

Tricky Treats:
How and When Temptations Boost Self-Control

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**Tricky Treats:
How and When Temptations Boost Self-Control**

Verraderlijke Verleidingen:
Hoe en Wanneer Verleidingen Zelfcontrole Activeren
(met een samenvatting in het Nederlands)

Proefschrift

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Chapter I:

General Introduction

Temptations are typically seen as ‘bad’: had Eve not eaten from the apple, she would not have been banned out of the Garden of Eden. Not only in the Bible, but also in modern real life people often believe it is dangerous to, for example, be confronted with fast food commercials when trying to lose weight, or to walk through their favorite store when planning to save money. Hence, when trying to behave in accordance with their good intentions, people tend to think they should avoid all temptations. For example, many students choose to study in the library rather than in their home environment, to prevent themselves from getting distracted by friends or computer games. Similarly, people who have known a history of debts may be hesitant to accept another credit card, and those who are conscious about their weight may refuse to pass through the sweets and snacks aisle in the supermarket. Of course, if we would never encounter temptations, it would be much easier to hold on to our good intentions. If there were only healthy choices to make people would probably have lower body weights, and if money loans were not available we would not face as much financial trouble. However, besides the fact that a temptation-free world is as unattractive as it is unrealistic, it may be worthwhile to reconsider our view of temptations. That is, instead of focusing on the negative consequences of indulgence to temptations, we suggest that more attention should be paid to instances where temptations are successfully resisted.

In this dissertation we will demonstrate that temptations are not always bad, and may even lead to ‘good’ behavior. That is, we claim that people are often well able to deal with temptations, and, more importantly, that exposure to temptations may even *boost* goal-directed behavior. To introduce our research aims, we will first discuss our definition of temptations and provide a brief overview of prior research on the topic of dealing with temptations.

Temptations and Goals

While dealing with temptations is widely studied in social and health psychology (e.g., De Ridder & De Wit, 2006; Baumeister & Vohs, 2003), an actual definition of temptation is, surprisingly, rarely given. According to the Oxford dictionary ‘temptation’ refers to “the desire to do something, especially something wrong or unwise”. Thus, the semantic definition of temptation implies that a conflict is involved between wanting something and knowing that you should not do it. Psychology literature also seems to show consensus in referring to temptations as immediate attractions that are in conflict with a long-term goal (e.g., Trope & Fishbach, 2000; De Ridder & De Wit, 2006), although this is rarely explicitly articulated. To consolidate the mere implicit notions in the literature, we propose a definition of temptations, stating that they need to be both attractive and in some way ‘forbidden’. The ‘forbidden’ component of temptations can

have different backgrounds (e.g., health concerns, conforming to social norms or obeying the law), but in the current context always refers to the violation of a personal goal. For example, watching your favorite TV show can be a temptation if it interferes with your goal to study for an exam but not during the weekend when you are allowed to spend the evening watching TV. Similarly, a chocolate cake is only a temptation for those who like chocolate cakes and who have a reason to not want to eat it, for instance because they are watching their weight. For people who like chocolate cakes and who have no reason not to indulge, the cake is a nice treat but not a temptation.

The temptation-goal conflict as illustrated above comprises two opposing forces: on the one hand, hedonic attraction pulls towards indulgence, whereas on the other hand, rational considerations with concern to the conflicting goal dictate to resist the temptation (e.g., Fishbach & Shah, 2006; Fujita, 2011). This dilemma has also been referred to in the so-called Goal Conflict Model (Stroebe, Mensink, Aarts, Schut, & Kruglanski, 2008), in which hedonic urges and restraint standards are positioned as two conflicting goals that are in competition with each other. At the same time, the temptation-goal conflict often has a temporal dimension: indulging leads to immediate pleasure, whereas goal-related benefits resulting from resisting the temptation are often delayed (e.g., obtaining a slim figure, or graduating with high grades). In this light, resisting temptations involves the “delay of gratification”, which refers to the ability to withhold from immediate pleasure for the purpose of long-term benefits. In sum, it can be stated that “[temptation] dilemmas are fundamentally dual-motive conflicts” (Fujita, 2011), where proximal (i.e., immediate satisfaction) and distal (i.e., goal pursuit) motives press for opposing action.

These two sides of the temptation conflict are reflected in classic models that are used to explain self-regulation, which is roughly defined as the process of goal setting and goal striving (De Ridder, & De Wit, 2006) or the self's capacity to alter its behaviors in accordance to some standards, goals or ideals (e.g., Bauer & Baumeister, 2011). In recent years, self-regulation literature has evolved toward dual-process models of behavior. For example, hot/cool systems theory (Metcalf & Mischel, 1999) proposes that behavior is determined by the interplay of a ‘hot’ system, which is fueled by emotions and responds impulsively, and a ‘cool’ system, which is rational and focused on long-term goal attainment. The hot system is activated in response to hedonically appealing stimuli, and, unless counteracted by the cool system, will stimulate indulgence. In order to activate the cool system, the balance needs to shift away from the hot system, for example by removing (attention towards) the temptation or construing it in a more abstract way. In this way, strategic long-term considerations will have room to facilitate resistance of temptations (Metcalf & Mischel, 1999). Along the same lines, the reflective-impulsive model of behavior proposed by Strack and Deutsch (2004; see also Strack, Werth & Deutsch, 2006) also distinguishes a rational (cf. ‘cool’) and an emotional (cf. ‘hot’) route that interact to determine behavior. For example, a dieter who is offered a piece of cake

will experience positive hedonic associations with the pleasure of eating cake as well as reasoned arguments that tell her not to forego her dieting goal. Which of these will determine behavior is dependent on specific circumstances. When cognitive resources are limited, behavior will predominantly be guided by the impulsive system which relies on implicit automatic processes. However, when cognitive resources are available the reflective system will take over, allowing room for rational choices and explicit preferences (Hofmann, Rauch, & Gawronski, 2007). Thus, hypothetically, when people are confronted with temptations self-regulation processes can go either way, leading to indulgence or resistance of temptations. However, most research has been concerned with instances where people fail to adhere to their goals and indulge, as we will outline below.

Self-Control

Typically, social and health psychology literature has suggested that temptations automatically trigger hedonic impulses (i.e., activating the 'hot' system), rendering the cool system powerless (e.g., Carver, 2004). In order to activate the cool system and resist the hedonic impulse self-control needs to be exerted (Baumeister, 2002). Self-control is defined as the "control over the self by the self" (Muraven & Baumeister, 2000), and is involved whenever an impulsive response needs to be inhibited, for example to resist temptations, persist working on a boring task, or to suppress emotions. Someone's general self-control capacity can be regarded as a personality trait that develops with age (e.g., Tangney, Baumeister, & Boone, 2004; Mischel, Shoda, & Rodriguez, 1989). At the same time, however, self-control capacity is also state-dependent and is said to be drawn from a limited resource that can get depleted after multiple attempts (e.g., Baumeister, Bratslavsky, Muraven & Tice, 1998; Vohs & Heatherton, 2000; Muraven & Baumeister, 2000). To illustrate, research showed that when participants had to exert self-control on two subsequent tasks, for example suppressing their emotions in one task and resisting ice cream in a second task, they consistently performed worse on the second task (Vohs & Heatherton, 2000). Analogous to a muscle, it has been proposed that self-control strength will weaken after prior exertion of effort, but it will be replenished after a period of rest (Muraven & Baumeister, 2000). Thus, based on self-control research it can be inferred that people may well be able to resist temptations, but cannot endlessly control their hedonic impulses. After having decided not to buy that beautiful pair of shoes, or after already having resisted a starter and an additional glass of wine, it may just take too much to also say no to the ice cream dessert. Hence, the self-control account can well explain how and when people fail to resist temptations. However, the strong focus on self-regulatory failure at the same time seems to leave a gap with regard to explanations for self-regulatory success. Naturally, people are not always subject to their impulses, and are often well able to avert temptations without relying on effortful strategies. In this

dissertation we aim to address this gap by approaching the topic of resisting temptations from the perspective of Counteractive Control Theory.

Counteractive Control Theory

Only in the past decade it has been suggested that the idea that temptations always trigger hedonic impulses and require effortful resistance would not be quite adaptive. Instead, Counteractive Control Theory proposes that temptations can also directly activate mechanisms that protect, rather than inhibit, the conflicting long-term goal (Trope & Fishbach, 2000). Thus, it is suggested that effortful control is not the only way to successful resistance of temptations, but that there is also an alternative 'automatic' route. A series of experiments (Fishbach, Friedman, & Kruglanski, 2003) indeed provided compelling first evidence that exposure to temptations yielded enhanced mental accessibility of the long-term goal, compared to a no-temptation control condition: the conflicting goal (e.g., dieting) was activated, rather than inhibited, upon exposure to temptations (e.g., cake). In addition, it was shown that this facilitative association between the temptation and the long-term goal was asymmetric, such that priming with temptations yielded enhanced accessibility of the long-term goal, whereas priming with the long-term goal yielded inhibited accessibility of temptations. This indicates that the temptation-goal association is not merely semantic, but reflects a functional mechanism to deal with temptations and protect long-term goals. Along the same lines, it was demonstrated that the availability of temptations leads to an increased positive valence of the conflicting goal (Fishbach, Zhang, & Trope, 2010) as well as a devaluation of the temptation itself (Myrseth, Fishbach, & Trope, 2009). Moreover, Fishbach and colleagues (2003) showed that exposure to temptations, as compared to a neutral control condition, lead participants to be more likely to choose a healthy over an unhealthy snack, demonstrating that the cognitive processes fostering self-control also translated to behavior. Hence, by reminding people of their long-term goal when they are confronted with temptations, counteractive control processes foster successful self-regulation without the need for effortful inhibition of impulses.

However adaptive, though, it is clear from the many accounts of self-regulation failure that counteractive control processes do not always show, or at least do not always yield actual goal-directed behavior. That is, if temptations would always automatically lead to goal-directed behavior, the current numbers of people struggling to hold on to their good intentions (e.g., weight watching) would be hard to explain. Considering that the implications of Counteractive Control Theory seem to be paradoxical in the light of many people's struggle with temptations, we first wish to point out that the theory in fact does not make explicit predictions with regard to behavioral outcomes. That is, counteractive control theory proposes that (cognitive) control processes will be activated upon confrontation with temptations, but it does not exclude the possibility that these

processes are overruled by hedonic impulses. Thus, the effects of temptations on actual goal-directed behavior are not explicitly predicted, and did in fact receive only limited attention in prior research. Therefore, it is important to further investigate the predictions based on Counteractive Control Theory on behavioral outcome measures. Next to that, it is relevant to disentangle the circumstances that do or do not foster counteractive control as it is plausible, in light of the notion that it is unlikely that temptations would always foster goal-directed behavior, that certain moderators can be identified.

Though clearly relevant, research explicitly investigating in which situations counteractive control processes can be observed is limited. Nonetheless, studies have highlighted two moderators of facilitative temptation-goal associations (Fishbach et al., 2003). First, people need to have a valued goal that is in conflict with the temptation. That is, as counteractive control processes serve to protect the conflicting goal, they are only observed to the extent that the goal is deemed important. However, we argue that goal importance is conceptually a prerequisite rather than a moderator, and therefore it is in fact already embedded in the definition of temptation that is used in this dissertation (i.e., without an – important – conflicting goal, an attractive chocolate cake would not be considered an actual temptation). Second, counteractive control processes were found to be related to self-regulatory success as operationalized as a self-reported individual difference factor (Fishbach et al., 2003; Papies, Stroebe, & Aarts, 2008). Thus, only successful, but not unsuccessful, self-regulators were found to show facilitative temptation-goal associations. It could be argued, however, that if the effects of counteractive control processes would depend on self-regulatory success this would imply circular reasoning. As counteractive control is indeed, as assumed, a reflection of successful self-regulation, it is obvious that successful self-regulators will make use of these mechanisms more so than unsuccessful self-regulators. Moreover, an important question would be what the causal relation is between the cognitive counteractive control processes and people's behavioral self-regulatory success: It could either be the case that people who happen to show facilitative temptation-goal associations turn into successful self-regulators, or that those who have repeatedly resisted temptations in face of their long-term goal developed such associations along the way. For that matter, although it is clear from daily experience that temptations do not always elicit successful self-regulation, the question of which factors moderate counteractive control processes still remains largely unanswered.

In this dissertation, rather than searching for individual difference factors that may moderate counteractive control processes, we focus on the central premises of the theory by investigating the role of the temptation itself, or more specifically, temptation strength. Theoretically, it is proposed that temptations should neither be very small nor very large for counteractive control to emerge: When temptations are too small,

counteractive control is not necessary because they can easily be resisted; when the temptation is too large, counteractive control will not be exerted because it will be powerless (Trope & Fishbach, 2000). Hence, Counteractive Control Theory proposes an inverted U-shape function of counteractive control processes as a function of temptation strength. Although the proposed inverted U-shape function of counteractive control was studied in the context of overcoming obstacles (i.e., doing something you don't like) to attain a goal (e.g., participants reported to attach greater value to taking an uncomfortable diagnostic test when the level of discomfort was presented as moderate compared to when it was presented as low or high; Trope & Fishbach, 2000), it did not yet receive empirical support in the context of resisting temptations (i.e., not doing something you like).

In the current dissertation we do not focus on the extremes, but rather on the 'regular' range of temptation strength, within which we predict a positive relation between temptation strength and counteractive control such that strong temptations elicit self-control processes to a larger extent compared to weak temptations. Our reasoning is inferred from a critical level perspective on people's responses to distress as proposed by Gilbert, Lieberman, Morewedge, and Wilson (2004). In line with Counteractive Control Theory, the authors propose that severe stressors (cf., strong temptations) will adaptively trigger defensive action to attenuate the negative consequences of the distress (cf., long-term goal threat). On the other hand, though, the consequences of mild stressors (cf., weak temptations) tend to be underestimated, triggering no defensive action and paradoxically yielding worse outcomes in the end. To illustrate, people may suffer from mild injuries (e.g., a bruised ankle) for a longer period of time than from severe injuries (e.g., a broken ankle) because appropriate cure was sought in the latter but not the former case. Some first empirical evidence for the translation of the critical level perspective to the issue of temptation strength and self-control in the context of eating comes from research showing that self-control is elicited in response to temptations that are available for consumption (i.e., real products) but not those that are unavailable (i.e., pictures of food; Geyskens, DeWitte, Pandelaere, & Warlop, 2008). In addition, studies have shown that people tend to eat more from small than from large packages of crisps, even though (or, in fact, because) they believe that small packages are less likely to lead to self-regulation failure (Coelho do Vale, Pieters, & Zeelenberg, 2008). Hence, these findings lend further support to our proposition of temptation strength as being a plausible candidate as a moderator of counteractive control processes.

In sum, Counteractive Control Theory provides an intriguing, novel perspective on dealing with temptations. At the same time, with the number of studies testing the (implications of the) theory still being limited, it gives rise to many interesting research questions. This fruitful starting point formed the basis for the current dissertation.

Aims

The current dissertation aspires to advance the understanding of how and when temptations boost self-control. More specifically, our research aims are threefold. The first aim is to replicate and extend previous findings demonstrating counteractive control processes on cognitive as well as behavioral measures. As noted before, studies on Counteractive Control Theory, especially ones employing behavioral measures as dependent variables, are still limited. Therefore, a demonstration of counteractive control effects using different dependent measures is most warranted. Second, we aim to explore the circumstances that do or do not foster counteractive control processes by considering the role of temptation strength. Although Counteractive Control Theory implies that strong temptations will elicit self-control processes to a larger extent compared to weak temptations, the literature based on the hot/cool systems perspective allows for an exact opposite hypothesis regarding the effect of temptation strength on self-control (see also the overview of Chapter 3 and Chapter 5 below). Therefore, it will be tested not only how, but also why and when weak and strong temptations may differently affect self-control. In this way, we seek to further our understanding of a relevant moderator of counteractive control processes. Finally, the third aim of this dissertation is to explore whether strategies facilitating counteractive control processes can be used in interventions for people who experience self-regulatory problems. A major advantage of the use of implicit counteractive control mechanisms (i.e., facilitative temptation-goal associations) over self-control techniques that are based on effortful control is that the automaticity of the mental associations suggests that they require little effort. Hence, installing facilitative temptation-goal associations in people who experience self-regulatory problems seems a promising approach to enhancing self-regulatory success.

Overall, the current dissertation aims to contribute to the understanding of successful self-regulation in the face of temptations. By gaining insight into the circumstances that foster counteractive control as well as into the processes underlying these effects, the development of interventions or strategies aimed at self-regulatory problems can be brought forward. Rather than focusing on the prevention of failure, there may be much to gain by shifting towards the promotion of success. In that sense, the current research has high theoretical as well as practical relevance.

