned to stimuli in their environment that match this hedonic motivation. We suggest, therefore, that the exposure to palatable food might trigger in restrained eaters an attentional bias for hedonically relevant food items. Visual attention is generally directed at stimuli that are motivationally relevant for an individual at a given moment (Lang, Bradley, & Cuthbert, 1997), and attentional biases for substance-related cues have been found among, for example, smokers, alcoholics, and users of heroin or cannabis (e.g., Ehrman et al., 2002; Field, Mogg, & Bradley, 2004; Lubman, Peters, Mogg, Bradley, & Deakin, 2000; Townshend, & Duka, 2001). Attentional biases for substance-related cues have thus been found to reflect cravings for the substance, but they also contribute to the maintenance of these cravings by keeping the individual focused on substance-related cues. Therefore, attentional processes have been argued to play a central role in psychological processes underlying addiction (Franken, 2003). We suggest that an attentional bias might also occur in restrained eaters who have been exposed to attractive food cues and therefore have a hedonic motivation towards food.

We tested our hypothesis in two experiments which first exposed restrained and unrestrained eaters to attractive food items and then measured their visual attention for food (Papies, Stroebe, & Aarts, 2008a). Participants first completed a word identification task, which served as the food pre-exposure manipulation and thus for half of the participants

contained attractive food items, and for the other half only food-unrelated words. This manipulation was designed to unobtrusively activate hedonic thoughts in restrained participants and trigger the inhibition of the dieting goal.

In the second phase of the experiment participants were presented with a modified probe classification task that was designed to measure selective attention for palatable and neutral food words (MacLeod, Mathews, & Tata, 1986). In this task two words are briefly presented on the computer screen next to each other, for example a food word (e.g., pizza) and an office-related word (e.g., staple). Then a probe (an arrow symbol) is presented in the location of one of these words, and participants are required to press a button quickly in order to indicate whether the arrow is pointing up or down. Although participants are not instructed to react to the location of the probe, their reactions will be faster when the probe appears in the same location as an item that captured their visual attention. Thus, to the degree that participants attend more to one of the words, their reactions to the probe are assumed to be faster when it is presented in the same location as, rather than in the opposite location to, the attended-to word. In this way, participants' reactions to the probes reflect their visual attention for the food words.

In this study we used 10 palatable (e.g., pizza, cookies, chocolate, etc.) and 10 neutral food items (carrots, oatmeal, rye bread, etc). Each food item was paired with an office-related word of equal length (e.g., stable, folder, desk), and these two words were presented on the screen simultaneously to measure visual attention for the food items versus the neutral, office-related items. The food/office trials were interspersed between an equal number of food-unrelated filler trials. After the probe classification task, participants indicated on a 9-point scale how much they liked each of the food items used in the probe classification task. In this way we assessed the subjective hedonic relevance of the presented food items.

Our analyses of participants' reaction times in this study showed that restrained eaters had increased selective attention for palatable food words as a function of their liking of this food. Thus, the more they indicated liking the palatable food items, the more visual attention they displayed for these items. Unrestrained eaters did not display such an attentional bias. However, this effect occurred only when participants had first been pre-exposed to attractive food items. In the control condition, where participants were not pre-exposed to attractive food items, there was no difference between restrained and unrestrained eaters. Moreover, no such attentional bias occurred for the neutral food items (Papies et al., 2008a).

In a second study we replicated these findings, but we also included an additional condition that was designed to provide further insight into the mechanism underlying this bias in visual attention. Here, half of the

participants who had been pre-exposed to the attractive food in the first phase of the experiment were subliminally primed with diet-related words while their visual attention for food words was assessed in the second phase of the experiment. This was done in order to test our hypothesis that restrained eaters' hedonically motivated attention for palatable food is contingent on the inhibition of the dieting goal as a result of the food pre-exposure. If the attentional bias for food disappeared due to the diet prime, this would be indirect evidence in favour of this hypothesised mechanism. This is indeed what was found: restrained eaters who were subtly reminded of their dieting goal after the food pre-exposure had no attentional bias for palatable food (see Figure 4). Thus, restrained eaters displayed an attentional bias for hedonically relevant food only after the pre-exposure to attractive food, but not when they were also subtly reminded of their dieting goal.

