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Healthy Cognition: Processes of Self-Regulatory Success in Restrained Eating

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Two studies examined self-regulatory success in dieting. Previous research has indicated that restrained eaters (i.e., chronic dieters) might fail in their attempts at weight control because the perception of attractive food cues triggers hedonic thoughts about food and inhibits their dieting goal. However, recent work suggests that in some dieters, temptation cues activate the relevant goal and thus facilitate self-regulation. The present work extends these findings by showing that self-regulatory success moderates the effect of food cues on restrained eaters such that food cues activate the dieting goal in successful restrained eaters and inhibit the dieting goal in unsuccessful restrained eaters. The specific time course of these effects was examined. Moreover, a correlational study revealed that only successful restrained eaters translate their dieting intentions into action. Results are discussed in the context of nonconscious self-regulation and the role of automatic processes in the link between intention and behavior.

Keywords: *self-regulation; dieting; temptation; nonconscious goal pursuit; intention-behavior link*

The ability to overcome one's first impulses in order to strive for a more abstract, higher order goal is crucial in many domains of life. Such efforts have been termed *self-control*, or *self-regulation*, and attracted a large amount of research from psychologists (Vohs & Baumeister, 2004). What seems to be crucial in order to ward off attractive temptations that constitute a challenge for self-regulation is to keep in mind the goal one eventually wants to reach (Shah, Friedman, & Kruglanski, 2002). It is easier, for example, to resist buying an attractive-looking pair of shoes if you remind yourself of the fancy car you are saving for, and the dieter may be able to resist a tempting dessert only by thinking about his or her desire

for a slim figure. At the same time, those who spontaneously "forget" that they were on a diet while standing in front of the buffet are likely to succumb to the temptations of tasty food and will be less successful in their dieting attempts. In the present research, we address this issue by examining the impact of temptation cues on the accessibility of the overriding goal, and we will show how this is related to actual success in goal pursuit.

An area in which self-regulation seems to be especially difficult for many people is the domain of eating and dieting behavior. The prevalence of overweight and obesity is constantly increasing in Western societies (Flegal, 2005), and dieting is a very popular means of weight regulation (Kruger, Galuska, Serdula, & Jones, 2004). However, most people find it difficult to maintain a successful weight loss diet. Only a small minority of dieters are able to reduce their body weight in the long term while the majority at least regain the weight initially lost through dieting (Jeffery et al., 2000; Mann et al., 2007). Thus, trying to diet seems to be a largely ineffective strategy for reducing one's body weight.

Restrained Eaters and the Impact of Food Cues

It has been suggested that a so-called "toxic environment" where highly palatable and calorically dense foods

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are very visible and easily available contributes to these difficulties in weight regulation and to the high prevalence of obesity (Hill & Peters, 1998; Wadden, Brownell, & Foster, 2002). Indeed, dieters' eating behavior seems to be strongly influenced by the perception of attractive food in their environment. Much research in this area has focused on the eating behavior of so-called restrained eaters (Herman & Polivy, 1980), who are chronic yet rather unsuccessful dieters (Gorman & Allison, 1995; Heatherton, Herman, Polivy, King, & McGree, 1988). According to restraint theory, restrained eaters chronically try to regulate their food intake by adhering to self-set dieting rules rather than responding to internal hunger signals. Because they try to override internal cues in order to restrict intake, they are especially responsive to external food and eating cues (Herman & Polivy, 1980, 1984).

Research on the eating behavior of restrained eaters has confirmed that their eating regulation can easily be disturbed by external food cues. Restrained eaters display higher levels of salivation when they are confronted with attractive food (e.g., Brunstrom, Yates, & Witcomb, 2004). Moreover, the sight, the smell, or thoughts about palatable food elicit in restrained eaters stronger urges to eat the cued food than in unrestrained eaters (Fedoroff, Polivy, & Herman, 1997, 2003; Harvey, Kemps, & Tiggemann, 2005). Finally, restrained eaters easily overeat when confronted with such food cues (Collins, 1978; Fedoroff et al., 1997; Jansen & Van den Hout, 1991; Rogers & Hill, 1989). In sum, these studies indicate that when restrained eaters have been confronted with attractive food cues, they no longer behave in line with their chronic dieting goal.