All studies in this dissertation were conducted in the context of food temptations. The current Western food environment is characterized by an abundance of (unhealthy) food that is available at any place, any time (e.g., French, Story, & Jeffery, 2001). At the same time, with rapidly rising numbers of overweight and obesity, people are becoming more and more concerned about their weight. Hence, the conflict between unhealthy food and long-term weight watching goals is highly prevalent and realistic, lending strong ecological validity to the context of our studies. Moreover, the context of food temptations forms an ideal framework for the current dissertation as eating is often

considered a prototypical example of self-regulation behavior (Herman & Polivy, 2011). Eating, other than for example smoking or drinking alcohol, is not a behavior that people can abstain from; we always have to eat. Given the naturally strong tempting features of food, self-regulation is necessary to find the balance between obtaining sufficient nutrients while not overeating. Of course, the struggle to find this balance will be most pronounced for those who find it important to not overeat, as discussed before. In this light, and in order to promote homogeneity of our samples, all studies were conducted in samples of young female students, as this is a group known to be particularly concerned about their weight (e.g., Wardle, Haase, & Steptoe, 2006).

Overview of Chapters

Twelve studies were conducted to address the research aims. The studies are described in five empirical chapters that were written in such a way that they can be read independently. As a consequence, the content of the chapters may overlap to some extent. First, in Chapter 2 we will replicate and extend previous findings demonstrating counteractive control processes using different dependent measures and explicitly testing the effect of temptations on actual self-regulation behavior. Specifically, it will be tested how being exposed to temptations affects the subjective importance of participants' weight watching goals (Study 2.1), their intentions to behave in accordance with the weight watching goal (Study 2.2), as well as their subsequent eating behavior when having to choose between a healthy or an unhealthy snack (Study 2.2).

In Chapter 3 we introduce temptation strength as a moderating factor of counteractive control processes. Based on Counteractive Control Theory as well as a critical level perspective (Gilbert et al., 2004) it was proposed that counteractive control processes only show upon exposure to strong, but not weak temptations. That is, we predict that, paradoxically, strong temptations yield better self-control as compared to weak temptations. Our hypothesis is tested in three studies employing cognitive (Study 3.1 and 3.2) as well as behavioral outcome measures (Study 3.3).

Chapter 4, then, further explores the underlying mechanism explaining the paradoxical effects of temptation strength on self-control processes. Inspired by the critical level perspective (Gilbert et al., 2004), we will consider the role of the perceived goal threat (i.e., the perceived unhealthiness) of temptations. In particular, it is proposed that people tend to (unjustly) believe that weak food temptations are less unhealthy as compared to strong food temptations, leading them to consume more of the former. The relation between temptation strength (i.e., temptations' attractiveness) and perceived unhealthiness is tested in studies 4.1, 4.2 and 4.3. In addition, Study 4.3 and 4.4 examine the indirect effects of temptation strength on consumption.

Further examining the role of temptation strength in self-control processes, in Chapter 5 we take up the issue of having two opposing predictions regarding the effects of

Chapter I

temptation strength on self-control based on the literature. Whereas we predicted based on a critical level perspective that strong temptations can yield better self-control compared to weak temptations, classic self-control literature would imply exactly the opposite. That is, returning to the hot/cool systems approach that was described earlier, it can be inferred that strong temptations, having ‘hotter’ appeal, are less likely to be successfully resisted compared to weak temptations. In Chapter 5 we suggest that both predictions may apply, depending on the availability of cognitive resources. Hence, we test the interaction between temptation strength and cognitive resources, hypothesizing that when cognitive resources are low weak temptations will yield better self-control compared to strong temptations whereas the opposite effect will be found when cognitive resources are high.

In the last empirical chapter, Chapter 6, it is investigated whether people who have trouble resisting temptations can be helped by *creating* facilitative temptation-goal associations that foster counteractive control processes. This research question was inspired by prior research showing that facilitative temptation-goal associations can be found in successful but not unsuccessful dieters. Using implementation intentions (i.e., if-then plans) as a tool, we test whether specific plans linking participants’ personal temptation to their dieting goal lead to improved resistance of the personal temptation in the following week (Study 6.1). Furthermore, we will test if the temptation-goal implementation intention indeed yields facilitative temptation-goal associations as assessed in a primed lexical decision task, and if the strength of the cognitive association in turn predicts consumption of the temptation in the following week (Study 6.2).

Together, the empirical chapters address a number of issues that have thus far remained implicit in Counteractive Control Theory research. Chapter 7 will provide a summary and discussion of the findings described in the previous chapters, devoting specific attention to the overarching theoretical implications of the current research. It will be discussed in what way the research described in this dissertation contributes to the development of our knowledge regarding counteractive control processes in response to temptations, specifically highlighting the role of temptation strength. Finally, practical implications and directions for future research will be provided.

Chapter 2

How chocolate keeps you slim:
The effect of food temptations
on weight watching goal
importance, intentions and
eating behavior

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Abstract

In the Western rich food environment, people are constantly confronted with palatable but unhealthy food products. For those who would like to watch their weight, the appeal of immediate satisfaction is in conflict with their long-term weight watching goal, constituting a classic self-control dilemma. The current studies were designed to test the effect of food temptations on self-regulation mechanisms. Hypotheses were based on counteractive control theory stating that temptations trigger goal-directed behavior, thereby forming an adaptive self-regulation mechanism. Two experimental studies showed that exposure to food temptations, compared to a control condition, yielded enhanced goal importance (Study 1), goal intentions, and goal-directed behavior (i.e., healthy eating; Study 2). It is concluded that confrontation with temptations is not always undermining self-control and may even be beneficial for long-term goal pursuit.

In our Western 'obesogenic environment' (e.g., French, Story, & Jeffery, 2001), people are confronted everywhere with palatable but unhealthy food products. Billboards with giant ice cream cones, the smell of fresh apple pie in supermarkets, and windows exposing the most delicious chocolates are all designed to seduce customers. With many people trying to watch their weight, these food temptations inevitably evoke a conflict between immediate satisfaction and the long-term weight watching goal. Finding a balance between the two sides of this temptation dilemma involves self-regulation processes (e.g., Baumeister & Heatherton, 1996). As self-control (i.e., "control over the self by the self", Muraven & Baumeister, 2000) to resist the appeal of immediate satisfaction is required but not always available, people tend to think they should better avoid temptations. Taking a counteractive control approach (following Trope & Fishbach, 2000), the current paper aims to show that food temptations do not always lead to indulgence, but can rather trigger healthy eating behavior by boosting the importance of the weight watching goal and increasing intentions to initiate goal-directed behavior.

Within the self-control literature, temptations are typically seen as responsible for triggering impulsive behavior aimed at immediate satisfaction, thereby undermining the long-term weight watching goal (e.g., Muraven & Baumeister, 2000). For example, the hot/cool framework proposed by Metcalfe and Mischel (1999) predicts that temptations activate the 'hot', impulsive system. As a result, people give in to the temptation while the 'cool', rational system representing long-term goals becomes powerless. In order to suppress impulses, cognitive resources are required (Baumeister & Heatherton, 1996). As these resources are limited and easily reduced, successful self-control is complicated (e.g., Vohs & Heatherton, 2000; Muraven, Tice & Baumeister, 1998; Baumeister & Heatherton, 1996). When cognitive resources are not available, behavior is best predicted by automatic impulses (e.g., Hofmann, Rauch & Gawronski, 2007), often leading to indulgence when confronted with temptations.

In contrast with the classic view of temptations compromising long-term weight goals, counteractive control theory (Trope & Fishbach, 2000) posits that rather than inhibiting the long-term goal, temptations may automatically trigger goal-directed behavior by mentally activating the long-term goal. In the context of self-regulation of eating behavior, this means that food temptations would actually remind people of their weight-watching goal and thus consequently lead to successful self-control. A mechanism as such would be very adaptive as it allows for successful goal pursuit in difficult situations, because the *automatic* activation of goal-directed behavior implies that cognitive resources are not necessarily needed. Indeed, it has been shown that confrontation with temptations enhances the mental accessibility of long-term goals and facilitates goal-directed behavior (Fishbach, Friedman & Kruglanski, 2003). Along the same lines, it has been found that restrained eaters consumed less after exposure to olfactory food cues as compared to a neutral scent condition (Coelho, Polivy, Herman & Pliner, 2009), and that exposure to

palatable foods that were available for consumption (so-called 'actionable temptations') lead to reduced consumption on a subsequent taste test compared to non-actionable temptations (Geyskens, DeWitte, Pandelaere, & Warlop, 2008).

An interesting perspective on the mechanism underlying temptations triggering self-control is provided by recent work conducted by Myrseth, Fishbach, and Trope (2009): The subjective valuation of temptations was reduced when they were made available as compared to when they were unavailable. That is, the confrontation with the self-control dilemma lead unhealthy snacks to be considered less attractive. A reduction of temptation attractiveness could be viewed as being an important factor that has its effect on one side of the temptation dilemma, with the long term (i.e., weight watching) goal on the other side. Complementary to a devaluation of temptations, then, a boost of the goal value would be a plausible effect of exposure to temptation, thereby counteractively assisting goal-directed behavior. A first indication of this effect is provided by Coelho, Polivy, Herman, and Pliner (2008), who showed that unrestrained eaters who were exposed to an olfactory food cue indeed reported higher weight watching goal importance than unrestrained participants in a control condition with no food cue.

One intriguing aspect of their results, however, was that the effect of boosted goal importance after temptation exposure was found only for unrestrained eaters (i.e., women who were not or only little concerned about their weight), raising the question whether weight watching was an actual 'goal' for this group. Although the authors state that also unrestrained women may have a desire to lose weight, this was not assessed in their studies. Therefore, the first aim of the current paper was to further establish the effect of exposure to temptations on weight watching goal importance. To provide a more direct test of this effect, the current studies will be conducted among samples consisting of women who report they want to lose weight.

The second aim of the current paper was to put forward goal intentions as a relevant factor in counteractive control mechanisms. Being one of the main predictors of behavior (Theory of Planned Behavior, Ajzen, 1985), the lack of research showing counteractive control processes affecting goal intentions constitutes a surprising gap in the literature. Based on the implications of the studies described above, it is predicted that confrontation with temptations yields boosted goal intentions, which in turn are precursors of goal-directed behavior (i.e., healthy eating).

Finally, to complete the story, the third aim was to show that the predicted counteractive control effects translate into actual behavior. Although an effect of confrontation with temptations on goal importance and intentions is interesting by itself, the ultimate counteractive control effect is to be demonstrated on a behavioral measure. Fishbach and colleagues (2003; Study 5) showed that participants who were primed with food temptations were more likely to choose an apple over a chocolate bar, as compared to participants in a neutral control condition. To minimize any possible demand or social

desirability effects, in the current studies a particularly subtle measure of snack choice will be employed by letting participants choose between two snacks that are equally liked and priced, but differ with regard to the extent that they are considered healthy foods.

Two studies were conducted manipulating exposure to temptation and assessing the effects on weight watching goal importance (Study 1), goal intentions, and goal-directed behavior (Study 2). It was expected that exposure to food temptations, compared to a neutral control condition, boosted a) the importance attached to the weight watching goal; b) intentions to perform goal-directed behavior; and c) healthy eating behavior.

Study 1

Study 1 was designed to test the effect of food temptations on the importance of the weight watching goal. The study was conducted among female students, as this is a group known to be concerned with their weight (e.g., Wardle, Haase & Steptoe, 2006). Exposure to food temptations was manipulated using pictures of a chocolate cake, as chocolate can be regarded as an important food temptation for this population (Weingarten & Elston, 1991). It was expected that exposure to temptations, compared to a neutral control condition, enhanced the importance of the weight watching goal.

Method

Participants. Ninety-six female students were recruited from the university campus and participated in exchange for money or partial course credit. Data from participants who did not have the goal to lose weight ($n = 21$) were not included in the analyses, as the weight watching goal was deemed not relevant for these women. Furthermore, data from three obese women (BMI [Body Mass Index = weight / (length * length)] > 30) were excluded from analyses, as obesity has often been related to abnormal responses to food cues (e.g., Stice, Spoor, Ng, & Zald, 2009). Inclusion of data from obese women did not yield different results, though. The final sample consisted of 73 women, with a mean age of 24.4 years ($SD = 7.0$) and a mean BMI of 23.5 kg/m² ($SD = 2.2$). On average, participants wanted to lose 5.5 ($SD = 4.4$) kilograms of weight.

Procedure and Materials. Participants were welcomed and seated individually in a quiet place in the university restaurant. The first part of the experiment consisted of a bogus memory task in which participants were exposed to either a food temptation (temptation condition) or a flower (control condition), entailing a between-subjects design. Immediately afterwards, the dependent variable (i.e., goal importance) was assessed.

Temptation. Participants were presented with a picture of either a chocolate cake (temptation condition) or a flower (control condition) for 30 seconds that were unobtrusively timed by the experimenter with a stopwatch. To shield the purpose of the

manipulation, the pictures were presented as part of a memory task. Participants had to answer six oral questions about the picture (e.g., 'what colors did you see') after it was shown. The pictures were pilot tested in a separate study among 30 female students. The chocolate cake picture was considered very attractive ($M = 6.40$, $SD = .83$ on a 7-point scale), indicating it being a valuable temptation manipulation. To make sure that any found effects would not be due to differences in induced positivity, the neutral flower picture was matched to be rated equally positive ($M = 5.53$, $SD = .64$) as compared to the temptation picture ($M = 5.40$, $SD = 1.18$); $F < 1$.

Goal importance. Goal importance was assessed with 1 item assessing 'the extent to which the goal of losing weight was important' for participants. The question could be answered on a Likert scale ranging from 1 (*not at all important*) to 7 (*very important*), and was embedded in between filler questions. Both the pictures and the goal importance questions were presented on paper.

Results and discussion

An Analysis of Variance (ANOVA) with condition as independent variable and goal importance as dependent variable yielded a significant condition effect; $F(1,70) = 6.11$, $p < .05$, $\eta_p^2 = .08$. For participants in the temptation condition the weight watching goal was more important ($M = 4.7$, $SD = 1.2$) than for participants in the control condition ($M = 3.9$, $SD = 1.3$). Neither BMI nor the amount of weight participants wanted to lose were significant covariates ($p = .68$ and $p = .57$, respectively).

The results confirmed our hypothesis that goal importance was enhanced after exposure to temptation, replicating the findings of Coelho et al. (2008). The findings add to the implications brought forward by Myrseth et al. (2009), who showed that temptations were valued less when made available. The combination of reduced temptation attractiveness and an enhancement of goal importance promises to be an adaptive self-regulation mechanism. Study 2 aimed to extend the findings of Study 1 by incorporating goal intentions and actual behavior.

Study 2

Study 2 was designed to test whether the effect of temptation exposure also translates into actual goal intentions. Moreover, a behavioral measure was included to test whether participants exposed to temptations display more healthy behavior as compared to participants without such exposure. The temptation manipulation procedure was slightly changed, to rule out the possibility that posing the bogus memory questions *after* the pictures (as in Study 1) lead to a diminished experience of temptation due to the time interval between the temptation exposure and the assessment of the dependent variable.

Method

Participants. Seventy female students participated in exchange for partial course credit or money. Participants who indicated they did not have the goal to lose weight ($n = 16$) were not included in the analyses. The final sample consisted of 54 women, with a mean age of 21.2 ($SD = 2.6$) years, and a mean BMI of 22.2 ($SD = 2.0$). No participants were underweight ($BMI < 18$) or obese ($BMI > 30$). On average, participants wanted to lose 4.0 ($SD = 2.5$) kilograms of weight.

Procedure and Materials. The experiment was conducted in a laboratory, where participants were seated individually behind laptop computers. All instructions, the manipulation pictures, and the questions were programmed on the computer such that no interruption by the experimenter was required during the procedure.

Temptation. Participants were presented with pictures of either a chocolate cake (temptation condition) or a flower (control condition). Two copies of the picture were presented on a screen, and participants were given 30 seconds to find the alleged differences between the two, to make sure they would pay attention to the stimulus.

Goal intention. Immediately after the temptation manipulation goal intention was assessed with two items ('To what extent are you planning to eat more healthily' and 'To what extent do you intend to eat more healthily'; Cronbach's $\alpha = .86$), that could be answered on Likert scales ranging from 1 (*not at all*) to 7 (*very much*).