These findings on restrained eaters' attentional processes are interesting in several respects. First of all, visual attention is crucial in information processing as it occurs quite "upstream" and thus has a large influence on

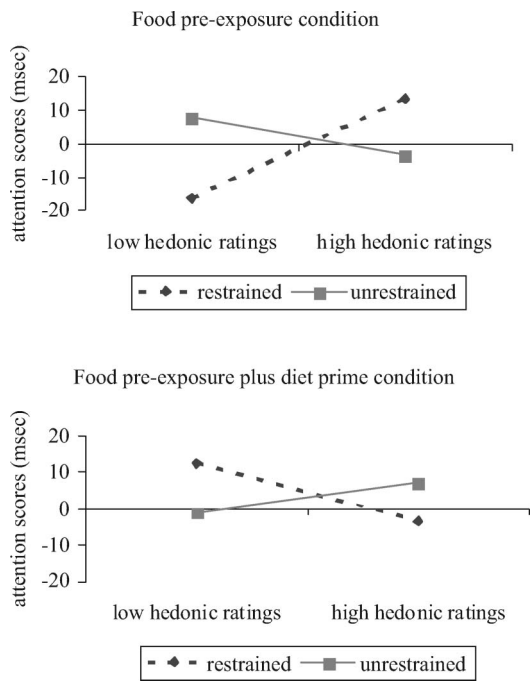

Figure 4. Visual attention scores for palatable food words as a function of restraint scores and hedonic ratings (one standard deviation above and below the respective means, see Aiken & West, 1991) in the food pre-exposure and food pre-exposure plus diet prime conditions (adapted from Papies et al., 2008a, Study 2).

later processes. Restrained eaters' attentional bias will keep them focused on the attractive food at the cost of competing cues and thereby contribute to the maintenance of hedonic thoughts about food (cf. Franken, 2003). Moreover, attentional biases for rewarding stimuli have been suggested in incentive-sensitisation theory (Berridge, 2004; Robinson & Berridge, 2000) to be an indication of increased "wanting", the motivational component of reward that is closely linked to behaviour. Restrained eaters' increased selective attention for liked food might thus reflect their increased motivation to obtain this food, and this parallels findings on the increased self-reported desire to eat and on the activation of craving-relevant brain areas after the exposure to attractive food (Fedoroff et al., 1997; Pelchat et al., 2004).

Finally, the present findings support the idea of restrained eaters' goal-conflict with regard to food, albeit indirectly. Restrained eaters' hedonic motivation was triggered by the exposure to palatable food cues and then guided visual attention towards hedonically relevant cues, but not when the conflicting dieting goal was being re-activated by our priming manipulation. Thus it was either the hedonic motivation or the weight control motivation that guided restrained eaters' visual attention, and the activation of either one subdued the influence of the other.

Processes of self-regulatory success

The research described so far tries to answer the question of what psychological processes drive restrained eaters' eating behaviour in the face of attractive food, in order to understand why dieting so often fails in such situations. A rather different approach was taken in a recent series of studies by Fishbach and colleagues (Fishbach, Friedman, & Kruglanski, 2003), who investigated the psychological processes underlying self-regulatory success. In their model of temptation-elicited goal activation, these researchers argue that after repeatedly exercising self-control in tempting situations, the perception of a temptation that might interfere with the pursuit of an overriding goal will automatically activate the mental representation of this goal. Applied to the domain of dieting behaviour, their research showed that priming participants with food temptations, such as cake or chocolate, increased the accessibility of the dieting goal, as measured in a lexical decision task, but only in those participants who considered dieting important and who reported being successful in their dieting endeavours (Study 4).