Recently, it has been suggested that there might be a common mechanism underlying these findings, namely, that the perception of palatable food cues leads to the inhibition of the dieting goal in restrained eaters and that this process can affect subsequent behavior. This idea was advanced in the goal conflict theory of eating by Stroebe and colleagues (Stroebe, 2008; Stroebe, Mensink, Aarts, Schut, & Kruglanski, 2008). This theory suggests that restrained eaters hold two incompatible goals with respect to food and eating, namely, the goal of eating good food and the goal of dieting and weight control. While the dieting goal normally curbs restrained eaters' hedonic orientation toward food and helps to restrain their eating behavior, the fragile balance between the two opposing goals can easily be disturbed by the exposure to attractive food cues. The theory proposes that perceiving palatable food leads to the inhibition of the mental representation of the dieting goal in restrained eaters. As a consequence, subsequent food-related cognition and behavior will be dominated by the hedonic goal of eating good food more than by

the dieting goal, and restrained eaters are more likely to overeat on attractive food.

Research testing hypotheses derived from this theory confirm that restrained eaters spontaneously activate a hedonic orientation toward food when they perceive palatable food cues. In two recent studies (Papies, Stroebe, & Aarts, 2007), restrained and unrestrained participants read behavior descriptions involving either palatable food or neutral food, after which they were probed unobtrusively for the mental accessibility of hedonic thoughts about food (e.g., delicious). Results showed that restrained eaters activated such hedonic thoughts, but only after reading behavior descriptions involving palatable food rather than neutral food. In a related series of studies, we examined restrained eaters' processes of visual attention after they had been exposed to attractive food cues (Papies, Stroebe, & Aarts, *in press*). Using a visual probe task, we found that restrained eaters allocated increased selective attention to food as a function of their liking of this food. However, this attentional bias only occurred for palatable food and not for neutral food. These studies confirm that the perception of attractive rather than neutral food cues triggers in restrained eaters a hedonic orientation toward food, which makes such cues especially relevant for understanding restrained eaters' processes of self-regulation.

Moreover, Stroebe and colleagues (2008) found that restrained eaters, who are chronic yet rather unsuccessful dieters, have a tendency to inhibit the mental representation of the dieting goal when they are confronted with palatable food cues (see also Papies et al., 2007a). Participants in the studies of Stroebe et al. were primed subliminally with palatable food words or with control words and subsequently probed for the accessibility of the dieting goal in a lexical decision task. While the food prime had no influence on the accessibility of diet-related words in unrestrained eaters, restrained eaters showed decreased access to diet-related words when they were primed with food words compared to control words. This suggests that the subtle exposure to palatable food cues causes restrained eaters to temporarily inhibit their dieting goal as this is incompatible with their hedonic orientation toward food (*cf.* Aarts, Custers, & Holland, 2007). The goal conflict theory proposes this inhibition of the dieting goal as the mechanism possibly underlying restrained eaters' dieting failures when they are confronted with tempting food.

The theory of temptation-elicited goal activation, however, which has been proposed by Fishbach and colleagues (Fishbach, Friedman, & Kruglanski, 2003), makes rather different predictions about the impact of tempting food cues on dieters. Rather than explaining why dieters are often unsuccessful, it suggests a mechanism by which dieters can in fact successfully regulate

their eating behavior. Fishbach et al. argue that when individuals repeatedly try to exert self-control in tempting situations, temptation cues will eventually become associated with the mental representation of the overriding goal that the temptation might undermine. As a result, facilitative links develop between temptations and goals, and the perception of a temptation cue will subsequently lead to the activation, rather than the inhibition, of the overriding goal. In a series of studies testing this theory (Fishbach et al., 2003), the accessibility of specific goal representations was measured after participants had been primed with words that represent a temptation potentially interfering with the pursuit of that goal. The findings in the domain of dieting show that priming temptations (e.g., chocolate) indeed increased the mental accessibility of the relevant overriding goal (e.g., dieting), but only for those dieters who reported being successful in their self-regulation. Thus, self-regulatory success seems to be associated with an increased tendency to activate the relevant goal in a situation where self-regulation is required (e.g., the confrontation with tempting food).