Snack choice. At the end of the experiment, participants were instructed to open a box containing a healthy and an unhealthy snack from which they could choose one, ostensibly as a reward for participation. Importantly, there was no interaction with the experimenter at this stage, reducing the possibility of choices being driven by social desirability. Participants' choice was recorded by the experimenter once they had left the room, by looking which snack was left in the box. The healthy snack was a wholegrain cookie; the unhealthy snack a chocolate cookie. A pilot test revealed that both snacks were equally liked and priced, but the wholegrain cookie was evaluated as being more healthy than the chocolate cookie.

Results

Goal intention. An Analysis of Covariance (ANCOVA) was conducted with condition as independent and goal intention as dependent variable. Both BMI and the amount of weight participants wanted to lose were included as possible covariates, but only the latter had a significant effect and was kept in the analysis; $F(1, 51) = 13.85, p < .01$. A main effect of condition was found; $F(1, 51) = 4.82, p < .05, \eta_p^2 = .09$. Participants who were exposed to the temptation had stronger goal intentions ($M = 4.0, SD = 0.9$) as compared to participants in the control condition ($M = 3.2, SD = 1.1$).

Snack choice. A Chi-square analysis was conducted to test whether a difference existed between conditions on snack choice. A marginally significant effect of condition

was found; $\chi^2(1) = 3.65$, $p = .056$. Participants in the temptation condition more often chose a healthy snack ($n = 16$) than an unhealthy snack ($n = 11$), whereas participants in the control condition more often chose an unhealthy snack ($n = 18$) than a healthy snack ($n = 9$). Neither BMI nor the amount of weight participants wanted to lose were significant covariates ($ps > .22$).

General Discussion

Two studies were conducted testing the effect of exposure to food temptations on weight watching goal importance, goal intentions and behavior. It was shown that participants who were exposed to temptations reported higher goal importance and intentions as compared to participants in the control condition. Additionally, behavioral effects were found, showing that participants who were exposed to temptations more often chose healthy snacks than unhealthy snacks, whereas for participants in the control condition a reversed pattern was found; albeit the effect was only marginally significant. The studies confirmed our hypotheses based on the implications of counteractive control theory.

The enhanced goal importance, intentions and behavior after exposure to temptations are illustrative of an adaptive self-regulation mechanism, helping people to resist temptations in difficult situations. It should be noted, though, that a mechanism as such cannot always work this way. That is, if temptations would always trigger goal-directed behavior, people would not experience so many difficulties trying to lose weight. Therefore, individual or situational characteristics that facilitate or impede the working of counteractive control mechanisms should be investigated in future research. For example, temptation strength could be an important moderator, such that strong temptations do indeed trigger counteractive control processes, whereas weak temptations do not (see also Geyskens et al., 2008). Alternatively, it could be the case that a certain threshold of temptation strength exists above which counteractive control mechanisms are no longer activated or overruled by impulses.

The current studies have a number of methodological strengths. First, the use of pictures forms a relevant presentation mode for the study of temptations. Pictures comprise an important part of visual advertisements surrounding our environment aiming to seduce people into indulgence (e.g., Seiders & Petty, 2004). Second, goal importance and intentions were assessed by asking explicit questions. This nicely adds to studies that use implicit measurements in reaction to temptations (e.g., goal accessibility; Fishbach, Friedman & Kruglanski, 2003). With temptations having similar effects on implicit and explicit measures of self-regulation processes, the counteractive control effect appears rather solid. A third strength of our studies is the inclusion of a behavioral measure by letting participants choose a healthy or unhealthy snack. Rather than using two extremes of the healthy-unhealthy spectrum (e.g., apple vs. candybar), participants were deliberately

offered two more closely related products (wholegrain vs. chocolate cookie), in order to prevent a choice driven by demand characteristics or social desirability.

Some limitations have to be mentioned as well. First, goal intention and behavior (Study 2) were operationalized in terms of healthy eating, which can actually be viewed as a subgoal but not a requirement for losing weight. Nevertheless, the use of this subgoal was believed to be justified. Firstly because the assessment of intentions and behavior demanded a more specified concrete goal, as 'losing weight' is not an actual behavior. Secondly, healthy eating is the pathway most taken to weight reduction among young women (e.g. Serdula et al., 1999). A second limitation concerns the external validity of the current results. We chose to use a sample of young women, as the food temptation – weight watching goal dilemma that was used as a framework for the current studies is particularly applicable to this population (e.g., Wardle et al., 2006). Although we have no indications that our results would be different for other non-pathological samples, the current sample only included female students (i.e., a young and highly educated sample). Future research may be needed to specifically investigate the extent to which the current results are generalizable to other self-regulation dilemmas or different populations.

Another interesting point for future research is the use of real 'consumable' temptation manipulations, rather than pictures. Requiring actual resistance, consumable temptations form a different category of temptations. Based on studies conducted by Geyskens et al. (2008), it can be expected that even stronger counteractive control effects will emerge when real products are used. In addition, deprivation may be a relevant factor to study in this regard. When people have been deprived from palatable, fattening food products for a long time, impulses to indulge may take over more easily.

Finally, future research would be needed to investigate the practical applicability of the current results. As mentioned before, people are frequently confronted with pictures of 'forbidden foods'. Although these pictures (e.g., advertisements) are believed to seduce people into indulgence, they may in fact prepare for effective self-regulation. Taking it one step further, based on the current studies it could be speculated that putting up pictures of food temptations on your fridge may help to keep your weight watching goal in mind. These or other possible applications could be valuable for intervention programs helping people to watch their weight.

Altogether, the current studies add to research on self-regulation and counteractive self-control by showing that exposure to temptations leads to enhanced goal importance and intentions, assisting successful self-regulation. Besides being theoretically relevant, the present results suggest that there is no necessity to always avoid temptations: Confrontation with temptations from time to time may actually be helpful.

Chapter 3

Tricky treats: Paradoxical effects of temptation strength on self-regulation processes

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Abstract

This series of studies examined the effect of temptation strength on self-regulation processes in the context of eating behavior. Based on the critical level model, it was hypothesized that weak, rather than strong, temptations yield the most unfavorable conditions for effective self-regulation, because the negative consequences of the former are underestimated. In line with the assumptions of this model, Studies 1 and 2 showed that weak temptations inhibited the mental accessibility of the weight watching goal, in contrast to strong temptations. Study 3 showed that exposure to weak temptations lead to higher consumption in comparison to exposure to strong temptations. It is concluded that weak temptations, as compared to strong temptations, have an inhibiting effect on self-regulation processes and may therefore form a bigger threat for long-term goal attainment.

Having to choose between short-term allurements or long-term benefits is a classic self-control dilemma. The experience of a dilemma as such is represented by temptation, comprising an immediate pleasure that is in conflict with a long term goal: on the one hand, you would love to eat that delicious apple pie, but on the other hand you know it would be in conflict with your weight watching goal. In order to deal with temptations and to be able to pursue long-term goals, people need to regulate or control their behavior. In the current paper it is proposed that temptation strength is an important factor in relation to self-regulation.

The influence of temptations on self-regulation processes is not straightforward, with different perspectives prevailing in the literature. Following from the idea of a conflict between immediate pleasure versus rationally known long-term benefits, a distinction between affective and cognitive processes playing a role in people's response to tempting stimuli has been proposed. It has been assumed that the default response to temptation is mostly impulsive and driven by affect (i.e., giving in to the short-term pleasure), and that in order to give the long-term goal a chance to overrule this impulse, conscious cognitive processes are required (e.g., Metcalfe & Mischel, 1999). The use of the cognitive system, however, can be undermined when cognitive capacity is reduced because of, for example, coping with emotional distress (Tice, Bratslavsky, & Baumeister, 2001), alcohol use (Hofmann & Friese, 2008), or when under cognitive load (e.g., Shiv & Fedorikhin, 1999; Ward & Mann, 2000). As a consequence, if affective processes have room to put a heavier weight on the decisional balance, people are more likely to give in to temptation (Shiv & Fedorikhin, 1999). Therefore, the presence of temptation appears to undermine goal attainment.

At the same time, recent research has suggested that temptations may in fact be helpful from a self-regulation perspective, adaptively triggering cognitive and behavioral processes congruent with the long-term goal. Importantly, the activation of the long-term goal could occur automatically, not requiring deliberate thought or cognitive effort. For example, Fishbach, Friedman, and Kruglanski (2003) have shown that, outside of participants' awareness, presentations of temptations could enhance the mental accessibility of the long-term goal. Moreover, the activation of the long-term goal in turn led to goal-directed behavior, resulting in healthier food choices among people who were exposed to temptation than among participants in the control condition (Fishbach et al., 2003; Kroese, Evers & De Ridder, 2009). In a similar vein, Fishbach and Shah (2006) found that people tend to have implicit dispositions to approach goals and avoid temptations, again pointing towards a low-effort, adaptive self-regulation mechanism. This suggests that temptations do not always have negative effects on the activation of self-regulation processes. The phenomenon of temptations directly triggering defensive mechanisms would be very adaptive and has been found to be related to self-control success (Fishbach

et al., 2003; Papies, Stroebe, & Aarts, 2008).

The apparent discrepancy between the theoretical views described above renders it useful to search for moderating factors that might bring about a more comprehensive understanding of the processes at hand. It seems likely that under certain circumstances temptations can indeed automatically trigger self-regulation processes, while other circumstances are less facilitating and require more conscious attention to avoid indulgence. Although a number of studies have put forward individual differences or situational characteristics as potentially influencing temptation resistance (e.g., Baumeister & Heatherton, 1996; Hetherington, 2007), characteristics of the temptation itself have received little attention thus far. The present paper will tackle this issue and focus on temptation strength. Returning to the example of the apple pie, we can all imagine feeling tempted more strongly by a freshly baked pie, warm from the oven, than by a cheap, deep-frozen one.

Although not explicitly studied, predictions regarding temptation strength can be derived from the literature. Distinguishing an affective/impulsive system from a cognitive/reflective system, it has been postulated that attractive stimulus characteristics activate the impulsive system, thereby requiring more effort from the cognitive or reflective system to be resisted (e.g., Dholakia, 2000; Strack, Werth, & Deutsch, 2006). Also according to Metcalfe and Mischel's hot/cool framework (1999) it can be predicted that stronger (hotter) temptations trigger self-regulation processes to a lesser extent than weak temptations. That is, the hotter a stimulus, the more the hot, affective system is activated, triggering impulsive indulgence and undermining self-regulation for which the cool system is needed.

The line of reasoning discussed above, however, is based on theoretical inferences rather than actual empirical evidence, as the difference between weak and strong temptations has to the best of our knowledge seldom been tested within these frameworks (but see Mischel & Moore, 1973, for a discussion on the presentation mode of temptation stimuli). In fact, recent insights suggest that the effect of temptation strength on self-regulation processes may even be opposite from what is predicted based on the theoretical inferences described above. That is, it may be the case that strong temptations yield more active self-regulation processes than weak temptations. This possibility can be derived from counteractive control theory (Trope & Fishbach, 2000), stating that temptations elicit self-control efforts to counteract anticipated costs. It then follows that, as strong temptations form a larger threat that may be perceived as having higher anticipated costs, self-control efforts are lower after weak temptations.

The effect of temptation strength can also be viewed from the perspective of the critical level model of threat as formulated by Gilbert, Lieberman, Morewedge, and Wilson (2004). This model suggests that people expect intense stressors to last longer than mild ones, and will therefore take action to attenuate the distress only when the stressor is

beyond a certain threshold. Paradoxically, this defensive behavior could then lead to quicker recovery from the intense stressor, than from the mild stressor for which no action was undertaken. Translating this model to the context of a temptation dilemma, strong temptations could have more beneficial effects on self-regulation processes than weak temptations. That is, the weight watching goal may be more salient after confrontation with a strong than with a weak food temptation. As a result, people may be more likely to give in to weak temptations as compared to strong ones.

This paradox has been illustrated in the area of self-regulation by a small number of studies. Coelho do Vale, Pieters and Zeelenberg (2008), for example, studied the effect of package size on snacking behavior: it was shown that large packages lead to better self-regulation than did small packages. Contrary to their own expectations, people who were offered tempting products in large package sizes were less likely to initiate eating, and consumed less than people who received small package sizes. In a similar vein, Geyskens, DeWitte, Pandelaere and Warlop (2008) showed that prior exposure to so-called actionable temptations (i.e., real candies allowing for actual consumption) prevented the activation of the hedonic eating goal at a subsequent consumption opportunity, whereas non-actionable temptations (i.e., pictures of candies) did not, presumably because self-regulation mechanisms were activated in the former but not in the latter case.

The current research question is in what way *temptation strength* has an influence on self-regulation processes. Based on the critical level model, we expect that strong temptations yield more active self-regulation mechanisms than do weak temptations. Temptations, by definition, have two components: they need to be both attractive and 'forbidden' in some way (e.g., Hughes, 2002). Temptation strength, then, could be conceptually framed as a multiplication of the separate forbiddingness and attractiveness factors: if both are high, temptation is strongest; if one is zero, temptation is not present. By manipulating the attractiveness of temptations, the current studies were designed to look at the influence of temptation strength on cognitive and behavioral self-regulation processes.

The Current Studies

Three experiments were designed in which temptation strength was varied by manipulating the attractiveness of food temptations. The presentation mode of the food temptations was varied across studies (i.e., texts, pictures, and real products) to explore the robustness of the effect. In the first study, participants were exposed to either weak or strong temptations by reading texts about chocolate, while the mental accessibility of the weight watching goal as measured with a lexical decision task was used as the dependent variable. In Study 2, instead of textual stimuli, pictures of food temptations

were used. Finally, Study 3 extended the findings to a behavioral level by assessing actual consumption upon exposure to 'real' food temptations, differing in attractiveness.

The experiments were conducted within the domain of eating behavior, where fattening foods represent temptations that are in conflict with many people's goal to watch their weight. Eating is believed to be an ideal framework for the study of temptations and goals. Not only is weight loss a very prevalent goal nowadays, the struggle with food temptation is something that many people experience frequently in the Western 'obesogenic environment' (e.g., French, Story & Jeffery, 2001). Unlike other health behaviors such as quitting smoking or drinking alcohol, eating is a matter of *regulating* one's food intake rather than abstinence. The choice to yield to or to resist temptation is therefore one to be made over and over again.

Study I

The first study was designed to measure the influence of temptation attractiveness on the mental accessibility of the long term goal (i.e., weight watching). Enhanced versus inhibited accessibility of a goal is indicative of current goal pursuit and increases versus reduces the likelihood of goal-congruent behavior (Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001). The mental accessibility of the long term goal was measured with a lexical decision task, based on previous studies using this task as an assessment of goal accessibility (e.g., Fishbach et al., 2003; Geyskens et al., 2008; Papies et al., 2008). Constituting possible moderators of the effect of temptations on goals, goal importance (Fishbach et al., 2003) and self-regulatory success (Fishbach et al., 2003; Papies et al., 2008) were taken into account.

Method

Participants. Seventy-nine female students participated in the experiment, in exchange for 4 euro or course credit. Data from participants who did not perform the task correctly ($N = 2$); were dyslexic ($N = 1$); wanted to gain rather than lose weight ($N = 8$); or did not like chocolate ($N = 1$) were excluded from all analyses, leaving a sample of 67 women. The average age was 21.9 ($SD = 3.8$) years. Participants' mean BMI was 21.7 kg/m^2 ($SD = 2.4$), and on average they wanted to lose 3.4 kg ($SD = 3.2$).

Design and Procedure. Participants were randomly assigned to three conditions: Weak temptation, strong temptation and control. Upon their arrival, participants were seated at individual desks with laptop computers. Constituting our temptation manipulation, participants' first task was to identify spelling errors in a text, which was administered on paper. Each participant was given one of three equal-length texts, in which she had to circle all spelling mistakes she could find. The two temptation texts provided chocolate descriptions in either a very attractive (strong temptation) or a rather factual (weak temptation) way. The text in the control condition described the

process of cotton production. After that, they were instructed to continue the experiment on the computer, which included a lexical decision task and a number of questionnaires. When finished, participants were debriefed, paid, and thanked for participation.

Materials.

Temptation Strength. In the bogus spelling test, the strong temptation text was supposedly from a box of chocolates, elaborating on the delicious taste experience of chocolate. The weak temptation text was a more factual story about chocolate production. Importantly, the word ‘chocolate’ appeared an equal number of times in both texts. The control condition text was about cotton production.