At first sight these findings seem to be inconsistent with the extensive research on dieters' overeating and the psychological processes possibly underlying their self-regulatory failure. After all, numerous studies have shown that restrained eaters experience stronger cravings for food, more salivation, and actual overeating when they are confronted with attractive

food temptations (e.g., Fedoroff et al., 1997; Jansen & van den Hout, 1991; LeGoff & Spigelman, 1987). Moreover, our own work indicated that restrained eaters inhibit, rather than activate, the dieting goal after the perception of attractive food cue, such as cake or chocolate (Stroebe et al., 2008a).

However, we should note that the Fishbach et al. studies used a self-constructed measure of "importance of dieting" to identify dieters, whereas the studies on restrained eaters' goal-conflict used the Concern for Dieting subscale of the Restrained Eating scale (Herman & Polivy, 1980), which makes the results difficult to compare. Since studies on the goal-conflict model reported so far did not include a measure explicitly assessing dieting success, it is possible that there are successful and unsuccessful dieters, even among restrained eaters, who have typically been characterised as being generally rather unsuccessful dieters (e.g., Heatherton, Herman, Polivy, King, & McGree, 1988). Therefore, given the findings of Fishbach and colleagues (2003), we argued that it might be especially interesting to see if we could detect patterns of self-regulatory success even among restrained eaters. We conducted two studies that included both the restraint scale and the measure of self-regulatory success to examine cognitive processes underlying success in chronic dieting behaviour, as well as its behavioural consequences.

In a first study (Papies, Stroebe, & Aarts, 2008b) we aimed to integrate the findings by Stroebe et al. (2008a), who reported that restrained eaters who are primed with food temptations or hedonic food words inhibit the mental representation of their dieting goal, with the findings of Fishbach et al. (2003), who reported activation of the dieting goal after food primes. In this study we again used a lexical decision task with diet-related word as targets. On the critical trials, participants were subliminally primed with attractive food items before the presentation of the diet targets. In order to measure the baseline accessibility of diet-related words, we also included trials in which participants were "primed" with random letter strings before the diet targets. In addition, we varied the time lag between the onset of the food prime and the target words (the so-called stimulus onset asynchrony, SOA) in order to gain more insight into the process potentially leading to differences between successful and unsuccessful restrained eaters. The activation and the inhibition of related concepts require some amount of processing time, specifically the chain of processing from the perception of palatable food to the activation of hedonic thoughts, to the resulting activation or inhibition of the dieting goal (cf. Neely, 1977; Simpson & Burgess, 1985). Therefore we expected the differences between successful and unsuccessful restrained eaters to be especially pronounced at the longer SOA.

After this lexical decision task, participants completed the restraint scale, as well as the measure of dieting success introduced by Fishbach et al. (2003). This comprises three questions assessing by means of a 7-point scale

how successful participants are in losing weight, how successful they are in watching their weight, and how difficult they find it to stay in shape (last item reverse coded).

The results of this study confirmed our hypothesis that self-regulatory success moderates the impact of attractive food primes on the accessibility of the dieting goal in restrained eaters (see Figure 5). Compared to the baseline, at which no food prime was presented, attractive food primes speeded up the recognition of diet targets in successful restrained eaters, but slowed it down in unsuccessful restrained eaters. Thus, attractive food increased the accessibility of the mental representation of the dieting goal in successful restrained eaters, and decreased the accessibility of the dieting goal in unsuccessful restrained eaters. This effect occurred only at the longest SOA, thus under those conditions where the prime had received most processing before the onset of the target word. In other words, with enough processing time, successful restrained eaters activate their dieting goal when they are confronted with attractive food, while unsuccessful restrained eaters inhibit it.

Within our goal-conflict model we argue that the resulting differences in accessibility of the dieting goal are likely to influence restrained eaters' behaviour in situations where attractive food is present. That is, successful dieters should be able to refrain from eating the attractive food because they are influenced by their dieting goal, whereas the dieting goal is not available to guide the behaviour of unsuccessful restrained eaters, who are therefore more likely to eat the food.