These findings seem inconsistent with the findings reported by Stroebe et al. (2008), who sought to explain why restrained eaters generally are not successful. Moreover, the findings by Fishbach et al. (2003) seem surprising given the literature on restrained eating behavior showing that restrained eaters overeat in response to tasty food cues (e.g., Fedoroff et al., 1997; Jansen & Van den Hout, 1991). However, although there is ample evidence for dieters' self-regulatory failures, the idea of successful self-regulation in chronic dieting is interesting and has potentially promising implications. Therefore, we will consider a number of methodological differences between these studies in order to assess the degree to which they could be integrated. First of all, the Fishbach et al. study on dieting (Study 4) used a self-constructed measure of "importance of dieting" to identify dieters, whereas Stroebe et al. used the Concern for Dieting scale of the Revised Restraint Scale (Herman & Polivy, 1980) as a measure of dieting motivation. According to extensive research in the domain of restrained eating, this scale identifies very motivated dieters who are chronically concerned with weight and dieting but who are also rather unsuccessful in this endeavor (e.g., Gorman & Allison, 1995; Heatherton et al., 1988; Herman & Polivy, 1980). This difference in measures used could explain why the Stroebe et al. studies showed, on the whole, a pattern of inhibition of the dieting goal following attractive food cues, as this might be typical of unsuccessful dieters.

A second difference between the two series of studies is also related to the issue of self-regulatory success. In fact, this individual difference was not assessed among the participants of the Stroebe et al. (2008) studies. However,

self-regulatory success could qualify the reported effects as different levels of self-regulatory success might even be found among restrained eaters. This would suggest that the two sets of findings could be integrated if one assumes that successful restrained eaters activate the dieting goal while unsuccessful restrained eaters inhibit the dieting goal in response to tempting food cues.

Finally, a third reason for the apparent inconsistencies between the two sets of findings might lie in the specific effects reported in both studies. Stroebe et al. (2008) compared the reaction times to diet words in the food prime to reaction times in the neutral prime condition, showing that for restrained eaters, the recognition of diet words was slowed down by the food prime as compared to the neutral prime. Fishbach et al. (2003), on the other hand, analyzed the reaction time to diet words following food primes as a function of importance of dieting and perceived self-regulatory success, showing that successful dieters recognize diet words after food primes faster than unsuccessful dieters. However, the reaction times to diet words after food primes were not compared directly to diet words after neutral primes. Hence, although suggestive, this study presents no conclusive evidence for actual facilitation or inhibition of the dieting goal among successful and unsuccessful dieters due to the presentation of food temptations.

These differences between the studies by Fishbach et al. (2003) and Stroebe et al. (2008) suggest that both temptation-elicited goal activation and goal inhibition could occur in restrained eaters, depending on levels of self-regulatory success. The present research was therefore designed to replicate and integrate these findings and thus answer the intriguing question of whether restrained eaters can actually diet successfully. For this reason, the current studies used the validated measure of Concern for Dieting (Herman & Polivy, 1980; Stroebe et al., 2008) to identify chronically restrained eaters and the measure of self-regulatory success introduced by Fishbach et al. to assess levels of self-regulatory success.

An interesting issue that might provide us with further insight into the processes underlying goal activation and inhibition is the time course of these priming effects. Although in both the Fishbach et al. (2003) and Stroebe et al. (2008) studies the food primes themselves were presented too short for conscious perception (50 ms and 23 ms, respectively), the onset of the diet target only occurred at least half a second later (700 ms and 500 ms, respectively), adding up to a stimulus-onset asynchrony (SOA) of 750 ms and 523 ms, respectively. The SOA is of relevance as it influences the amount of processing that the prime receives before the actual target is presented, thus determining the prime's impact on the accessibility of related concepts. Research on the time course of priming effects has

revealed that both the activation and the inhibition of related concepts require some amount of processing time, especially when the prime and the target are not very strongly associated (Burgess & Simpson, 1988; Neely, 1977; Simpson & Burgess, 1985). In order to augment our understanding of the processes underlying the effects of food primes, the present study examined the time course of the temptation-elicited goal activation and inhibition by systematically varying the SOA between food primes and diet targets. We hypothesized that both the activation and the inhibition of the dieting goal after the food prime would be especially pronounced at longer SOAs. In Study 1, then, we examined the hypothesis that while unsuccessful restrained eaters will inhibit their dieting goal in response to food temptations, successful restrained eaters will activate this goal when they perceive tempting food, especially at longer SOAs. Study 2 was designed to assess the behavioral implications of self-regulatory success by testing whether it increases restrained eaters' adherence to their dieting plans over an extended period of time. This way, we hoped to gain insight into self-regulatory success by examining its effects on behavior as well as its cognitive underpinnings.

STUDY 1

Study 1 was set up to test the impact of palatable food primes on the accessibility of the dieting goal for successful and unsuccessful restrained eaters. Words related to the goal of dieting were presented in a lexical decision task following the subliminal presentation of palatable food primes or neutral primes. In order to examine the time course of the prime effect and get a better understanding of its underlying process, the time interval between the presentation of the food prime and the presentation of the target (i.e., SOA) was varied within participants. We expected the accessibility of the dieting goal to differ from baseline only at the longer time interval and not at the shorter time intervals between the onset of prime and target.