Goal Accessibility. Goal accessibility was assessed with a lexical decision task. Participants had to indicate by using a left or right key on their keyboards (counterbalanced across participants) whether each given letter string was an existing word or not. Half of the 84 trials were non-words. On three critical trials, a goal-related word was shown (slim, dieting, and diet). The other trials were neutral words that were matched with the goal words on word length and usage frequency. The dependent variable was participants’ mean reaction time to the goal words in milliseconds. Extreme reaction times (defined as deviating at least 3 standard deviations from the mean) were excluded from the analyses. Furthermore, only trials that participants responded to correctly (% errors: $M = 5.6$, $SD = 4.7$) were used to calculate average reaction times on neutral and goal trials for each participant. As the mean reaction times were not normally distributed, they were natural-log transformed before analyzing the data. All analyses will be performed on the log-transformed data, but for the ease of interpretation means will be depicted in milliseconds.

Moderators and descriptives. Goal importance (e.g., “To what extent is it important for you to lose weight?”) and weight watching success (e.g., “To what extent are you successful in watching your weight?”) were assessed with 2 and 3 items respectively, that could be answered on a 5-point scale from 1 (*not at all*) to 5 (*very much*). The reliabilities of both scales were satisfactory (Cronbach’s alpha = .92 for goal importance and .73 for weight watching success). Median splits were used to divide participants into high and low scorers. Furthermore, participants’ age, height, weight and ideal weight were assessed with self-reports. All questions were posed after the lexical decision task to prevent unintended priming effects.

Results

Reaction times were analysed using an Analysis of Covariance (ANCOVA), testing the effect of condition on reaction times to diet words, with reaction times to neutral words included as a covariate. The covariate was significant; $F(1, 63) = 55.68$, $p <$

.001. The analysis revealed a significant effect of condition, $F(2, 63) = 3.58, p < .05, \eta^2 = .10$ (see Figure 1a). Simple main effects showed that participants in the weak temptation condition ($M = 599, SD = 66$) responded slower to diet words than participants in the strong temptation ($M = 560, SD = 50; p < .05$) and the control condition ($M = 575, SD = 66; p < .05$). Between the strong temptation and the control condition, no difference was found ($p = .92$). An ANOVA testing the effect of condition on reaction times to neutral words indicated no significant difference between conditions; $F < 1$.

Including goal importance as a factor in the analysis yielded a significant main effect, $F(1, 60) = 5.09, p < .05$, showing that participants scoring high on goal importance reacted faster to diet words ($M = 563, SD = 62$) than participants for whom the goal was less important ($M = 596, SD = 57$). Goal importance did not interact with condition ($F < 1$). For weight watching success, neither main nor interaction effects were found ($F_s < 1$).

Discussion

Temptation strength significantly influenced participants' reaction times to diet words. It was shown that, compared to the control condition and the strong temptation condition, the diet goal was less accessible in participants in the weak temptation condition. No difference was found between the control group and participants who were confronted with a strong temptation. The results suggest that weak temptations inhibit a potentially helpful self-regulation process, whereas strong temptations do not. This may indicate that people are more likely to succumb to weak temptations than to strong temptations, which is in line with the critical level model (Gilbert et al., 2004).

A main effect of goal importance was found, with people who valued the weight watching goal as important reacting faster to diet words. This finding is in accordance with previous literature stating that the mental accessibility of constructs related to currently active goals is enhanced (e.g., Forster, Liberman & Higgins, 2005). However, goal importance did not alter the influence of temptation strength on reaction times to diet words, and neither did weight watching success. These factors are therefore no longer included in the subsequent studies.

Counteractive control theory predicts that exposure to temptations would activate a diet goal (e.g., Fishbach et al., 2003). In the current study, however, we did not find a difference between the strong temptation and the control condition. Previous studies already indicated that there are some factors that moderate the goal activation effect after temptation, such as temptation accessibility (Geyskens et al., 2008) and weight watching success (Fishbach et al., 2003; Papies et al., 2008). As it is hard to compare these studies with the current one since they did not entail temptation strength manipulations, it may well be that other moderating factors play a role as well. Although weight watching success was assessed in the current study, no effects of this factor were found on goal accessibility. However, this could be due to the fact that only five participants in our

sample scored high (i.e., 4 or higher) on the success scale, making a goal activation effect difficult to find. Alternatively, a floor effect of reaction times to diet words may apply, such that participants in the control condition were also relatively fast on these critical trials. This could then be reflective of a preoccupation with weight-watching in our sample. In order to assess if this latter explanation is relevant, we tried to replicate these findings in Study 2.

One concern regarding the manipulation used in Study 1 may be that the presentation mode of the stimuli through texts was not 'hot' enough. It may be argued that a cognitive manipulation as such is not sufficient to expose affective influences of temptation. Indeed, De Houwer and Hermans (1994) reported that pictures as compared to words have privileged access to a semantic system in which affective information is represented. To rule out the possibility that the effect of weak and strong temptations could be obtained only in a 'cold' presentation mode using words, we intended to replicate the study using pictures of food temptations.

Study 2

Method

Participants. Ninety-six female students participated in the experiment in exchange for money (3 euro) or course credit. As pictures of chocolate cake were used as the temptation manipulation, data from participants who did not like chocolate were excluded ($N = 6$). In the final sample ($N = 90$), participant's mean age was 21.2 years ($SD = 2.7$), and the mean BMI was 21.8 ($SD = 2.0$). On average, participants wanted to lose 3.3 kg ($SD = 2.8$) of weight.

Design and procedure. Study 2 was designed similar to Study 1, comprising three conditions (weak temptation, strong temptation, control), to which participants were randomly assigned. Upon arrival, participants were seated behind a laptop computer at individual desks. The first part of the experiment consisted of a bogus comparison task of two pictures, which was used as our manipulation of temptation strength. Afterwards, the experiment continued with a lexical decision task and a short questionnaire. When they were finished, participants were instructed to return to the experimenter where they were debriefed, paid and thanked for their participation.

Materials.

Temptation Strength¹. Pictures of chocolate cakes were pilot tested among a sample of 30 female students who were asked to rate the attractiveness of the pictures on a 7-point scale from 1 (*not at all*) to 7 (*very much*). Participants in the strong temptation condition were shown a very attractive ($M = 6.40$, $SD = .83$) picture, and participants in the weak temptation condition were shown a less attractive ($M = 5.40$, $SD = 1.59$) picture

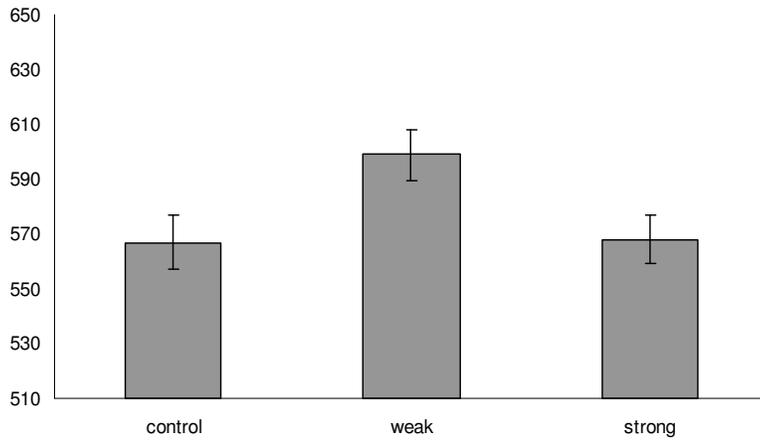
of a chocolate cake. Both pictures differed significantly in attractiveness ratings, $F(1, 28) = 4.64, p < .05$. The weak temptation picture was rated on the higher end of the attractiveness scale as well, which is important because a minimum level of attractiveness is a prerequisite for temptation to exist. For the control condition, a picture of a flower was used. Two copies of one of the pictures were shown on a computer screen. To shield the purpose of the manipulation, participants were instructed to find the alleged differences between the two within a one minute timeframe.

Goal Accessibility. To measure the accessibility of the diet goal, the lexical decision task from Study 1 was used. A similar procedure for data preparation was followed, excluding trials which were responded to incorrectly (% errors: $M = 4.7, SD = 3.2$) or with reaction times slower or faster than three times the standard deviation from the mean. Natural log transformations of average reaction times to goal and neutral words were used in the analyses, to correct for a non-normal distribution.

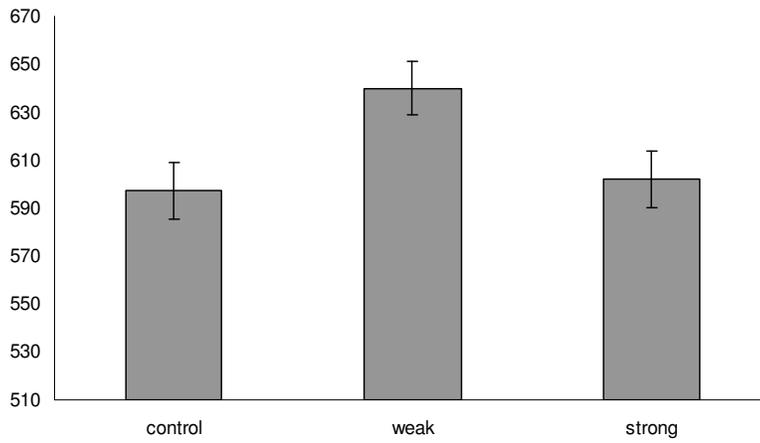
Descriptives. At the end of the experiment, participants were asked to provide their age, height, current and ideal weight.

Results

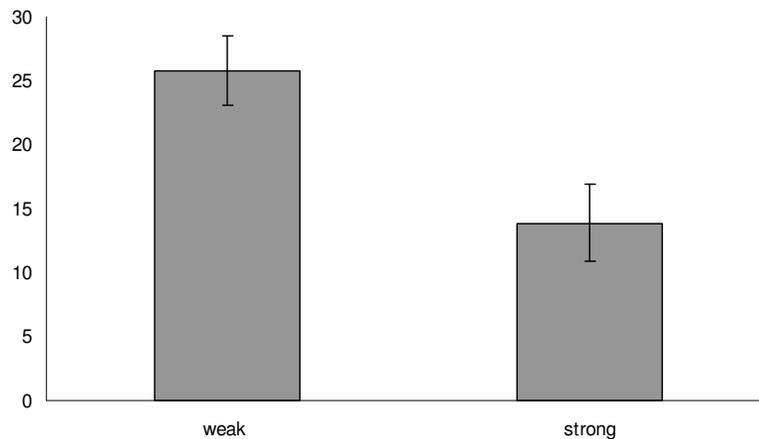
An ANCOVA testing the effects of condition on reaction times to diet words, with reaction times to neutral words as a significant covariate; $F(1, 86) = 103.26, p < .001$, revealed a significant main effect of condition, $F(2, 86) = 3.55, p < .05, \eta^2 = .08$ (see Figure 1b). Simple contrasts showed that participants in the weak temptation condition ($M = 640, SD = 110$) reacted significantly slower to diet words in comparison to participants in the control condition ($M = 591, SD = 86; p < .05$) and compared to participants in the strong temptation condition ($M = 608, SD = 77; p < .05$). No difference was found between the strong temptation and the control condition ($p = .60$). An ANOVA testing the effect of condition on reaction times to neutral words indicated no significant difference between conditions; $F < 1$.



a. Mean reaction times (+ SE) to diet words in Study 1.



b. Mean reaction times (+ SE) to diet words in Study 2.



c. Percentage of consumed chocolate cake (+ SE) in Study 3.

Figure 1. The effect of temptation strength on outcome variables in Studies 1-3.

Discussion

Study 2 showed again that the mental accessibility of the dieting goal was inhibited after exposure to a weak temptation. Replicating the results of Study 1, no difference was found between the control condition and the strong temptation condition, indicating that indeed a floor effect of reaction times to diet words may apply. In support of this possibility, it is noted that reaction times to diet words were lower than to neutral words in all conditions. Inhibition of the weight watching goal after exposure to weak temptations theoretically yields unfavorable conditions for self-regulation. In order to assess if the effects of weak and strong temptations on self-regulation also apply on a behavioral level, Study 3 employs a measure of consumption as the dependent variable. Furthermore, participants were exposed to 'real' temptations (as opposed to texts or pictures) to further strengthen our test.

Study 3

In Study 3, the manipulation of weak and strong temptations was realized by using real food products (i.e., chocolate cakes). Again, temptation strength was operationalized in terms of attractiveness: based on a pilot study, highly and weakly attractive chocolate cakes were selected. Participants were presented with one half of either the highly attractive cake (strong temptation condition) or the less attractive cake (weak temptation condition), and were invited to cut a piece of the cake in order to eat it and evaluate its taste. As the dependent measure, we assessed the size of the piece that was cut and

consumed by each participant. In accordance with Study 1 and 2, it was predicted that weak temptations yielded less favorable conditions for self-regulation as compared to strong temptations. Thus, it was expected that participants in the weak temptation condition would eat a larger piece of the chocolate cake as compared to participants in the strong temptation condition.

Method

Participants. Forty-one female students participated in exchange for 3 euro or course credit. Data from participants who wanted to gain rather than lose weight ($N = 2$), and from one participant who was an outlier on the consumption measure (> 3 SD from the mean) were removed before the final analyses. The remaining sample consisted of 38 women with a mean age of 21.8 years ($SD = 2.2$) and a mean BMI of 21.4 ($SD = 1.6$). On average, participants wanted to lose 2.5 kg of weight ($SD = 2.3$).

Design and Procedure. Participants were randomly assigned to either a weak temptation or a strong temptation condition. Upon arrival, participants were welcomed by the experimenter and seated behind a desk in a separate room. Half a chocolate cake, weighed before the participant arrived, was placed at the table. In the weak temptation condition participants received a weakly attractive chocolate cake; in the strong temptation condition a highly attractive chocolate cake (see Materials for details). Participants were given a booklet with instructions and questionnaires, and the experimenter left the room. The instructions read that the investigators were interested in students' opinions about chocolate cake for research purposes. They were instructed to cut off (and eat) a piece of the cake, as large as they liked, because all that was left over had to be thrown away. Having taken a piece, participants had to answer a number of bogus questions about their liking of the cake. In addition, measures of restraint eating, trait self-control, hunger, length and weight were included at the end of the questionnaire to control for possible confounds. After they had answered all the questions, instructions read that they could return to the experimenter room (next door) to receive their money. The experimenter weighed the remainder of the cake, unbeknownst to the participants, after they had left.

Materials.

Temptation manipulation. Different cakes were used for the weak and strong temptation condition. Both chocolate cakes were pilot tested beforehand in a sample ($N = 22$) from the same population of female students (age: $M = 22.9$, $SD = 2.3$; BMI: $M = 20.6$, $SD = 1.8$). In the pilot task, students were asked "to what extent they thought this cake looks attractive", on a scale from 1 (not at all) to 7 (very much). The cake that was used in the weak temptation condition was rated somewhat attractive ($M = 3.50$, $SD = 1.63$), and the cake that was used in the strong temptation condition was rated highly attractive ($M =$

5.05, $SD = 1.68$); $F(1, 21) = 13.55, p < .01$. Each participant was presented with a half chocolate cake. Both cakes contained a comparable number of calories (≈ 800 Kcal per half cake) and the sizes of both cakes were about the same with a diameter of approximately 20 cm.

Consumption measure. Participants were instructed to cut off a piece of the cake, while the experimenter was not in the room. In order to provide an objective measure of the size of the piece, we calculated the percentage of the cake that was cut by the participants by dividing the difference between pre- and post-weight measurements of the cake by the pre-weight of the cake, and multiplying by 100%. The size of the piece that was taken by the participants constituted our measure of consumption, as all pieces were also completely consumed, except in 4 participants (see below).

Questionnaires. To control for possible confounds, participants completed the Restraint Scale (Polivy Herman, & Warsch, 1978) and the brief Self-Control Scale (Tangney, Baumeister, & Boone, 2004). Both scales had satisfactory reliability (Cronbach's $\alpha = .72$ and $.76$, respectively). Furthermore, hunger, participants' height, current and ideal weight were assessed by self-report.

Results

Randomization check. Separate Analyses of Variance (ANOVAs) were conducted with condition (weak vs. strong temptation) as the independent variable and BMI, hunger, restraint eating, and trait self-control as dependent variables. No effects of condition were found (all p 's $> .25$), indicating successful randomization.

Main analysis. An ANOVA was conducted with condition (weak vs. strong temptation) as the independent variable and the percentage of the chocolate cake that was consumed by the participants as the dependent variable. A significant condition effect was found, $F(1, 35) = 8.66, p < .01, \eta^2 = .20$ (see Figure 1c). Participants in the weak temptation condition consumed a greater percentage of the cake ($M = 25.78, SD = 14.48$) than did participants in the strong temptation condition ($M = 13.92, SD = 8.79$). As four participants had not completely consumed the portion they initially chose, we additionally analyzed the data with the percentage of the cake that was cut as the dependent variable. The condition effect remained significant, $F(1, 36) = 6.60, p = .01, \eta^2 = .16$.