These behavioural implications of dieting success were investigated in a study that examined the association of restrained eaters' dieting intentions and actual dieting behaviour over a 2-week period (Papies et al., 2008b, Study 2). Successful and unsuccessful restrained eaters were asked to indicate the degree to which they intended *not* to eat certain food items over

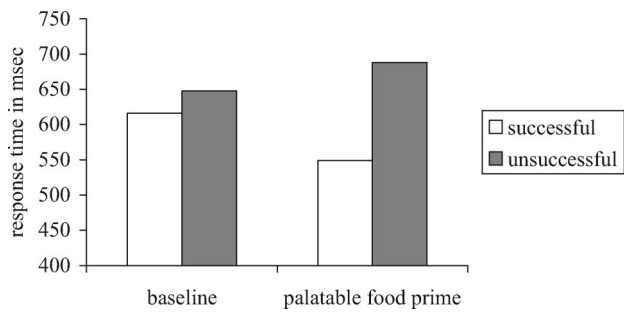

Figure 5. Accessibility of diet-related words in restrained eaters (one standard deviation above the mean of the restraint scale, see Aiken & West, 1991) in the baseline condition and the palatable food prime condition with an SOA of 540 ms (adapted from Papies et al., 2008b, Study 1).

the next two weeks. Two weeks later they were contacted again by email and asked to indicate on a self-report measure how often they had actually eaten these items.

The results of this correlational study confirmed our hypothesis that self-regulatory success increases the likelihood that restrained eaters act on their intentions. Regression analyses showed that among unrestrained eaters there was a main effect of intentions, such that stronger intentions not to eat certain food items were indeed associated with a lower frequency of eating them. However, among restrained eaters, self-regulatory success moderated the association between intentions and behaviour. Only for successful restrained eaters was there a strong negative association between their intentions not to eat certain food items and the frequency of actually eating them, while for unsuccessful restrained eaters, intentions did not predict their actual behaviour. Thus, self-regulatory success emerged as a moderator of the intention–behaviour link in restrained eaters.

These two studies offer converging evidence that self-regulatory success is a crucial dimension in restrained eating, as it influences goal accessibility in critical situations, as well as the degree to which goal intentions are enacted over a longer period of time. With regard to the goal-conflict model of eating, these studies suggest that the conflicting relationship between the goal of eating good food and the goal of weight control might result in the inhibition of the dieting goal, especially in the case of unsuccessful restrained eaters. This raises the interesting question of what the mechanism is that makes one group of restrained eaters successful (see also Aarts, 2007). Research on nonconscious goal pursuit suggests that goals that have repeatedly been pursued in response to certain situational cues can eventually be triggered automatically by the perception of these cues, because strong associations have developed between such cues and the goal representations (Bargh, 1990). Based on this reasoning, we suggest that successful restrained eaters have learned to associate the dieting goal with attractive food cues because they have repeatedly pursued this goal when they were confronted with food temptations (cf. Fishbach et al., 2003). These strengthened associations are reflected in the increased accessibility of the dieting goal after food primes. Thus, while this group of restrained eaters might also have a goal-conflict between the goal of eating good food and the goal of weight control, they have learned to resolve the conflict in favour of the dieting goal, which makes long-term dieting success more likely.

Summary

The goal-conflict model has been developed to explain restrained eaters' failures in eating regulation when they are confronted with attractive food cues. We presented a series of studies that tested hypotheses derived from

this model and provided evidence for its central tenets. We showed that restrained eaters spontaneously think about palatable food in hedonic terms, and inhibit the representation of their dieting goal when they are confronted with palatable food. The resulting hedonic motivation towards food was found to guide restrained eaters' visual attention towards palatable food that they liked, but not when the dieting goal was subtly made salient. Together, these sets of studies provided evidence for the conflicting relationship between restrained eaters' goals with respect to food: eating good food, and controlling their weight. Another set of studies extended these conclusions by showing that there is a group of restrained eaters who qualify themselves as successful, and indeed follow up on their dieting intentions. In line with research by Fishbach and colleagues (2003), we found that these successful restrained eaters activate their dieting goal, instead of inhibiting it, when they perceive food temptations, which makes it more likely that they will refrain from eating them. The empirical studies reported here focused on examining the cognitive processes that might underlie restrained eaters' responses to attractive food and their frequent lapses of restraint. We will now discuss how the model relates to earlier accounts of these phenomena.