Method

Participants and Design

In all, 52 students (13 men, 39 women) of Utrecht University participated in the study for course credit or €2.50. The study used a mixed design with trial type (baseline vs. 180 ms vs. 360 ms vs. 540 ms SOA) as a within-participant factor and restrained eating and self-regulatory success as continuous predictors. Gender did not have a main effect or interact with the other predictors. Therefore, it will not be discussed any further.

Materials

Five words related to the goal of dieting (*weight, slim, diet, losing weight, weight watching*) served as targets in the lexical decision task. Five office-related words of equal word length served as control targets (*book, staple, office, desk, file*). Moreover, there were 10 neutral words and 20 nonwords that served as targets in filler trials. Five palatable food items (*chocolate, cookies, pizza, French fries, chips*; all single words in Dutch) were used as subliminal palatable food primes. Random letter strings were used as primes on filler and baseline trials and as pre- and postmasks for the food primes.

Procedure

Upon arrival at the laboratory, participants were seated in individual cubicles containing a desktop computer, which presented all materials and instructions.

Lexical decision task. Participants were instructed to indicate as fast and as accurately as possible whether the words presented between asterisks on the screen were existing Dutch words or not, using the clearly marked keys on the keyboards for their responses. They were instructed that series of letter strings would appear in between words, and they were not supposed to react to these letter strings. Five practice trials were presented to familiarize participants with this task.

The lexical decision task used here was adapted in such a way as to accommodate the different SOAs necessary to test our specific hypothesis. Participants were presented with a letter string presented for 30 ms followed by a letter string presented for 150 ms, again followed by a letter string of 30 ms, and so on. At random intervals, a target word was presented between asterisks, and participants were required to respond. This way, the length of a trial varied between 900 ms and 2.5 seconds, and participants were not able to form expectancies as to when the next target would appear. On critical trials, a food prime was presented for 30 ms and followed by varying numbers of letter strings until the diet word or office word was presented 180 ms, 360 ms, or 540 ms after the onset of the subliminal food prime (see Figure 1 for an example of a critical trial). On baseline trials, as well as on filler and nonword trials, the target word was preceded only by letter strings. The lexical decision task consisted of 20 diet-target trials, 20 office-target trials, 40 filler trials, and 80 nonword trials, adding up to a total of 160 trials. Trials were presented in a random order but with critical trials in fixed positions in order to ensure enough distance between them. After 80 trials, there was a break of 30 seconds.

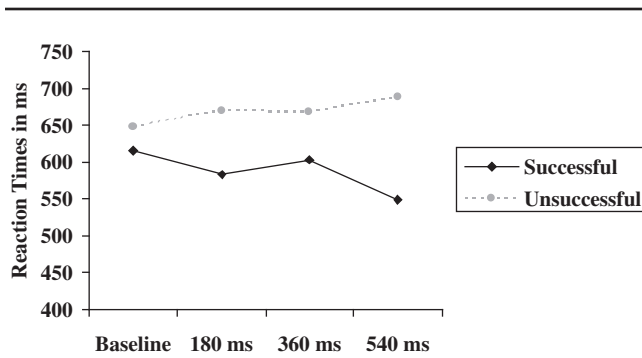


Figure 2. Restrained eaters' mean response latencies to diet targets as a function of self-regulatory success and stimulus-onset asynchrony (SOA).

NOTE: Successful and unsuccessful groups represent one standard deviation above versus below the mean of the success scale.

food prime compared to baseline trials, but only when the SOA was 540 ms, $F(1, 48) = 5.80$, $p = .02$, $\eta^2 = .11$, and not when the SOA was 180 ms, $F(1, 48) = 1.00$, $p = .32$, $\eta^2 = .02$, or when the SOA was 360 ms, $F(1, 48) = 1.30$, $p = .26$, $\eta^2 = .03$. Thus, at the SOA of 540 ms, the food prime led to an activation of the dieting goal above baseline in successful restrained eaters and to its inhibition below baseline in unsuccessful restrained eaters.