Discussion

Study 3 replicated the effects found in Studies 1 and 2 on a behavioral level. In line with the critical level model, it was found that weak temptations yielded less successful self-regulation as compared to strong temptations. Paradoxically, participants who were confronted with a weakly attractive chocolate cake consumed a larger portion than did participants who were tempted by a strongly attractive chocolate cake.

General Discussion

The aim of the current paper was to study the effect of temptation strength, as operationalized by manipulating temptation attractiveness, on self-regulation processes. In three experiments a similar pattern emerged: Weak temptations, as compared to strong temptations, had an inhibitory effect on self-regulation processes. The effect is robust across different modes of temptation presentations (i.e., texts, pictures, real products) and was found on cognitive as well as behavioral measures. In Studies 1 and 2 it was found that the mental accessibility of diet-related words was decreased when participants were exposed to weak temptations. Strong temptations, however, did not affect the goal accessibility compared to the control conditions. Study 3 showed that exposure to weak temptations, as compared to strong temptations, lead to less successful self-control, as demonstrated by participants taking and consuming a larger piece of chocolate cake. We therefore conclude that weak temptations yield less favorable conditions for successful self-regulation than do strong temptations. Hence, temptation strength, though being largely neglected in previous research, is suggested to be an important factor influencing self-regulation. Although people may be able to defend themselves when facing obvious threats (i.e., strong temptations), they may be less well prepared to deal with more subtle threats.

Theoretical Implications

The results are in line with the implications of the critical level model (Gilbert et al., 2004), predicting that action is undertaken in response to severe stressors, whereas mild stressors are underestimated and therefore trigger no defensive action. Although the results of Studies 1 and 2 point towards an inhibitive effect of weak temptations rather than an activating effect of strong temptations, the implications are the same: Weak temptations yield less active defensive mechanisms than strong temptations.

The current studies are relevant from a self-regulation perspective. The implication that people may be better prepared to deal with strong than with weak temptations is rather adaptive, and supports the assumptions of counteractive control theory. That is, defensive mechanisms are elicited according to the magnitude of the threat towards a long-term goal (Trope & Fishbach, 2000). However, the present research demonstrates that this adaptive phenomenon also entails a potential caveat, as weak temptations may be particularly dangerous for self-regulation processes.

As noted in the discussion of Study 1, the goal activation effect after temptation exposure predicted by counteractive control theory was not observed in the current studies, possibly because there was a floor effect in reaction times to diet words. This may reflect participants' preoccupation with weight watching as all participants were women who were watching their weight. The sample used by Fishbach et al. (2003; Study 4) was

different in that current and ideal weight were not assessed in their study, and half of the sample consisted of men. There are a number of moderators of counteractive control effects and so a promising avenue for future research will be to examine when temptations do or do not activate the long-term dieting goal.

One moderator proposed by Geyskens et al. (2008) is temptation actionability: Behavioral counteractive control effects were found only for pre-exposure to temptations with a consumption opportunity (i.e., 'real products'), and not when non-actionable temptations (e.g., pictures) were presented. Viewing (non-)actionable temptations as (weak) strong temptations, our pattern of results was comparable. In the current studies, however, effects of temptation strength were found across modalities: Texts, pictures and real products yielded the same pattern of results. It is difficult to compare our findings to those of Geyskens et al. (2008) as we did not include different modalities of temptations in one single study. Furthermore, the difference between pictures and real products on cognitive measures in their studies was not found on dieting goal accessibility, but rather on the activation of the hedonic eating goal. It would be interesting for future research to consider the combined effects of temptation attractiveness and actionability.

Methodological Considerations

The current studies provide useful insights regarding the conceptualization and operationalization of temptations. First of all, temptation should not be viewed as a homogeneous construct, but should rather be seen as multidimensional. Whereas most previous research on temptations compared a single temptation condition with a control condition, the present studies show how influential it is to highlight specific aspects of temptation. That is, the extent to which the temptation is presented in an attractive manner may determine the effects on self-regulation measures. For example, in Study 1 chocolate temptation was operationalized by using textual context to manipulate attractiveness. It is important to note that the word 'chocolate' appeared an equal number of times in both the weak and strong temptation texts, but the manipulation produced very different effects on cognitive self-regulation mechanisms. Priming procedures often entail single word flashes (e.g., 'chocolate'). Our studies reveal that it is legitimate to question what exactly is being primed when people are confronted with a single temptation word without context, or, more precisely, to what extent such single word temptations are actually tempting and how that affects the results. This could be a point of attention for future studies.

Avenues for Future Research

Temptation strength in the current studies was operationalized by manipulating the attractiveness of food temptations. Theoretically, our definition of temptation comprises two components, namely attractiveness and 'forbiddenness'. The forbiddenness

component was kept constant in all studies. More closely examining the effects of varying forbiddenness is an interesting pathway for future research. Furthermore, the relation between temptation strength and goals should be investigated in other domains as well. One can think of numerous examples of temptations threatening long-term goals, such as being around a smoking friend after just having quit, or being seduced by an attractive person while in a relationship.

Conclusion

Altogether, the current results provide relevant insights into processes of self-regulation and the influence of temptation strength. A specific focus on characteristics of the temptation itself has not often formed the basis for empirical studies, but future research may be directed toward disentangling the aspects of temptations that play a role in people's ability to resist these temptations. Although it may be too early to draw practical implications from the current experiments, for people pursuing a long-term goal it may be worthwhile to pay more attention to the weak and underestimated threats, because these seem to be the tricky treats.

Chapter 4

“If it’s good it must be bad”:
The effects temptation strength
on perceived unhealthiness and
indulgence

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temptation strength on perceived unhealthiness and indulgence.

Abstract

Previous research has shown that, paradoxically, strong temptations may engender better self-control performance compared to weak temptations. However, the underlying mechanism for these counterintuitive findings is still unknown. The current paper is the first to test the theoretically implied suggestion that the effect of temptation strength on self-control is indirect and can be explained through temptations' perceived 'danger' in relation to the long-term goal. Four experiments showed that people tend to associate attractiveness with unhealthiness such that weak temptations were unjustly perceived to be less unhealthy compared to strong temptations (Study 1-3), while perceived unhealthiness was negatively related to indulgence (Study 3). As a consequence, people consumed more from weak than from strong temptations (Study 4). It is concluded that weak temptations tend to be underestimated and can be more dangerous than strong temptations.

The obesogenic food environment is often blamed for the rapidly rising numbers of overweight in Western societies (e.g., French, Story & Jeffery, 2001). The ubiquitous availability of 'easy', (often) unhealthy food brings along a continuous struggle for people to keep a balance between immediate hedonic gratification and long-term health considerations. As such, food temptations represent a typical self-control dilemma. Although we may especially fear the strong temptations that look most delicious, in this paper we aim to demonstrate that the underestimated subtle temptations may be most dangerous. That is, we claim that weak temptations are unjustly believed to be healthier and as a consequence engender poorer self-control compared to strong temptations.

Temptations, by definition, are in conflict with a (long-term) goal: they are at the same time attractive and forbidden (e.g., Kroese, Evers & De Ridder, 2011). A traditional viewpoint in the literature is that food temptations automatically trigger hedonic impulsive behavior and inhibit the conflicting weight watching goal (e.g., Stroebe, Mensink, Aarts, Schut, & Kruglanski, 2008; Strack, Werth, & Deutsch, 2006). For example, the hot/cool systems theory illustrates that temptations automatically activate the impulsive hot system, leaving the rational cool system powerless (Metcalf & Mischel, 1999). To resist hedonic impulses, people would have to exert self-control which is dependent on limited resources of cognitive capacity (Muraven & Baumeister, 2000). From this perspective it follows that temptations require effort to be resisted and thus hinder goal pursuit.

Counteractive control theory (Trope & Fishbach, 2000), however, proposes that rather than inhibiting goal pursuit, temptations may actually *activate* the conflicting goal and, to counter the threat of temptations, trigger self-control processes. Indeed, studies have shown that exposure to temptations facilitates the mental accessibility of conflicting goals (Fishbach, Friedman, & Kruglanski, 2003), enhances goal importance and intentions (Kroese, Evers, & De Ridder, 2009), and leads to healthier food choices (Fishbach et al., 2003; Kroese et al., 2009) compared to neutral control conditions. Counteractive control theory states that temptations signal a threat towards the conflicting goal and trigger alarm bells to activate defensive mechanisms countering the threat. Although the theory is mute about the role of temptation strength, we posit that temptations need to be sufficiently strong (i.e., present a large enough threat) to be able to trigger counteractive control processes. Indeed, prior studies have suggested that temptation strength is an important factor in this regard. For example, it was shown that strongly attractive temptations engender better self-control than weakly attractive temptations (Kroese et al., 2011). Along the same lines, it was found that people consume more from small than from large package sizes (Coelho do Vale, Pieters, & Zeelenberg, 2008), and that people limit their consumption of unhealthy food after exposure to actionable (i.e., available for consumption) but not unactionable temptations (Geyskens, Dewitte, Pandelaere, & Warlop, 2008).

In line with the idea of alarm bells that need to be triggered, one suggested explanation for the finding that participants activate self-control processes when exposed to strong but not weak temptations is that weak temptations are perceived to be less 'dangerous'. That is, in the current context of food temptations, weak temptations would be believed to be less bad in terms of weight watching goals (i.e., less unhealthy or fattening). As a consequence, weak temptations fail to trigger the alarm bells that signal the need for defensive self-regulatory action. Strong temptations, on the other hand, would indirectly (through higher perceived danger) yield boosted self-control performance. This suggestion is theoretically supported by the critical level model (Gilbert, Lieberman, Morewedge, & Wilson, 2004). The authors propose that stressors need to reach a certain threshold for defensive processes to be triggered. Severe stressors (cf. strong temptations) signal the need for action to counteract the threat, whereas mild stressors (cf. weak temptations) do not. The model suggests that the negative consequences of mild stressors are underestimated, such that paradoxically, severe stressors triggering defensive mechanisms will in the end yield better outcomes compared to mild stressors to which no action was undertaken. Although the critical level model provides a plausible explanation for previous findings showing that strong temptations engender better self-control compared to weak temptations, the proposition that weak temptations may be underestimated has not been tested empirically.

The aim of the current paper is to extend previous work showing that strong temptations may trigger self-control processes to a larger extent compared to weak temptations (Kroese et al., 2011) and provide empirical support for the implications regarding the indirect effect of temptation strength on self-control through the perceived danger of temptations, derived from the critical level model (Gilbert et al., 2004). We expect that the perceived danger of weak temptations will be underestimated compared to that of strong temptations. More specifically in terms of the self-regulation dilemma we referred to above, 'danger' is reflected by the perceived unhealthiness of temptations, or the extent to which indulgence would compromise the weight watching goal. Hence, we propose that temptation strength is positively related to perceived unhealthiness such that weak temptations are believed to be less unhealthy than strong temptations.

An indication of an existing relationship between temptation strength and healthiness is suggested by Raghunathan, Naylor and Hoyer (2006), who provided empirical evidence for what they call the "unhealthy = tasty intuition." Interestingly, they showed that when food items are portrayed as unhealthy (vs. healthy) they are a) perceived to taste better, b) better enjoyed during actual consumption and c) preferred more to the extent that an hedonic goal is more salient. Apparently, people tend to have an implicit idea about the relation between healthiness and attractiveness such that unhealthy food is believed to be more attractive than healthy food. In the current paper we aim to demonstrate that this association is bidirectional. That is, we predict that food

that is considered to be strongly tempting is perceived as more unhealthy than food that is considered to be weakly tempting. In other words, we hypothesize that weak temptations are underestimated in the sense that they are perceived to be less dangerous in terms of weight watching goals compared to strong temptations. As a consequence, the lower perceived unhealthiness may lead to greater consumption. First we will demonstrate in two studies that temptation strength is related to perceived healthiness, such that weak temptations are judged to be less unhealthy compared to strong temptations. In Study 3, then, we will test our hypothesis of the indirect effect of temptation strength on consumption through perceived healthiness. Finally, in Study 4, we will show that people may consume more from weak than from strong temptations.

Being defined as the product of attractiveness and forbiddenness (Kroese et al., 2011), temptation strength is manipulated by varying the attractiveness of food products throughout our studies. The forbiddenness of temptations in the current studies is reflected in the extent to which the food products are 'bad' in terms of weight watching goals. Hence, this factor is held constant by recruiting young female students who are concerned about their weight, and for whom the products used will all be 'forbidden'. Weight concern will be assessed and included as a covariate in all analyses to control for any variation in our samples.

Study 1

Study 1 was designed to demonstrate people's general tendency to associate attractive with unhealthy (and unattractive with healthy), extending the findings reported by Raghunathan and colleagues (2006) and supporting the suggestion that strong temptations are perceived as more unhealthy compared to weak temptations. Temptation strength was manipulated using vignettes in which a new snack was described. The snack was allegedly rated by a test panel as either moderately or highly tasty, respectively reflecting weak or strong temptations. The dependent variable was the extent to which participants, based on the description, thought the new snack would be unhealthy. It was hypothesized that the snack that was described as moderately tasty would be perceived as less unhealthy compared to the highly tasty snack.

Method

Participants. Fifty-nine female students participated in the study. Data from one obese participant (BMI > 30) were excluded from all analyses, as obese participants are known to react differently from normal weight individuals to food stimuli (Stice, Spoor, Ng, & Zald, 2009). No underweight participants (BMI < 18) were included. Participants in the final sample ($N = 58$) had a mean age of 21.5 years ($SD = 1.6$) and a mean BMI of 21.8 kg/m² ($SD = 2.5$). On average, participants indicated to be moderately concerned about their weight ($M = 4.18$, $SD = 1.36$).

Procedure. Participants were presented with a short text describing a new snack (see below). The attractiveness of the new snack was manipulated by providing different taste ratings that were allegedly given by a test panel: the test panel rated the tastiness of the new snack at 6.0 (weak temptation condition) or 8.5 (strong temptation condition) on a 10-point scale. After reading the text, participants were asked to rate the unhealthiness of the snack.

Material.

Manipulation text. “A new snack is being introduced to the market: a granola bar with pieces of chocolate. The bars are wrapped individually and make an ideal snack for people who are on the move. The snack was recently presented to a test panel. One question the panel was asked was **how tasty** they found the new snack. The test panel rated the new snack on this question on average at [6.0 - weak temptation condition / 8.5 – strong temptation condition] on a scale from 1-not at all to 10-extremely.”

Estimated unhealthiness and attractiveness. Participants were asked to rate “to what extent they thought the new snack would be healthy” [reverse coded] on a scale from 1(not at all) to 9 (very much). In addition, they were asked “to what extent do you think the new snack is attractive?” to function as a manipulation check for temptation strength.

Control variables. Self-reported length and weight were assessed to calculate BMI (Body Mass Index = weight / height*height). In addition, weight concerns were assessed with a single item (i.e., “To what extent are you concerned about being slim). Scores are represented on a scale ranging from 1(not at all) to 7(very much).

Results

Randomization and manipulation check. Two Analyses of Variance (ANOVAs) were conducted to test the difference between conditions on BMI and weight concerns. Neither revealed a significant effect (p 's > .33), indicating successful randomization across conditions.

To validate our manipulation, an ANOVA testing the effect of condition (weak vs. strong temptation) on participants' ratings of attractiveness of the snack revealed a significant difference between conditions; $F(1, 56) = 9.80, p = .003, \eta_p^2 = .15$. Participants in the strong temptation condition ($M = 5.50, SD = 1.69$) believed the snack was more attractive compared to participants in the weak temptation condition ($M = 4.03, SD = 1.87$), indicating that our manipulation worked as intended.

Estimated healthiness. An Analysis of Covariance (ANCOVA) was conducted with attractiveness condition as independent variable, estimated unhealthiness as dependent variable, and weight concerns as a covariate. The covariate was significant; $F(1, 55) = 4.52, p = .04$. Furthermore, the analysis revealed a significant effect of temptation strength; $F(1, 55) = 4.71, p = .03, \eta_p^2 = .08$. Participants in the weak temptation condition

thought the new snack would be less unhealthy ($M = 5.10$, $SD = 1.49$) compared to participants in the strong temptation condition ($M = 5.82$, $SD = 1.47$).