THE GOAL-CONFLICT MODEL IN CONTEXT

The goal-conflict model was proposed to explain the difficulties that restrained eaters have in controlling their eating when they are confronted with attractive food. We argued that the emphasis on hedonic aspects of food and on nonconscious processes in eating regulation might add to our understanding beyond traditional approaches to this issue. We will now briefly discuss how the goal-conflict model relates to earlier theories and can help us to understand some of the unresolved issues in the domain of restrained eating.

Recently research on the regulation of eating behaviour has begun to emphasise the role of hedonic processes. It is increasingly recognised that the hedonic properties of food determine to a large part how much we eat, and that individual differences with respect to the sensitivity to the hedonic properties of food could play a role in difficulties in eating regulation (Blundell et al., 2005; Lowe & Butryn, 2007; Lowe & Levine, 2005; Mela, 2006; Yeomans et al., 2004). Our model not only anticipated this development (e.g., Stroebe, 2002), it also specifies the mental processes by which this hedonic sensitivity could be translated into behaviour. The behavioural implications of hedonic sensitivity have been demonstrated in a number of studies, in which it was found that restrained eaters react with increased salivation, cravings, and overeating to the presence of attractive food cues (Brunstrom et al., 2004; Fedoroff et al., 1997, 2003; Harvey et al.,

2005). As our studies have shown, the perception of attractive food cues triggers hedonic thoughts in restrained eaters and leads to the inhibition of the dieting goal, so that an increased motivation to eat the attractive food (e.g., consciously experienced cravings), as well as actual overeating, become more likely.

The goal-conflict model might also be helpful in understanding the empirical findings on Schachter's externality theory (1968). Schachter suggested that the eating behaviour of obese individuals is more strongly triggered by external cues, like the sight or taste of food, than is the eating of normal-weight people. In support of this theory, when offered food that they liked, obese people were found to increase their eating, regardless of whether they were actually hungry or not (Nisbett, 1968; Schachter et al., 1968); they were found to avoid food that they did not like, such as the meals of an unattractive university meal plan (Goldman et al., 1968), and obese Jews reported less difficulty in fasting on a religious holiday when they spent more time in the synagogue, which suggests that they could fast more easily when they were not surrounded by tempting food cues (Goldman et al., 1968). All these studies indicate that obese people are more responsive to the hedonic properties of food, and that the confrontation with palatable food easily triggers them to overeat. These results bear a strong resemblance to the findings on the hedonic sensitivity of restrained eaters and, to the degree that obese people are trying to restrain their eating behaviour, both sets of findings could be based on the same processes, namely the activation of hedonic thoughts and the inhibition of the dieting goal. Therefore, contrary to the conclusions drawn by some researchers (e.g., Rodin, 1980), externality theory might actually have explanatory value for explaining instances of overeating, as long as the external food cues are hedonically relevant.

One of the central findings related to the boundary model (Herman & Polivy, 1984) is that restrained eaters do not adjust their consumption in a taste test when they have consumed a preload; the so-called disinhibition effect. As was noted above, this effect is especially pronounced when the preload is palatable, or high in calories, which we argue could serve as a proxy for palatability. In these experiments the preload might function as a palatable food cue that triggers hedonic eating in restrained eaters at the cost of their dieting goal. Thus, the preload findings fit well in the framework of the goal-conflict model. In addition, the goal-conflict model specifies the process that could underlie these effects and provides empirical evidence for it—which is especially relevant since the hypothesis of the "what-the-hell" cognitions suggested by Herman and Polivy (1984) has received no empirical support.