The same pattern of results emerges in a between-subjects analysis when comparing the reaction times of successful and unsuccessful restrained eaters at the different types of trials. Results showed that their responses did not differ at baseline, $F(1, 48) = 0.41$, $p = .53$, $\eta^2 = .01$. The effect of success approached significance at the SOA of 180 ms, $F(1, 48) = 2.88$, $p = .10$, $\eta^2 = .06$, and at the SOA of 360 ms, $F(1, 48) = 2.42$, $p = .13$, $\eta^2 = .05$, and it was significant at the SOA of 540 ms, $F(1, 48) = 6.89$, $p = .01$, $\eta^2 = .13$.¹ This difference between successful and unsuccessful restrained eaters is a conceptual replication of the findings reported by Fishbach et al. (2003).

There were no significant effects on trials in which office words served as targets.

Discussion

The findings of Study 1 confirmed our hypothesis that the subliminal presentation of an attractive food prime has a differential impact on the accessibility of the dieting goal in restrained eaters, depending on their self-regulatory success. For successful restrained eaters, food primes led to the facilitation of the dieting goal compared to baseline, whereas for unsuccessful restrained eaters, food primes caused the inhibition of the dieting goal. Moreover, these priming effects were observed only in the condition

with a time delay of 540 ms between the onset of the food prime and the onset of the diet target. At shorter SOAs, food primes did not affect the accessibility of the dieting goal. This result mirrors the findings of Fishbach et al. (2003) and Stroebe et al. (2008), which also relied on relatively long SOAs (750 ms and 523 ms, respectively) to assess effects of temptation primes.

The goal of Study 1 was to integrate the findings of Fishbach et al. (2003) and Stroebe et al. (2008), who reported seemingly inconsistent findings with regard to the effect of food primes on the dieting goal. The present study replicated the findings by Fishbach et al. (2003, Study 4) with the slight modification of using the Concern for Dieting Subscale of the Restraint Scale as a predictor, and it showed that those restrained eaters who are relatively more successful display facilitation of the dieting goal in response to food primes. At the same time, we replicated the findings by Stroebe et al. by demonstrating the inhibition of the dieting goal after food primes, but only in unsuccessful restrained eaters. These findings point toward self-regulatory success as the crucial moderating variable in the effects of food primes on the dieting goal. The question remains, however, whether the effect of self-regulatory success extends not only to goal accessibility but also to the corresponding goal-directed behavior. This is the central question of Study 2.

STUDY 2

Recent research on goal-directed behavior has provided ample evidence that the accessibility of a behavioral goal is a crucial parameter in the subsequent pursuit of that goal. Unobtrusively increasing the accessibility of a goal by a priming manipulation makes subsequent behavior in pursuit of that goal more likely, for example, when participants who are primed with the goal of socializing subsequently expend more effort in order to win tickets for a student party (Aarts, Gollwitzer, & Hassin, 2004; Bargh, Gollwitzer, Lee-Chai, Barndollar, & Troetschel, 2001; Custers & Aarts, 2007). Thus, if self-regulatory success increases the accessibility of the dieting goal when a temptation is perceived, we argue that it might also facilitate the pursuit of the dieting goal in tempting situations, that is, align one's action with one's intentions.

Fishbach et al. (2003) report a study that appears to be relevant to this issue as it investigates the effects of temptation priming on the behavior of diet-concerned individuals (Study 5). After participants had been primed with either attractive food cues, diet cues, or neutral cues, the mental accessibility of the dieting goal was measured in a lexical decision task. Then, participants could choose between a healthy, diet-congruent gift (apple) and an

unhealthy, palatable gift (chocolate bar) from the experimenter. Results showed that both the attractive food prime and the diet prime increased the mental accessibility of the dieting goal and also triggered participants to choose the diet-congruent parting gift more often than in the control condition. Thus, this study seems to indicate that attractive food primes increase dieters' adherence to the dieting goal. Although all participants of this study were somewhat concerned with weight and dieting, their self-regulatory success was not measured. It is therefore difficult to relate the findings of this study to the differences reported earlier between successful and unsuccessful dieters. Based on earlier findings, one would expect that only successful dieters will behave in line with their dieting intentions in such a tempting situation. Less successful dieters, as we have seen earlier, have a tendency to overeat when confronted with tempting food cues, and they should be more likely to choose the chocolate bar instead of the apple (e.g., Fedoroff et al., 1997, 2003). Therefore, we designed a second study to test the hypothesis that only successful dieters pursue their dieting intentions in tempting situations.