Discussion

Study 1 confirmed our hypothesis that temptation attractiveness tends to be associated with unhealthiness: the mere suggestion that a snack tastes good makes people believe it will be unhealthy. It is noted that energy-dense, unhealthy foods (i.e., containing lots of fat and sugar) indeed tend to possess appealing taste qualities, which had evolutionary benefits when food was scarce (Birch, 1999). However, the current study shows that this natural association may be overstretched in people's perceptions nowadays.

It is interesting to see that even with the little information that was provided to participants, the relationship between attractiveness and perceived healthiness emerged. Yet, in order to further strengthen our case, we conducted a second study in which participants were presented with real, as opposed to hypothetical, products.

Study 2

The aim of Study 2 was to replicate the findings of Study 1 that weak temptations are perceived to be less unhealthy compared to strong temptations with a distinct manipulation and with real food products. Different brands of typical Dutch December treats (i.e., small spiced cookies) were pilot tested to distinguish a strong and a weak temptation such that one brand was considered more attractive than the other, respectively. Participants in the study were presented with either one of the brands, and were asked to indicate the perceived unhealthiness of the product. Importantly, in terms of being actually dangerous in relation to weight watching goals, the objective healthiness of both products was similar (i.e., the two brands contained an equal number of calories per 100 grams). It was expected that participants who were shown the weak temptation (i.e., the less attractive brand) would rate the product as less unhealthy compared to those who rated the strong temptation (i.e., the more attractive brand).

Method

Participants. One-hundred-eleven female students participated in the experiment. Data from participants who were underweight ($BMI < 18$; $N = 7$) or obese ($BMI > 30$, $N = 2$) were excluded for the same reasons as in Study 1. Participants in the remaining sample ($N = 102$) had a mean age of 20.5 years ($SD = 2.1$) and a mean BMI of 21.5 kg/m^2 ($SD = 2.1$). On average, participants reported to be moderately concerned about their weight ($M = 4.5$, $SD = 1.3$, as assessed on a 7-point scale, see Materials).

Procedure. The study was introduced as a study on seasonal food preferences. Participants were presented with either one of two brands of typical Dutch December

treats. The study was conducted in November, and the cover story read that we were interested in people's preferences for these treats in different seasons. It was said that we would conduct the same study during spring, to see how people liked the December treats in atypical seasons compared to the typical winter season that we were in now.

Material.

Temptation strength. Temptation strength was manipulated by using two different brands of the same December treats that varied in attractiveness. A pilot test was conducted among 41 female students (Age: $M = 20.8$, $SD = 2.0$; BMI: $M = 22.2$, $SD = 2.5$) who were presented with either one brand or the other to establish whether the manipulation was appropriate. In the pilot as well as in the experiment, participants were exposed to a bowl of treats together with its package. Attractiveness was assessed with 1 item ("To what extent do you find this product attractive") that could be answered on a scale from 1 (*not at all*) to 7 (*very much*). Indeed, it was found that one brand was considered more attractive ($M = 5.4$, $SD = .7$) than the other ($M = 4.9$, $SD = .9$); $F(1, 39) = 4.48$, $p = .04$, $\eta^2 = .10$. Importantly, both the weak and strong temptation contained an approximately equal number of calories per 100 grams.

Food preferences questionnaire. The food preferences questionnaire contained questions in line with the cover story concerning seasonal food preferences (e.g., "To what extent do you think this product especially belongs to December" or "To what extent would you like this product to be available in stores during spring").

Perceived unhealthiness. Embedded within the food preferences questionnaire, participants were asked "To what extent do you think this product is unhealthy?" The question could be answered on a scale from 1 (*not at all*) to 7 (*very much*).

Control variables. Age, height, current and ideal weight were assessed by self-report. Furthermore, as a measure of weight concerns, participants were asked "to what extent they were concerned with their weight". Scores are represented on a scale from 1 (*not at all*) to 7 (*very much*).

Results

Randomization check. Separate Analyses of Variance (ANOVAs) were conducted to test for a difference between temptation strength conditions on BMI and weight concern. No effects of condition emerged (p 's $> .64$), confirming successful randomization.

Perceived unhealthiness. An Analysis of Covariance (ANCOVA) was conducted with temptation strength as independent variable and perceived unhealthiness as dependent variable, including weight concerns as a covariate. The covariate was significant; $F(1, 99) = 5.63$, $p = .02$. Most importantly, though, the analysis revealed a significant effect of temptation strength on perceived unhealthiness; $F(1, 99) = 15.15$, $p < .001$, $\eta^2 = .13$, showing that the strong temptation (i.e., the more attractive brand) was

perceived as more unhealthy ($M = 5.57$, $SD = .95$) compared to the weak temptation (i.e., the less attractive brand; $M = 4.78$, $SD = 1.11$).

Discussion

Study 2 again supported our hypothesis that temptation strength is positively related to perceived unhealthiness, such that weak temptations are believed to be less unhealthy compared to strong temptations.

Having found support for the, irrational, negative association between temptation attractiveness and healthiness, the next step is to see how this effect translates into behavior. That is, our reasoning implies that perceived healthiness is positively related to consumption in health-conscious consumers: the healthier a product, the more it will be consumed (cf. Provencher, Polivy, & Herman, 2009). Indirectly, then, weak temptations, as compared to strong temptations, would be considered less unhealthy, which in turn would lead to higher consumption.

Study 3

In Study 3 we aimed to demonstrate the indirect effect of temptation strength on consumption through perceived unhealthiness. To be able to relate our findings to previous work, we chose to use a different manipulation of temptation strength that was based studies by Coelho do Vale and colleagues (2008). To this end, temptation strength was manipulated by exposing participants to either a large bowl (strong temptation) or three small bowls (weak temptation) of crisps. Slightly adapting the procedure of Coelho do Vale and colleagues, in the current study we chose to present crisps in bowls rather than bags to prevent any possible effect of participants hesitant to open another package. In addition, we conducted a pilot test assessing perceived attractiveness in both conditions to establish whether this particular manipulation of portion size can indeed be interpreted as an operationalization of temptation strength. The perceived danger was operationalized by assessing participants' estimates of the number of calories in a handful of crisps. In the context of weight watching, caloric content, as opposed to the more general '(un)healthiness', was deemed a stricter and more relevant measure reflecting the extent to which the weight watching goal would be compromised by indulgence. Furthermore, consumption of the product was assessed. It was hypothesized that weak temptations would yield lower caloric estimates, which in turn would lead to higher consumption.

Method

Participants. Forty-three female students participated in the study. Data from 1 participants who was underweight ($BMI < 18$) and from 3 participants who were outliers ($> 3 SD$) on either caloric estimates or consumption were excluded from all analyses. The sample included no obese participants ($BMI > 30$). The mean age of the remaining sample

($N = 39$) was 22.6 years ($SD = 4.3$), and the mean BMI was 21.9 kg/m² ($SD = 2.5$). On average, participants indicated to be moderately concerned about their weight ($M = 3.9$, $SD = 2.0$).

Procedure. Participants were seated behind individual desks, and exposed to either three small bowls of crisps (weak temptation condition) or one large bowl of crisps (strong temptation condition). The total amount of crisps was equal across conditions (100 grams). The study was presented as a marketing test and participants were asked taste and rate the crisps on several dimensions (appearance, crispiness, color, etc.). Before they started eating, participants were asked to estimate the number of calories in a handful of these crisps. Consumption was assessed by weighing the bowl(s) of crisps prior to and after the experiment, unbeknownst to participants.

Materials.

Temptation strength. A pilot test was conducted to assess the temptation strength of 3 small bowls vs. 1 large bowl of crisps, containing the same amount of crisps in total. Twenty-nine participants from the same population as our experimental sample (i.e., female students) were shown either 3 small bowls or 1 large bowl of crisps. They were asked to rate the tempting qualities of the product by responding to 3 items on a scale from 1(not at all) to 7(very much): “To what extent do you think this bowl/these bowls of crisps are tempting/attractive/looking tasty”. A mean score was computed and a t-test showed that participants found the large bowl of crisps more tempting ($M = 4.89$, $SD = 1.11$) than the three small bowls of crisps ($M = 3.42$, $SD = 1.36$); $t(28) = 2.90$, $p = .007$.

Bogus marketing test. The marketing test consisted of a number of statements regarding the product. Participants were encouraged to eat at least a little bit to be able to rate the taste of the product. They were told to eat as much as they liked, as fresh crisps had to be used for new participants and the remainders would be thrown away.

Caloric estimates. Participants were asked to “estimate the number of calories in a handful of these crisps”. As a reference point, the number of calories in a cheese sandwich (150 Kcal) was given. Please note that we asked caloric estimates for *a handful* of crisps, which is a portion size unit that was unrelated to the sizes of the presented bowls.

Consumption. The bowl(s) of crisps were weighed before participants entered the lab and after they had left. Postweight was subtracted from preweight to calculate consumption.

Control variables. Age, height, current and ideal weight were assessed by self-report. Furthermore, as a measure of weight concerns, participants were asked “to what extent they were concerned with their weight”. Scores are represented on a scale from 1(not at all) to 7(very much).

Results

Randomization check. Separate one-way ANOVAs were conducted to test whether participants in the two conditions differed on age, BMI, weight concerns, or the amount of weight they wanted to lose. No differences were found (all p 's > .35), indicating successful randomization.

Caloric estimates and consumption. A path analysis was conducted to test our hypothesis that temptation strength was positively related to the estimated caloric content, which in turn was related to consumption. Including weight concerns as a covariate in all analyses, first caloric estimates were regressed on temptation strength ($\beta = .39$, $p = .01$), showing that strong temptations yielded higher caloric estimates compared to weak temptations. Furthermore, a regression of consumption on caloric estimates showed that higher caloric estimates were associated with lower consumption ($\beta = -.33$, $p = .05$). Bootstrapping analyses confirmed that the indirect effect of temptation strength on consumption through caloric estimates was significant (95% CI: -4.44, -.15).

Discussion

The results of Study 3 showed that participants in the weak temptation condition estimated the number of calories in a handful of crisps to be lower compared to participants in the strong temptation condition. Furthermore, lower caloric estimates were related to higher consumption. This finding supports our hypothesis that weak temptations are unjustly believed to be less dangerous compared to strong temptations and as a consequence may indirectly yield less effective self-control. That is, all else being equal it would be most plausible that temptation strength is positively related to indulgence, such that people consume more when they are tempted to a greater extent. However, as strong temptations are perceived as being 'worse' in terms of weight watching goals (i.e., possessing higher caloric contents), self-control processes will be triggered to a larger extent and consumption is reduced, relative to a situation in which no self-control would have been triggered (for example, among participants who do not consider crisps a temptation as they do not have a weight watching goal). It is noted, though, that counteractive control theory does not directly offer predictions in terms of outcome behavior: The extent to which self-control processes are triggered is to be considered in balance with other factors (e.g., the concurrent stronger hedonic pull of strong temptations) to determine behavior. Strong temptations may therefore yield more goal-directed behavior (i.e., lower indulgence) compared to weak temptations (e.g., Kroese et al., 2011), but this is not necessarily the case (Trope & Fishbach, 2000). In fact, both the total and direct effects of temptation strength on consumption were insignificant (p 's > .59) in the current study.

It is noted, however, that a total effect of temptation strength on consumption, such that participants consumed more from weak temptations than from strong

temptations, was found by Coelho do Vale et al. (2008), using a very similar manipulation. One reason for not finding a total effect of temptation strength on consumption in the current study could be that explicitly assessing the estimated caloric content of the product functioned as a weight watching prime that directly affected subsequent consumption, thereby reducing the impact of the temptation strength manipulation. To explore this possibility, we conducted another study using the same manipulation and procedure, without assessing perceived healthiness (or caloric content).

Study 4

Study 4 was conducted to replicate the findings by Coelho do Vale et al. (2008), and show that people may, paradoxically, consume more from weak than from strong temptations. Our manipulation of temptation strength was identical to Study 3.

Method

Participants. Forty-two female students participated in the study. Data from one participant who was underweight (BMI < 18), two participants who were obese (BMI > 30) and 2 participants who were outliers (> 3 SD) on the dependent variable were excluded. Participants in the remaining sample ($N = 37$) had a mean age of 21.4 years ($SD = 2.1$) and a mean BMI of 22.4 kg/m² ($SD = 2.7$). On average, participants indicated to be rather strongly concerned about their weight ($M = 4.9$, $SD = 1.7$).

Procedure and materials. The procedure was identical to that of Study 3, except that we did not assess caloric estimates, but only the amount of crisps eaten during the bogus marketing test. To this end, the bowls were weighed before and after each session, unbeknownst to the participants. Control variables were assessed similar to Study 3.

Results

Randomization check. Separate one-way ANOVAs were conducted to test whether participants in the two conditions differed on age, BMI, weight concern or the amount of weight they wanted to lose. No differences were found (all p 's > .60), indicating successful randomization.

Consumption. An ANCOVA was conducted with temptation strength as independent variable, consumption as the dependent variable and weight concerns as covariate. The covariate was not significant ($p = .38$). The analysis showed that participants in the weak temptation condition consumed significantly more grams of crisps ($M = 12.1$, $SD = 9.1$) than did participants in the strong temptation condition ($M = 5.5$, $SD = 4.1$); $F(1, 34) = 8.04$, $p = .008$, $\eta_p^2 = .19$.

Discussion

Study 4 underscored our proposition that strong temptations may engender better self-control performance compared to weak temptations (Kroese et al., 2011), and replicated previous findings by Coelho do Vale et al. (2008). Participants who were exposed to crisps that were presented in a weakly tempting way (i.e., in small bowls) consumed more compared to participants who were presented with crisps that were presented in a strongly tempting way (i.e., a large bowl).

General Discussion

Counteractive Control Theory (Trope & Fishbach, 2000) proposes that temptations may adaptively activate, rather than inhibit, self-control processes and thereby assist goal-directed behavior. Building upon this intriguing idea, an important next step is to further specify the effect of temptations on self-control processes by considering the role of temptation strength. The aim of the current paper was to shed light onto the underlying processes explaining previous findings that strong temptations may engender better self-control as compared to weak temptations. To that end, our hypotheses were based on the implications of the critical level model, suggesting that the extent to which weak temptations are 'dangerous' in terms of compromising the long-term goal may be underestimated relative to that of strong temptations. Consequently, we set out to show that weak temptations can have worse consequences compared to strong temptations in terms of self-regulation goals.

Four studies yielded support for our hypotheses. Study 1 showed that temptation strength is negatively related to perceived healthiness: Without any further information, a simple fact with regard to the attractiveness of a (hypothetical) snack had effects on its inferred healthiness. Participants who were led to believe that the snack tastes good (i.e., a strong temptation) inferred that it would be less healthy as compared to participants who believed the snack had a less attractive taste (i.e., a weak temptation). Study 2 replicated this finding using two brands of real products of which one was found more attractive than the other. Although objectively being equally 'bad' in terms of weight watching goals, again the strong temptation was perceived to be more unhealthy as compared to the weak temptation. In line with Raghunathan et al. (2006), these studies confirmed that people seem to hold a biased view on the relationship between attractiveness and healthiness such that "tasty = unhealthy". Hence, weak temptations are perceived as less unhealthy as compared to strong temptations. Unjustly, then, weak temptations do not signal the need for defensive action and thereby foster greater indulgence (Kroese et al., 2011). Indeed, in Study 3 it was demonstrated that weak temptations, as compared to strong temptations, yielded lower caloric estimates, which in turn lead to higher consumption. Finally, in Study 4 we showed that participants consumed more from weak than from strong temptations.

Our findings support the implications put forward by counteractive control theory and the critical level model: To the extent that temptations are a danger towards the weight watching goal defensive self-control mechanisms will be activated. However, the threat (i.e., unhealthiness) of weak temptations tends to be underestimated and self-control will be triggered to a lesser extent. Paradoxically, then, in some cases weak temptations may have worse outcomes in terms of self-control behavior compared to strong temptations.

Using different manipulations of temptation strength, previous findings suggesting that weak temptations may be more dangerous than strong temptations (e.g., Coelho do Vale et al., 2008; Geyskens et al., 2008; Kroese et al., 2011) are now further established. More importantly, the current studies are the first to confirm the earlier proposed explanation for these findings, stating that the danger of weak temptations is underestimated relative to that of strong temptations. This is in line with studies reporting that the dieting goal is inhibited after exposure to weak but not strong temptations (Kroese et al., 2011): Apparently weak temptations do not ring the alarm bells triggering self-regulatory processes.