Further research on disinhibition phenomena has suggested that the limited availability of resources for self-regulation in restrained eaters makes it more likely that their eating behaviour will be guided by the hedonic

aspects of the presented food. This conclusion fits well with our model, which assumes that the hedonic aspects of food are especially relevant for restrained eaters. As the pursuit of the dieting goal might be a more controlled process and thus require more cognitive resources than the goal of enjoying good food, the cognitive load might interfere strongly with the pursuit of this goal and lead to overeating when attractive food is presented.

This argument is also in line with the reflective-impulsive model of Strack and Deutsch (2004) which proposes that reflective decisions, such as not to eat a certain food in order to diet, require more cognitive capacity than the pursuit of more impulsive goals, such as giving in to food temptations, and are therefore more easily disrupted (cf. Hofmann, Rauch, & Gawronski, 2007). Indeed, although we have so far treated the hedonic eating goal and the weight control goal of restrained eaters as goals of equal status, we do acknowledge that this might be an undue simplification of the matter. The hedonic goal of eating good food naturally has the advantage of being triggered more frequently by cues in the environment, and it can be reached easily by reacting to the hedonic cognitions elicited by the stimulus and giving in to the temptation of eating it. The goal of weight control, on the other hand, requires a longer time-frame and can only be reached by repeatedly and consistently performing goal-directed behaviours. In addition, these behaviours are different from the behaviours that serve the eating goal, as weight control often requires one *not* to eat something.

However, the mechanisms of restrained eaters' self-regulatory conflict that we demonstrated—for example, the finding that restrained eaters' hedonic thoughts guide their visual attention unless offset by the dieting goal—indicate that both goals do have comparable influence on the nonconscious cognitive processes underlying the regulation of eating behaviour. Nonetheless, examining the implications of a possible asymmetry between the two eating-related goals of restrained eaters might be a fruitful issue for further research.

The goal-conflict model can also help us to better understand the mixed findings on the relationship between food cravings and restrained eating. Recall that in this domain some studies reported that dieters experience food cravings more often than non-dieters do, while other studies report no such association. We argue that food cravings are especially likely to occur when a restrained eater is confronted with palatable food, rather than as a continuous experience, because palatable food cues will trigger a hedonic orientation towards food and inhibit the dieting goal. In fact, food cravings might be the conscious experience of exactly this state, namely the strong motivation to consume a certain palatable food at the cost of one's dieting goal. In support of this reasoning, we reported the occurrence of nonconscious processes that resemble food cravings in their focus on the attractive aspects of food—the activation of hedonic thoughts about food,

and the bias in visual attention for preferred food items. Both of these processes were activated by the perception of palatable food items, and we argue that this is the crucial trigger of such hedonic processes in restrained eaters. Thus, researchers might be more likely to find a relation between restraint and explicit measure of cravings when these are assessed during the confrontation with palatable food, or when participants are asked whether they experience cravings in situations where they are confronted with attractive food. The methods used in our studies have the added value of assessing hedonic processes in eating without the conscious awareness of the participants, so that they are less susceptible to demand characteristics than are traditional measures of cravings.

In sum, the goal-conflict model specifies the psychological processes underlying chronic dieters' responses to food cues and can explain previous findings in this research area, such as externality findings, the disinhibition effect, and experiences of food cravings. However, the question remains as to why some individuals are burdened with such a goal-conflict in regard to food, whereas others are not. A possible answer might be found in research on individual differences in personality, which shows that individuals reliably differ in their sensitivity to rewarding stimuli, which is grounded in neurobiological structures involving dopamine activity (Gray, 1991). Differences in sensitivity to signals of reward have been suggested to underlie the personality characteristics of extraversion and impulsivity (Depue & Collins, 1999), and indeed, overweight and restrained eating have been found to be associated with impulsivity on a variety of measures (Nederkoorn, Braet, Van Eijs, Tanghe, & Jansen, 2006a; Nederkoorn, Smulders, Havermans, Roefs, & Jansen, 2006b; Nederkoorn, Van Eijs, & Jansen, 2004). The increased sensitivity to the hedonic aspects of palatable food (e.g., Lowe & Butryn, 2007; Yeomans et al., 2004) might be considered as one specific manifestation of this generally increased sensitivity to reward. We suggest that such neurobiological differences underlying more general personality characteristics could also play a role in the development of eating restraint and thus in the conflict between the goal of eating good food and the goal of weight control.