In this study, we specifically examined the role of self-regulatory success in restrained eaters' adherence to their dieting plans over a 2-week period. As prior research has shown that restrained eaters activate hedonic cognitions and easily abandon their diets when confronted with high-calorie, palatable food (e.g., Fedoroff et al., 1997, 2003; Papies et al., 2007, in press), we were especially interested in restrained eaters' dieting behavior with respect to abstaining from such food items. We hypothesized that unsuccessful restrained eaters, who have been shown to inhibit the dieting goal when confronted with palatable food, would not translate their intentions not to eat the critical food items into behavior as the representation of the dieting goal is not available to guide their actions in the relevant situations. Successful restrained eaters, on the other hand, have a tendency to activate their dieting goal when they are confronted with palatable food, which enables them to execute their diet-related intentions. In sum, therefore, self-regulatory success should moderate the intention-behavior relationship for restrained eaters.

Method

Participants and Design

In all, 65 students of Utrecht University (12 men, 53 women) participated in this study in exchange for either course credit or €2 and the chance to win an additional prize of €30. The study used a longitudinal design with two measurements separated by a time interval of 2 weeks. Dietary restraint, dieting success, and not-eating

intentions were measured at Time 1 and used as continuous variables to predict eating behavior measured at Time 2.²

Procedure

Time 1. Participants were seated in individual cubicles and completed several questionnaires on the computer. Restrained eating and perceived self-regulatory success were assessed the same way as in Study 1. As a measure of the goal to diet, participants were then asked to indicate on a 7-point scale their intentions not to eat five palatable food items (e.g., pizza, chocolate) within the next 2 weeks. These were the same five food items that had been used as primes in Study 1. After this, participants were paid and thanked for their participation. They had no indication that they would be contacted again.

Time 2. Each participant was contacted by e-mail exactly 15 days after initial participation. They were asked to complete a short electronic questionnaire concerning the same food items as in the first measurement. They indicated how often they had eaten the food items in the past 2 weeks on a 7-point scale ranging from *never* to *very often*. Participants returned the questionnaire by e-mail either on the day they received it or on the following day.

Results

The frequency of eating the critical food items was analyzed in order to test our hypothesis that intentions not to eat certain food items predict behavior only for successful restrained eaters but not for unsuccessful restrained eaters. In order to reduce multicollinearity, predictor variables were transformed to standardized scores before computing cross-product terms (Dunlap & Kemery, 1987). Regression analyses revealed a main effect of intention, $\beta = -.61$, $t(57) = -4.41$, $p = .00$, such that intentions not to eat the food items in question were associated with a lower frequency of eating them. However, this effect was qualified by the predicted three-way interaction between intentions, restraint, and success, $\beta = -.31$, $t(57) = -2.10$, $p = .04$. To further examine this interaction, the effect of intentions and success was assessed for unrestrained and restrained eaters separately (one standard deviation below vs. above the mean of the restraint scale; see Aiken & West, 1991). For unrestrained eaters, there was a strong main effect of intentions, $\beta = -.67$, $t(57) = -3.90$, $p = .00$, such that intentions not to eat the food items was associated with a lower frequency of eating them. For restrained eaters, however, the main effect of intention, $\beta = -.55$, $t(57) = -2.96$, $p = .01$, was qualified by a significant

interaction between intentions and success, $\beta = -.43$, $t(57) = -2.10$, $p = .04$. In line with our hypothesis, simple slope analyses showed that intentions only predicted the behavior of successful restrained eaters, $\beta = -.98$, $t(57) = -3.85$, $p = .000$, such that stronger intentions not to eat the critical food items corresponded with eating them less frequently. For unsuccessful restrained eaters, these intentions did not predict how often they ate the critical food items, $\beta = -.12$, $t(57) = -0.40$, $p = .69$.

Discussion

The results of Study 2 confirmed our hypothesis that self-regulatory success among restrained eaters influences their actual eating behavior. We found that successful and unsuccessful restrained eaters differed in the degree to which they were able to translate their diet-related intentions into actual behavior, such that intentions not to eat certain food items predicted the self-reported frequency of actually eating these items only for successful restrained eaters. For unsuccessful restrained eaters, the frequency of eating the critical food items was not related to their intentions. Thus, self-regulatory success emerged as a moderator of the intention-behavior link in restrained eaters.