The current studies also relate to work showing that dieters display ironic behavior when it comes to healthiness perceptions of food: Chernev (2011), for example, showed that dieters erroneously believe that adding healthy foods to a meal decreases its total calorie count. Along the same lines, it was found that dieters are more likely to indulge when presented with a product choice set that includes healthy items as opposed to a set that does not include healthy items (Wilcox, Vallen, Block, & Fitzsimons, 2009). In addition, people tend to believe that perceived-to-be healthy foods are less fulfilling: Finkelstein and Fishbach (2010) demonstrated that consumers who sampled a product that was framed as healthy, as opposed to those who ate the same product that was framed as tasty, reported being more hungry and indulged more at a later occasion. Hence, accumulating evidence suggests that when trying to behave 'good' by taking foods that are not their most favorite temptation, small portions (Coelho do Vale et al., 2008), foods that seem healthy (Finkelstein & Fishbach, 2010), or have healthy parts added to it (Chernev, 2011), weight conscious consumers may actually have a tendency to fool themselves, making dietary failure in fact more rather than less likely.

One strength of the current studies is that our manipulations of temptation strength were very subtle. Keeping all else equal, little variances in the description of a product (Study 1), the perceived attractiveness of two similar products (Study 2), or even only the presentation mode of the same product (Studies 3 and 4) were sufficient to obtain the predicted effects. Furthermore, we were able to show the paradoxical effects of temptation strength on cognitive as well as behavioral measures.

A seeming limitation of the current studies may be the selective population from which our samples were drawn: All participants were young, weight conscious female

students. However, it is again explicitly noted that our hypotheses only apply to people who are watching their weight and trying to control their food intake. Female students are known to be a group that is likely to fulfill these criteria (e.g., Wardle, Haase, & Steptoe, 2006). For unhealthy food to be a temptation, it needs to be considered attractive as well as 'forbidden', or in conflict with a long-term goal. Hence, for those who do not have a weight watching goal the definition of temptation would not apply. Moreover, we would not expect to find counteractive self-control processes to be activated upon exposure to (strong) temptations. That being said, it would be interesting to see whether the same results could be obtained in a sample of less educated, older, or male participants.

Altogether, the current studies elicit a number of relevant research questions. For example, in the current design, participants were exposed to either weak or strong temptations such that any comparison between products was not possible. It would be interesting for future research to see whether the same behavioral effects can be observed when participants are presented with both choices. That is, based on the current research it would be hypothesized that people would eat more from the less attractive option than from the most attractive option, thereby irrationally consuming most calories from the product that is not even their favorite.

Another avenue for future research would be to investigate possible ways to counter the paradoxical effects. A first plausible direction could be to make people explicitly aware of the actual healthiness or caloric content of foods, such that estimated healthiness can no longer play a role. It seems unlikely, that, when knowing that two products are equally unhealthy, people would still consume more from the least attractive one.

To conclude, the current research provides insight into the underlying processes explaining the effects of temptation strength on self-control. It was demonstrated that people assume that there is a negative relationship between attractiveness and healthiness, such that less attractive temptations are unjustly perceived as more healthy. As a consequence, dieters paradoxically may fail not because the food 'was just too good' but because it was only 'just good'.

Chapter 5

With low resources at least you eat the good stuff: The effect of cognitive resources and temptation strength on self-control

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Abstract

Theoretically, two opposing predictions can be made regarding the effect of temptation strength on self-control. On the one hand, classic self-control theories imply that strong temptations yield worse self-control performance compared to weak temptations. On the other hand, the critical level perspective suggests that, paradoxically, weak temptations yield worse self-control performance compared to strong temptations based on the idea that strong temptations trigger counteractive control processes whereas weak temptations do not. The current aim was to unite both perspectives by considering the moderating role of cognitive resources. In a 2 (cognitive resources: high vs. low) x 2 (temptation strength: weak vs. strong) between subjects design, assessing food consumption as the dependent variable, it was shown that when cognitive resources were low participants consumed more from strong than from weak temptations, in line with classic theories. However, when cognitive resources were high the effect was reversed and participants consumed more from weak than from strong temptations, in line with the critical level perspective.

If you would ask someone whether a very attractive (strong) or a less attractive (weak) temptation is more likely to be resisted, the answer would probably be the latter. Although this sounds quite logical indeed, we may also think of instances where paradoxically, people are better able to resist strong rather than weak temptations. Imagine a dieter who is celebrating her friend's birthday party. When offered a piece of delicious home-made apple pie she nicely says no, referring to her diet intentions. Meanwhile, however, she finds herself mindlessly accepting small chocolate cookies, which she doesn't even like that much. Not only in real life but also in theory different predictions can be found regarding the effects of temptation strength on self-control. In this paper we aim to unite both perspectives by considering the moderating role of cognitive resources.

Temptations are typically seen as obstacles in the way of long-term goal attainment. By definition, temptations are attractive and at the same time 'forbidden', or in conflict with a personal goal (e.g., Kroese, Evers, & De Ridder, 2011). Temptation strength, then, is determined by both factors. That is, by increasing either attractiveness or forbiddenness, within certain boundaries, temptation strength will become greater. In the context of weight watching, food temptations' inherent forbiddenness is reflected by the extent to which they have negative effects on the weight watching goal (i.e., higher caloric foods are more 'forbidden'). In the current paper, we focus on the attractiveness of temptations, which refers to their mere hedonic appeal. The tension between temptations' attractiveness and forbiddenness is reflected in classic self-control conflicts where immediate satisfaction of hedonic goals may yield negative consequences in terms of long-term health goals.

Why Strong Temptations May Yield Worse Self-Control Performance

The temptation conflict between attractiveness and forbiddenness, or rather between immediate satisfaction and long-term goal attainment, has long been acknowledged in the literature. For example, the goal conflict model (Stroebe, Mensink, Aarts, Schut, & Kruglanski, 2008) illustrates that food temptations elicit conflicts between hedonic goals and long-term health goals, while only one of these can 'win'. Research has shown that for the long-term goal to win the temptation battle, effortful inhibition of impulses is needed (e.g., Baumeister & Heatherton, 1996; Muraven & Baumeister, 2000; Vohs & Heatherton, 2000). To illustrate, hot/cool systems theory (Metcalf & Mischel, 1999) distinguishes a hot, impulsive, system and a cool, rational, system, which interact to determine behavior. Upon confrontation with temptations, the hot system will be activated and triggers hedonic impulses. At this point, the cool system is powerless unless conscious effort is exerted to counter the impulsive response (see also Strack, Werth & Deutsch, 2006). Though not explicitly stated, it can be derived from this theorizing that strong temptations, possessing 'hotter' appeal than weak temptations, should more

strongly trigger hedonic impulses and hence may be more likely to yield indulgent behavior.

Why Weak Temptations May Yield Worse Self-Control Performance

Although the perspective described above is intuitively sensible, people obviously are not always subjected to their impulses. In many cases, the ‘hotness’ of temptations will not solely determine behavior and people will successfully adhere to their long-term goals. Moreover, studies have shown that temptations do not always automatically trigger hedonic indulgence, but may also activate the conflicting long-term goal (Counteractive Control Theory; Trope & Fishbach, 2000). Counteractive Control Theory posits that temptations, by definition being in conflict with a long-term goal, trigger ‘alarm bells’ signalling goal threat, and in turn activate defensive mechanisms to counter the threat. Indeed, research has shown that exposure to food temptations activated self-control processes and lead to healthy food choices more so than did exposure to neutral cues, suggesting that in some cases temptations can have beneficial rather than compromising effects on self-control (e.g., Fishbach, Friedman, & Kruglanski, 2003; Kroese, Evers, & De Ridder, 2009).

In further studies, temptation strength appeared to be an important moderator of counteractive control effects. Based on a critical level perspective (Gilbert, Lieberman, Morewedge, & Wilson, 2004), it was found that defensive self-control processes were triggered by strong but not weak temptations. That is, counteractive control processes become activated only when people are exposed to large threats, or strong temptations. Small threats (or weak temptations) fail to trigger the alarm bells and no defensive action will be undertaken. Paradoxically, then, people are less well guarded against weak threats compared to strong threats. Empirical evidence for this account can be derived from a number of studies. For example, people were found to eat more from small package sizes than from large package sizes (Coelho do Vale, Pieters, & Zeelenberg, 2008), and exposure to real candies, as opposed to pictures of candies, lead to lower food consumption at a subsequent occasion (Geyskens, DeWitte, Pandelaere, & Warlop, 2008). Similarly, it was found that weakly attractive temptations inhibited self-control processes and yielded higher consumption as compared to strongly attractive temptations (Kroese et al., 2011).

Altogether, these studies suggest that hedonic impulses can be successfully counteracted by self-control processes as long as the temptations are strong. Notably, these predictions regarding the effect of temptation strength on self-control seem to be opposite to those derived from perspectives like hot/cool systems theory described earlier. Whereas the latter would predict that weak (i.e., ‘cooler’) temptations are more likely to be successfully resisted, the critical level perspective suggests that strong temptations are more likely to be resisted. The current paper aims to address this

intriguing discordance in the literature by suggesting cognitive resources as a moderating factor that allows for both predictions to apply in certain cases.

Cognitive Resources As a Moderator

We propose an interaction between cognitive resources and temptation strength such that the availability of cognitive resources moderates the effect of temptation strength on self-control: When cognitive resources are high, we predict that counteractive control processes will be triggered by strong but not weak temptations, as supported by the critical level perspective. Hence, weak temptations will yield greater indulgence compared to strong temptations. However, when cognitive resources are low, we suggest that counteractive control processes are overshadowed by hedonic urges, such that strong temptations will trigger indulgence to a larger extent compared to weak temptations, in line with the implications derived from the hot/cool systems framework.

Cognitive resources are a familiar moderating factor in self-control research. The availability of cognitive resources has been shown to be related to the extent to which behavior is predicted by impulses. For example, the limited resource model states that low cognitive resources will increase the likelihood of indulgence as impulses are less well resisted (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Muraven & Slessareva, 2003). Also, it was demonstrated that low cognitive resources are related to impulsive shopping (Vohs & Faber, 2007). Other insightful work showed that behavior is predicted by automatic attitudes or impulses to a larger extent when cognitive resources are low due to alcohol (Hofmann & Friese, 2008) or reduced working memory capacity (Hofmann, Gschwendner, Friese, Wiers, & Schmitt, 2008). Hence, low cognitive resources foster a focus on immediate concerns and hedonic impulses will guide behavior. In this light we predict that with low cognitive resources, in accordance with the hot/cool framework, strong temptations will yield greater indulgence compared to weak temptations. In contrast, when cognitive resources are high, long-term concerns become more important (Hofmann, Rauch, & Gawronski, 2007), and we predict that strong temptations, compared to weak temptations, in this case will yield counteractive control processes that consequently result in lower indulgence.

The current study was designed to test the proposed interaction between cognitive resources and temptation strength on consumption. Hunger and weight concern were assessed as possible control variables. The latter is important as our definition of temptation comprises a component of 'forbiddenness' that in the current context only applies to those who would rather not eat the product due to weight concerns. For that matter, the study will be conducted in a sample of young females, which is a group known to be concerned about their weight (Wardle, Haase, & Steptoe, 2006).

It is expected that in the low cognitive resources condition, strong temptations will yield greater consumption compared to weak temptations. In the high cognitive

resources condition, weak temptations are expected to yield higher consumption compared to strong temptations.

Method

Participants

One hundred thirty nine female students who were concerned about their weight completed the experiment. Data from participants who were underweight ($BMI < 18$; $N = 9$), or obese ($BMI > 30$; $N = 3$) were excluded. In addition, we excluded data from 6 participants who were outliers within their condition on the dependent variable (> 3 SD from the mean). The remaining sample ($N = 121$) had a mean age of 21.0 ($SD = 3.1$) and a BMI of 21.7 ($SD = 2.1$). On average, weight concerns were high ($M = 4.8$, $SD = 1.2$), and participants wanted to lose 3.1 kg of weight ($SD = 2.6$).

Design and procedure

The study was presented as a study on mood and chocolate preferences in women. Upon arrival at the lab, participants were randomly assigned to conditions and seated individually at secluded desks. At the desk, participants were presented with a) a bowl filled with chocolate coated peanuts, representing the food temptation, b) an envelope containing instructions for the cognitive resources manipulation, c) a chocolate preference questionnaire, and d) a personal characteristics questionnaire. All instructions were provided on paper. First, participants had to open the envelope containing the cognitive resources manipulation. Inside the envelope was a card with either a 2-digit or a 7-digit number on it, reflecting the high vs. low cognitive resources conditions, respectively. They were instructed to remember the number and told that they would be asked to reproduce it at the end of the experiment. Next, the envelope had to be put away, and participants were asked to taste the chocolate coated peanuts and fill out the chocolate preference questionnaire. Participants were randomly offered strongly attractive chocolate coated peanuts (strong temptation condition) or less attractive chocolate coated peanuts (weak temptation condition). The chocolate preference questionnaire was used to back up the cover story and included questions about mood and chocolate eating behavior. At the end of the chocolate preference questionnaire, participants were instructed to write down the number they had to remember, and last, they filled out the personal characteristics questionnaire. When finished, participants were debriefed, paid and thanked.

Materials

Cognitive resources manipulation. We used a classic manipulation of cognitive resources (e.g., Shiv & Fedorikhin, 1999), instructing participants to keep in mind either a 2- or a 7-digit number, which results in high versus low available resources, respectively.

With low resources, at least you eat the good stuff

Temptation strength manipulation. Two different secondary brands of chocolate coated peanuts were selected and pilot tested to represent weak and strong temptations. The pilot test was conducted among 38 female students (Age: $M = 19.7$, $SD = 1.9$; BMI: $M = 21.6$, $SD = 2.1$), who were presented with a bowl filled with either one of the products together with its package. Attractiveness was assessed with 1 item (“To what extent do you find this product attractive”) that was answered on a scale from 1 (*not at all*) to 7 (*very much*). Analyses revealed that indeed, one brand was considered more attractive ($M = 5.3$, $SD = 1.0$) than the other ($M = 3.7$, $SD = 1.6$); $F(1, 36) = 13.74$, $p = .001$.

Chocolate preferences test. In line with the cover story, participants filled out a preference questionnaire about the chocolate coated peanuts that were placed in front of them. The questionnaire started with 2 items assessing hunger (i.e., “To what extent do you feel hungry?” and “To what extent do you feel like a bite?”; $r = .94$, $p < .001$) that were answered on a scale from 1 (*not at all*) to 7 (*very much*). A mean hunger score was computed and used as a control variable. The remainder were filler items covering, for example, chocolate purchase habits (e.g., “How often a month do you buy chocolate?”) and chocolate consumption habits (e.g., “How often do you eat chocolate when you are hanging out with friends?”).

Consumption. At the start of the chocolate preferences questionnaire participants were instructed to taste the chocolate coated peanuts. They were explicitly told that they could eat as much as they liked, as each participant would receive a new bowl. Unbeknownst to participants, consumption was computed by weighing the bowls before and after the experiment.

Control variables. Weight concern was assessed by 1 item (i.e., “To what extent are you concerned about your weight”) that was answered on a scale from 1 (*not at all*) to 7 (*very much*). Furthermore, age, height, current and ideal weight were assessed by open-ended questions to determine participants’ BMI and the amount of weight they wanted to lose.

Results

Randomization check

Separate ANOVAs were conducted to test the effect of cognitive resources and temptation strength on weight concern and hunger. Weight concern did not differ between conditions; neither main nor interaction effects were found (p 's $> .12$). Unintendedly, however, hunger was not distributed evenly across conditions as a marginally significant interaction effect emerged ($p = .06$). Therefore, hunger was included as a covariate in the main analysis.

Main analysis

A 2 × 2 ANCOVA was conducted with cognitive resources and temptation strength as independent variables and consumption as the dependent variable. Hunger was included as a covariate. The analysis revealed no significant main effects, but as predicted a significant interaction effect emerged (see Figure 1); $F(1, 115) = 5.56, p = .02, \eta^2 = .05$. One-sided simple main effects revealed that participants with low cognitive resources who were in the strong temptation condition consumed marginally significantly more from the product ($M = 15.2, SD = 15.2$) compared to those in the weak temptation condition ($M = 10.8, SD = 8.0; p = .06$). However, among participants with high cognitive resources those in the weak temptation condition consumed more ($M = 17.7, SD = 13.6$) compared to those in the strong temptation condition ($M = 12.7, SD = 10.2; p = .04$).