In an environment where palatable, hedonically relevant food is easily available, increased sensitivity to rewarding stimuli and to palatable food could lead to the overconsumption of palatable, high-calorie food, and eventually to weight gain. However, our society favours a rather slim physique, so that many individuals who have gained some amount of body weight sooner or later adopt a weight control goal. In a sample of our own participants, for example, the correlation between body mass index and restraint was $r = .45$, $p < .01$ (Papies et al., 2008b). In this way, individuals who are highly sensitive to reward could eventually become restrained eaters, with the associated conflict between the goal of eating good food,

which results from the increased hedonic sensitivity, and the goal of weight control, which is the result of repeatedly succumbing to the hedonic aspects of high-calorie, palatable food. The processes outlined in the present chapter give an indication of the difficulties for self-regulation once such a goal-conflict has developed.

FUTURE RESEARCH

In the present chapter we have laid out a goal-conflict model to explain the processes of self-regulation in the domain of dieting behaviour from a perspective of nonconscious goal pursuit. Due to this conceptualisation, we would like to argue that examining the processes that characterise the goal-conflict of restrained eaters is also highly relevant to understanding self-regulatory processes in other domains of goal pursuit.

For example, goals such as saving money, academic success, or a happy marriage often require that we resist attractive temptations such as shopping sprees, socialising with colleagues during working hours, or having extra-marital relationships. When confronted with an attractive temptation that interferes with the pursuit of a long-term goal, focusing on the rewarding properties of the temptation and allocating heightened visual attention to temptation-related cues makes it more likely that one will give in to the temptation (cf. Mischel et al., 1996). On the other hand, when one is able to think actively about the long-term goal that the temptation would interfere with, successful pursuit of this goal is more likely to emerge (cf. Fishbach et al., 2003). Thus, avoiding tempting situations, or actively keeping the long-term goal in mind or devising subtle reminders of one's goals, might prevent attractive temptations from leading us astray from our long-term goals, in the domain of dieting as well as in other domains where self-regulation is needed. Hence, future research on the goal-conflict of dieters can also be informative for understanding self-regulation more generally. We will now briefly sketch a few research priorities that we feel might be particularly instructive for this area.

First of all, it might be particularly interesting to identify more closely the factors that make some individuals more susceptible to a variety of temptations than others. As mentioned earlier, individual differences in the sensitivity of the dopamine-based reward system might play a role in this susceptibility. These might be reflected in increased scores on the personality inventories measuring extraversion and impulsivity (Depue & Collins, 1999), and on scales measuring the sensitivity to reward more directly (e.g., Sensitivity to Punishment and Sensitivity to Reward Questionnaire; Torrubia, Avila, Molto, & Caseras, 2001).

Related to this issue is the potentially even more pressing question of how self-regulatory success can be attained for restrained eaters. Certainly, our

research programme showed that restrained eaters differ in their levels of self-regulatory success in dieting, and that there are restrained eaters who are indeed able to translate their dieting intentions into behaviour. The activation of the dieting goal in response to attractive food temptations seemed to play a crucial role in this process. But how do some restrained eaters manage to access and maintain their dieting goal in such situations, when others tend to inhibit it? We suggest that it might be moderated by the initial preparation of how to successfully pursue the dieting goal in a situation where attractive food is present that can put a restrained eater on the path to success (Fishbach et al., 2003; Papies et al., 2008b). By repeatedly activating the dieting goal in response to a hedonically relevant food, and then actually pursuing this goal by not eating the food, the association between hedonic thoughts about food and the goal of eating it will be weakened, and at the same time the association between hedonic thoughts and the dieting goal will be strengthened (Bargh, 1990).