In order to successfully execute one's intentions, it is essential that one remembers them at the right moment. Study 1 showed that unsuccessful restrained eaters have a tendency to inhibit their dieting goal in tempting situations, and we argue that this might be the critical process that interferes with the execution of dieting intentions in unsuccessful restrained eaters. Because their dieting goal is inhibited when they perceive an attractive food item, they might simply not think of the fact that they had formed an intention not to eat it. Although we did not directly assess the effect of the accessibility of the dieting goal on eating behavior, Study 2 presents converging evidence for this hypothesized process underlying restrained eaters' self-regulatory failure. By examining the effects of self-regulatory success on actual behavior, we extended the findings of Study 1 as well as the findings by Fishbach et al. (2003) that focused on the cognitive processes associated with success. Thus, this study confirms that self-regulatory success is a meaningful dimension among restrained eaters as it is reflected not only in processes of goal activation but also in goal-directed behavior.

GENERAL DISCUSSION

The presence of attractive food has a profound impact on the cognitions and behavior of dieters and

their efforts at self-regulation (e.g., Fedoroff et al., 1997, 2003). Given the omnipresence of food cues in our living environment, is there any hope at all for the dieters among us? The present article suggests that there is and presents cognitive and behavioral characteristics of dieting success.

Study 1 confirmed earlier findings by Fishbach et al. (2003) that dieters who indicate being successful in their weight regulation have a tendency to activate their dieting goal when they perceive tempting food. Our study found evidence of this process of successful self-regulation even among restrained eaters, who previously were found to be chronic but rather unsuccessful dieters on the whole. However, restrained eaters who indicated being unsuccessful showed the opposite tendency: These dieters inhibited their dieting goal after the presentation of attractive food primes, which resembles the findings of earlier studies by Stroebe and colleagues (2008) for a subgroup of relatively unsuccessful dieters. Thus, the results of Study 1 integrate the findings of two lines of research and present us with a differentiated picture of the impact of attractive food cues on the dieting goal in restrained eaters as this is moderated by self-regulatory success. Study 2 then extended these findings to actual dieting behavior and showed that successful dieters are more likely to enact their dieting intentions than unsuccessful dieters. Taken together, our studies corroborate the existence of the mechanism of temptation-elicited goal activation associated with dieting success (Fishbach et al., 2003) and also provide evidence for the behavioral effects of dieting success.

What are the implications of these findings for our understanding of the impact of food cues on restrained eaters? A large number of studies demonstrated the detrimental effects of attractive food cues on the self-regulation of restrained eaters, providing evidence of restrained eaters' appetitive responses and overeating when they are confronted with attractive food cues (e.g., Fedoroff et al., 1997, 2003; Harvey et al., 2005; Jansen & Van den Hout, 1991). The goal conflict model (Stroebe, 2008; Stroebe et al., 2008) has been developed to explain these instances of self-regulatory failure and points toward the activation of hedonic thoughts and the inhibition of the dieting goal as the possible underlying mechanisms. The present studies, however, suggest that these processes might be especially relevant for a subgroup of restrained eaters, namely, those who report to be rather unsuccessful at their dieting attempts. Those dieters who are successful trigger their dieting goal in tempting situations so that they should be less prone to overeat when confronted with the sight, the smell, or thoughts of attractive food.

Note that the present studies only examined restrained eaters' cognitive and behavioral responses to high-calorie,

palatable food, and it is possible that successful restrained eaters activate their dieting goal even in response to other, less tempting food cues. An additional limitation of our studies is that our measure of dieting behavior relied on participants' self-reported frequency of eating the critical food items without controlling for the frequency of actually having been exposed to these temptations. Future studies might further examine successful dieters' cognitive and behavioral strategies of self-regulation and relate them to instances of eating behavior in more controlled situations.

Our finding that dieting success emerged as a significant moderator of the intention-behavior link in restrained eaters is in line with earlier research on the execution of diet-related intentions, which has identified individuals' perceived control with respect to losing weight as a moderator of the intention-behavior link (Schifter & Ajzen, 1985). In the study by Schifter and Ajzen (1985), perceived control was measured by asking participants to indicate the likelihood that their attempts at weight control would be successful, which closely resembles the measure of self-regulatory success used in the present studies. Thus, both scales might tap into the same underlying construct, namely, participants' perceived ability to reduce their body weight, which helps dieters to translate their dieting intentions into actual behavior. In all of these studies, however, self-regulatory success was assessed by assessing participants' own perceptions of success so that it remains unclear how these measures are related to more objective standards of weight control. In the present work, we made a first step toward including such objective standards by computing the correlation with BMI and confirming that successful participants had a relatively lower BMI. However, future studies should include more extensive assessments of dieting success.