Attaining self-regulatory success by thus replacing an existing association with a new, more beneficial one, requires the dieter to repeatedly substitute one course of action by another. Eventually, the new behaviour (i.e., dieting) will be overlearned to a sufficient degree so that it will be triggered more or less automatically by relevant environmental cues (i.e., hedonically relevant food). We propose, however, that initially this strategy requires attention on behalf of the dieter. An important goal for future research might be to lay out the most effective routes for restrained eaters to do this, for example by using planning strategies such as implementation intentions (Gollwitzer & Brandstätter, 1997) or other mental preparations that may promote effective self-control in dieting, such as mental simulation (Taylor, Pham, Rivkin, & Armor, 1998).

Another interesting research question with implications for successful dieting concerns the degree to which the activation of hedonic thoughts in restrained eaters occurs automatically. In the studies presented here, restrained eaters activated hedonic thoughts in response to palatable food without being instructed to do so, and most likely also without being aware of this. However, we do not know whether this activation results from mere associations or from more complex information processing—thus whether it occurred in an efficient way, or whether it could, for example, be prevented by distraction or by imposing a cognitive load. If the activation of hedonic thoughts could be prevented in this way, restrained eaters might be well advised to distract themselves when in the presence of attractive food items. However, research on the effect of cognitive load on the eating behaviour of restrained eaters suggests that this might not be a good strategy, as cognitive load triggered overeating when the presented food was high in hedonic value (e.g., Boon et al., 2002). Indeed, under such conditions the eating goal might be much easier to pursue than the goal of weight control, which again points to an asymmetry between these goals, meriting further research.

There is ample evidence that exposure to attractive food cues triggers overeating in restrained eaters (e.g., Fedoroff et al., 1997, 2003). However, we have not yet examined whether this overeating is mediated by increased accessibility of hedonic thoughts about food and decreased accessibility of the dieting goal. Thus, we have not yet shown that the minute differences in the accessibility of hedonic thoughts about food or thoughts about dieting observed between restrained and unrestrained eaters as a consequence of our experimental manipulations translate into overeating in everyday life. Future research will have to demonstrate that the exposure to attractive food cues triggers actual overeating in restrained eaters, especially in those restrained eaters who are unsuccessful, and that this overeating is mediated by increased accessibility of hedonic thoughts about food and decreased accessibility of the dieting goal. In this way, the nonconscious cognitive processes examined in the present research programme could be linked directly to eating behaviour. Apart from providing further evidence for the processes laid out in the goal-conflict model, such an approach could also be helpful for developing manipulations that can change eating behaviour in the long term by influencing the relative accessibility of the eating and the dieting goal.

CONCLUDING REMARKS

In this chapter we have presented a goal-conflict model designed to delineate the processes involved in restrained eaters' overeating. Specifically, we systematically examined the cognitive processes that might underlie restrained eaters' behaviour when they have been confronted with attractive but "forbidden" food. This innovative approach to the regulation of eating behaviour builds on recent research on nonconscious goal pursuit, which is still in its infancy. Therefore the application of knowledge from this domain to issues of health behaviour has only just started, and our work should be seen as an initial exploratory step towards explaining and predicting restrained eaters' behaviour from their cognitive responses to food cues. However, in our research programme we have already conducted a systematic test of hypotheses derived from the goal-conflict model. The social cognitive measures used to test our predictions allowed us to tap into restrained eaters' spontaneous reactions to food, in terms of hedonic thoughts, motivated attention, and goal accessibility, and we made a first step towards predicting restrained eaters' goal-directed behaviour. Moreover, our findings relate to goal-conflict in other domains of behaviour and can provide a starting point for examining the interplay between external temptation cues and long-term goals to identify the processes underlying goal-conflict more generally.

Our research programme on the goal-conflict of chronic dieters is thus informative for several domains of self-regulation and can help both to generate novel theoretical predictions and to identify practical implications

for helping individuals to bolster their long-term goal against the influence of attractive temptations. The next step in research on goal-conflict should now be to relate such cognitive responses to temptation cues to actual instances of goal-directed behaviour, both inside the laboratory and outside. We believe that the goal-conflict model could serve as a useful theoretical framework for this challenging endeavour.

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