Another moderator of the intention-behavior link that has emerged from earlier research and that is relevant to the current investigation is goal accessibility. That is, in order to have an effect on behavior, goals should be increasingly accessible at the time of action. Evidence for the beneficial effect of the accessibility of the behavioral goal in intention-behavior relations stems mostly from research on implementation intentions (for a meta-analysis, see Gollwitzer & Sheeran, 2006; Sheeran, 2002). These are concrete plans that specify when, where, and how one is planning to pursue a goal, thereby producing a cognitive association between certain situational cues on one hand and the behavioral goal that one wants to pursue on the other hand. Forming implementation intentions increases the likelihood that the mental representation of the goal becomes highly accessible when the relevant situation is encountered, which in turn contributes directly to the actual execution of

the intention (Webb & Sheeran, 2007). Although our current studies did not examine the behavioral effects of the accessibility of the dieting goal directly, the combined findings of Studies 1 and 2 might point in this direction, that is, that changes in goal accessibility might be the cognitive process underlying the reported effects of self-regulatory success on the link between intention and behavior in restrained eaters.

The fact that self-regulatory success emerges as such a crucial parameter in restrained eating raises questions about the mechanism underlying the activation or inhibition of the dieting goal. How do some restrained eaters manage to spontaneously activate their long-term dieting goal in the face of an attractive short-term temptation? Fishbach et al. (2003) argue that such a facilitative link between temptations and goals arises from repeated attempts at self-control in a given domain, for example, by repeatedly trying to diet when one is confronted with a tasty food temptation. Our earlier studies (Papies et al., in press) showed that perceiving attractive food triggers in restrained eaters the activation of hedonic thoughts about food. Thus, once such hedonic thoughts have been activated, attempts at self-control require a restrained eater to overrule the tendency to translate these into action (i.e., eating the good food) by consciously thinking about his or her dieting goal and then pursuing it (i.e., refraining from eating the food). By doing so repeatedly, the association between hedonic thoughts about food and the goal of eating the food will be weakened, and at the same time, the association between hedonic thoughts and the dieting goal will be strengthened (Bargh, 1990; Bargh & Gollwitzer, 1994).

Note that this mechanism necessitates a conscious effort on behalf of the dieter to substitute one course of action by another, which might eventually also lead to the substitution of one cognitive association by another, more beneficial one. Once the new association is overlearned to a sufficient degree, attractive food cues can trigger the dieting goal unconsciously and efficiently, two important aspects of automaticity (Bargh, 1994). The effectiveness of such a conscious "intervention" to replace an existing unwanted behavior with a new, more desirable one has recently been demonstrated in a field study on implementation intentions (Holland, Aarts, & Langendam, 2006). The actual strength of the goal, namely, the degree to which it is seen as desired by the individual, could influence the likelihood that a dieter will consciously decide to pursue it in critical situations and thus contribute to the development of self-regulatory success (Ferguson, 2007; see also Custers & Aarts, 2005).

In sum, the process that we suggest helps restrained eaters to be successful in their dieting attempts resembles the concept of implementation intentions in two important dimensions. First, both strategies of self-regulation

are effective because they increase the accessibility of the behavioral goal in the critical situation. And second, both require conscious planning of the individual to change his or her behavior, which might eventually lead to a change in the underlying cognitive structure that triggers responses to certain situations. This way, our current studies fit in a new direction in psychological research that focuses not only on the detrimental effects of automatic processes for health behaviors, such as in unhealthy habits that are hard to break (e.g., Sheeran et al., 2005; for an overview, see Aarts, 2007), but points also at the potential benefits of both conscious planning and automatic processes for one's healthy goal pursuits.

NOTES

1. The mean reaction times of successful and unsuccessful restrained eaters at the different types of trials were $M = 616$ ($SE = 38.85$) versus $M = 648$ ($SE = 23.61$; baseline); $M = 583$ ($SE = 39.48$) versus $M = 669$ ($SE = 24.00$; stimulus-onset asynchrony [SOA] 180 ms); $M = 603$ ($SE = 32.59$) versus $M = 668$ ($SE = 19.80$; SOA 360 ms); and $M = 549$ ($SE = 41.21$) versus $M = 688$ ($SE = 25.05$; SOA 540 ms).

2. Although 126 participants completed the first part of the study, only 65 participants returned the e-mail questionnaire that was sent to them 2 weeks later. This relatively high attrition rate is probably due to the fact that participants were not aware that they would be contacted again for the second part of the study. However, there were no differences on the measures of restraint, success, or intentions at Time 1 between participants who did and those who did not respond to the e-mail follow-up (all $F_s < .8$).

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