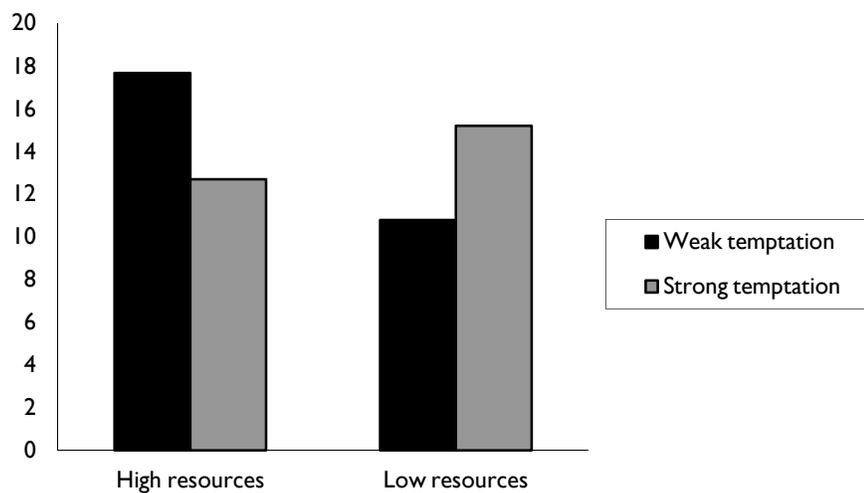


Figure 1. Number of grams consumed from weak and strong temptations in conditions of high and low cognitive resources.

Discussion

Theoretically, self-control literature allowed for two opposing predictions with regard to the effect of temptation strength on self-control performance. On the one hand, classic self-control theories such as the hot/cool system perspective supported the intuitively plausible prediction that strong temptations yield worse self-control performance compared to weak temptations. Strong temptations, compared to weak temptations, pose a greater appeal on the hot system, and resistance will therefore

require more effort. On the other hand, the critical level perspective suggests that strong temptations are better dealt with compared to weak temptations based on the idea that strong temptations can trigger counteractive self-control processes. It was proposed that both perspectives may apply in different situations, depending on the availability of cognitive resources. Cognitive resource availability was suggested as a moderator as it is known to be related to the extent to which behavior is guided by impulses (e.g., Hofmann et al., 2007). It was predicted that in the low cognitive resources-condition, when impulses play a large role in determining behavior, strong temptations would yield worse self-control performance compared to weak temptations. However, when cognitive resources were high, we predicted that counteractive control processes would overrule hedonic impulses, and strong temptations would yield better self-control compared to weak temptations.

The study supported the proposed interaction between cognitive resources and temptation strength. With low cognitive resources, participants consumed more from strong than from weak temptations. This effect is in accordance with the predictions derived from the hot/cool systems perspective stating that hotter temptations pose a greater challenge to effective self-control. The pattern was reversed when cognitive resources were high: in this case participants consumed more from weak than from strong temptations, replicating previous findings (e.g., Kroese et al., 2011). This effect can be explained by counteractive control theory and the critical level perspective suggesting that defensive self-control action is triggered by strong temptations more so than by weak temptations.

The current findings are a relevant addition to the literature, being the first step towards synchronizing two seemingly opposing viewpoints regarding the effect of temptation strength on self-control. Being able to show the predicted effects on an outcome measure as complex as actual eating behavior gives credibility to the proposed underlying processes.

Another strength of the current study was that the manipulation of temptation strength was quite subtle, through the use of two similar products which only differed on perceived attractiveness. Though subtle, the distinction between weak and strong temptations was sufficiently pronounced such that participants reported different ratings of attractiveness for the two products without having the opportunity to compare them (i.e., all participants in both pilot studies and in both experiments only saw either the weak or the strong temptations).

It would be interesting to see whether the effect still holds when participants are able to compare both products. It may be the case that, when aware of a difference in temptation strength, people are less likely to – irrationally - consume more from the weak temptation compared to the strong temptation.

One seeming limitation of the current study may be the specific population from which our sample was drawn (i.e., young, weight-conscious females). However, we would like to stress that our hypotheses, particularly those derived from counteractive control theory and the critical level perspective, only apply to populations in which unhealthy food can be considered a true temptation. That is, temptations need to be attractive as well as forbidden, or in conflict with a (weight watching) goal. Young females are known to be concerned about their weights (Wardle et al., 2004), representing an excellent group to test the current predictions. That being said, it would be interesting to replicate the current findings in other populations and in the context of different self-control conflicts.

Furthermore, given that weight consciousness is believed to be a prerequisite for the current effects to appear, we would expect to find an interaction effect between weight consciousness and temptation strength on self-control as well: For weight conscious people (with high cognitive resources, that is), counteractive control processes and the critical level perspective would apply, leading them to consume more from weak than from strong temptations. For non-weight conscious people, however, we would predict that counteractive control processes do not play a role and consumption will be greater from strong than from weak temptations, in line with hot/cool system theory.

Another line for future research would be to investigate the underlying processes that are assumed to direct the current findings. In particular, we predict that our behavioral outcome patterns could be traced back to the mental activation of the hedonic eating goal versus the weight watching goal. Congruent with the critical level perspective, previous work has already shown that the mental accessibility of the weight watching goal in weight-conscious participants was enhanced (Kroese et al., 2011), and that the accessibility of the hedonic eating goal was inhibited (Geyskens et al., 2008) after exposure to strong but not weak temptations. It can be assumed that participants in these studies had high cognitive resources (i.e., they were not under cognitive load), although this should be verified more explicitly in future research. Furthermore, it should be investigated whether, under circumstances of low cognitive resources, the effect of temptation strength on the mental accessibility of the weight watching goal and the hedonic eating goal is reversed.

To conclude, the current studies provide a first step towards reconciling two seemingly opposing theoretical viewpoints on the role of temptation strength in self-control processes. Next to theoretical relevance, practical implications can be drawn as well. That is, people should hold onto their intuition to particularly fear strong temptations, but only in situations when cognitive resources are low. Whenever resources are high, paradoxically, it is the weak temptations that can be most dangerous. Put otherwise, with high resources people may behave as ironic as to eat most from the temptation they like the least, whereas with low resources, at least they will eat most from their favorite treats.

Chapter 6

“Instant success”: Turning temptations into cues for goal-directed behavior

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Abstract

Contrary to lay intuition, Counteractive Control Theory posits that tempting food cues can help individuals to act in accordance with their long-term dieting goal. However, studies have shown that temptations trigger goal-directed behavior only in successful but not in unsuccessful self-regulators. The aim of the present study was to test whether it is possible to create facilitated temptation-goal associations in unsuccessful dieters using implementation intentions (e.g., “If I see or smell chocolate then I will follow my goal to diet”) and whether this indeed stimulates more successful self-regulation. It was found that implementation intentions linking a temptation to a dieting goal lead to self-perceived improved resistance to (Study 1) as well as reduced consumption (Study 2) of tempting snacks compared to a control condition. Moreover, Study 2 revealed that the reduced snack consumption was indeed related to facilitated temptation-goal associations in participants who had formed implementation intentions.

Whether or not someone will be successful at long-term goal attainment is largely dependent on his or her ability to deal with interfering temptations (e.g., resisting a tempting chocolate cake when trying to lose weight). By definition, temptations are in conflict with a long-term goal while at the same time hedonically appealing (e.g., Kroese, Evers & De Ridder, 2011). Ample literature has documented how the presence of temptations can frustrate goal attainment, especially in cases where self-control resources are reduced (e.g., Baumeister & Heatherton, 1996; Muraven & Baumeister, 2000). For example, the Goal Conflict Model (Stroebe, Mensink, Aarts, Schut, & Kruglanski, 2008) suggests that food temptations activate the hedonic eating goal and simultaneously inhibit the dieting goal, for activation of one goal inhibits other conflicting goals. Given that food temptations are omnipresent in our Western obesogenic environment (French, Story, & Jeffery, 2001), dieters seem to face difficult challenges when trying to stick to their goals.

However, an opposing line of evidence based on counteractive control theory (Trope & Fishbach, 2000), paints a different picture by suggesting that temptations may assist, rather than inhibit, long-term goal congruent behavior. In their Counteractive Control Theory, Trope and Fishbach (2000) propose that temptations, signaling a threat toward long-term goals, automatically activate goal-directed behavior to avert the threat. A classic example of a study in support of Counteractive Control Theory for example showed that when individuals are presented with tempting food items, such as chocolate or cookies, their long-term goal to diet becomes more strongly mentally accessible compared to a neutral control condition (Fishbach, Friedman, & Kruglanski, 2003). In a similar vein, other studies in support of Counteractive Control Theory have shown that temptations boosted goal importance and intentions to diet (Kroese, Evers, & De Ridder, 2009), as well as actual goal-congruent behavior (Fishbach et al., 2003; Kroese et al., 2009).

Yet, despite their obvious adaptive value, counteractive control processes are rather counterintuitive. It is clear from both research and practice that temptations do not in all cases trigger goal-directed behavior, but, in line with the Goal Conflict Model, often yield indulgence. Indeed, counteractive control processes have been found to be moderated by several factors. For example, exposure to temptations was found to lead to goal activation only for certain temptations: only when temptations were strong (e.g., very attractive looking chocolate cakes, Kroese et al., 2011; or temptations that were available for consumption, Geyskens, DeWitte, Pandelaere, & Warlop, 2008) and not when temptations were weak (e.g., not so attractive looking chocolate cakes, or temptations that were not available for consumption) did they trigger the long-term goal to diet. In addition to qualities of the temptations, personal qualities also moderate counteractive control processes: It was found that successful dieters, but not unsuccessful dieters showed a facilitated mental association between food temptations and dieting goals (Fishbach et al., 2003; Papies, Stroebe & Aarts, 2008).

As the quality of temptations people encounter is not very amenable to change, the latter moderating factor (i.e., weight watching success) is interesting in light of a search to help individuals improve their resistance of temptations. The relation between successful self-regulation and a facilitated mental association between temptations and goals renders an interesting starting point for self-regulation interventions. Specifically, as for unsuccessful dieters temptations appear to trigger indulgence (in support of the Goal Conflict Model) rather than restraint (as would be predicted by Counteractive Control Theory), this is a population in which trying to create counteractive control processes would be particularly worthwhile.

Such an attempt is warranted not only from an applied perspective, but also from a theoretical perspective. To date, previous research has focused almost exclusively on whether temptations trigger impulsive behavior or activate long-term goals, and on the factors moderating these processes. Whether or not, under certain circumstances, indulgence or restraint was triggered was generally the end-point of studies on temptations. However, research investigating how we may intervene in these processes and create mental temptation-goal associations among individuals for whom temptations generally undermined their self-regulatory processes is lacking. In other words, little has been done to investigate whether unsuccessful dieters can become successful dieters by creating mental temptation-goal associations, and thus counteractive control processes. In view of this lack of research, investigating the possibility of creating mental association between temptations and goals among unsuccessful dieters is the topic of the present studies.

A number of techniques that may strengthen mental associations between two constructs have been reported in the literature. In principle, we suggest that any such method (e.g., associative learning, (evaluative) conditioning, or implementation intentions) could be used to create an association between temptations and goals. For the current paper, however, we chose to focus on implementation intentions, mostly because if this technique were successful, it would provide a very simple tool for promoting counteractive control processes among unsuccessful dieters.

Implementation intentions are known as simple action plans that link situation X to behavior Y through a predefined if-then format: "If situation X occurs, then I will perform behavior Y." (Gollwitzer, 1993; 1999). These specific plans have been found to have robust and beneficial effects on promoting a wide range of health behaviors, such as increasing vitamin C intake (Sheeran & Orbell, 1999), exercising (Milne, Orbell, & Sheeran, 2002), performing breast self-examination (Orbell, Hodgkins & Sheeran, 1997), and reducing unhealthy snack intake (Adriaanse, De Ridder, & De Wit, 2009).

Two underlying mechanisms that make this planning strategy effective have been identified. First, by specifying a critical situation in advance, this situation becomes highly accessible in memory and is more likely to be recognized as a good opportunity to act on

one’s intentions when it is encountered (e.g., Parks-Stamm, Gollwitzer & Oettingen, 2007; Webb & Sheeran, 2004). Moreover, by using an if-then format to link this situation to a goal-directed response, a strong mental association is created between situation X and behavior Y, such that situation X *automatically* triggers the desired behavior Y (e.g., Bayer, Achtziger, Gollwitzer, & Moskowitz, 2009; Cohen, Bayer, Jaudas, & Gollwitzer, 2008; Gawrilow & Gollwitzer, 2008; Webb & Sheeran, 2007; 2008). Making use of this underlying mechanism, we aim to apply the implementation intentions technique to our current objective of strengthening the mental association between temptations and goals.

The current research provides a relevant addition to the literature in two ways. First, to the best of our knowledge we are the first to try to strengthen counteractive control processes (i.e., temptation-goal associations) in such a direct manner. Previous research has assessed the mental accessibility of a long-term goal after being primed with temptations. No attempts have been made, however, to actively *create* these types of adaptive counteractive control associations. Second, we extend the work on implementation intentions by deviating from the regular content of the plans specifying a *situation* and a *behavior*. Instead, our participants formulated plans specifying a *temptation* and a *goal*. As previous research has indicated that implementation intentions that specify which goal-directed behavior to perform are effective only among individuals who are motivated to attain the overarching goal (Sheeran, Webb & Gollwitzer, 2005), our approach of activating *goals* would be particularly effective in cases where temptations would normally inhibit the goal (and general implementation intentions thus would not be effective).

Overview of Studies

We conducted two studies to test our hypotheses that temptation-goal implementation intentions specifying “If I see or smell [a food temptation], then I will follow my goal to diet” would lead to facilitated temptation-goal associations (i.e., counteractive control mechanisms) and reduced temptation consumption. The aim of Study 1 was to show that temptation-goal implementation intentions, incorporating idiosyncratic temptations, yielded improved resistance to the specified temptation during the following week. Moreover, we tested the prediction that this particular technique would be most beneficial to those who had previously been unsuccessful dieters. In Study 2, then, we aimed to test the cognitive effect underlying the behavioral outcomes. That is, we predicted that temptation-goal implementation intentions would yield a facilitated mental association between temptations and the goal to diet, as assessed using a primed lexical decision task. In addition, we aimed to relate the cognitive effects to self-reported behavioral outcomes. Both studies were conducted with young female college students, as this is a group known to have bad snacking habits (e.g., Gores, 2008) and to be concerned about their weight (e.g., Wardle, Haase, & Steptoe, 2006). The goal ‘to diet’ in our studies

refers to the reduction of unhealthy food intake, without necessarily involving the intention to lose weight.

Study I

Methods

Participants. In total, 83 participants completed the study. Data from participants with a Body Mass Index (BMI) lower than 18 ($N = 3$) or higher than 30 ($N = 1$) were excluded from all analyses, because obesity and being underweight have been related to abnormal responses to food (e.g., Forman-Hoffman, 2004; Stice, Spoor, Ng, & Zald, 2009). The final sample consisted of 79 women with a mean age of 21.1 years ($SD = 2.2$) and a mean BMI of 21.7 kg/m^2 ($SD = 2.5$).

Design and procedure. Participants were randomly assigned to either the implementation intention condition or the control condition. The experiment consisted of four parts: a) the listing of a personal temptation; b) baseline questionnaires; c) the experimental manipulation; and d) follow-up questionnaires after one week.

On the recruitment flyers as well as upon arrival at the lab, participants were told that the goal of the experiment was to help them eat healthier, and that inclusion criteria involved being motivated to eat more healthily. Only individuals with the intention to eat healthy were recruited as previous research has indicated that this is a prerequisite for establishing counteractive control processes (Fishbach et al., 2003). Each participant was seated at an individual desk behind a desktop computer. All instructions for the listing of a personal temptation, the questionnaires, and the experimental manipulation were provided through a computer task.

After their completion of this part of the experiment, participants were instructed to keep track of their snacking behavior for the next seven days, as they would get questions about it when they returned to the lab next week. This was done to further explicate that the goal of the present study was to eat more healthily in the coming week and to increase the reliability of the self-report follow-up measures. One week after the computer experiment participants came back to fill out a follow-up questionnaire in which they reported how successful they had been in reducing the intake of their personal temptation. After this, participants were either rewarded with either €12 or course credits.

Materials.

Personal temptation. All participants were prompted to list a personal temptation, which was defined as “an unhealthy snack that you really like but that you would rather eat less of” (i.e., something that is attractive and in conflict with the dieting goal; Kroese et al., 2011). For participants in the implementation intention condition, the personal temptation was later used in the if-part of their plan.

Questionnaires.

Intention. Four questions were asked to assess diet intentions of the participants: “I (am) determined/intend/want/expect to diet the next period of time”. The items were answered on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Intention was assessed before (Cronbach’s $\alpha = .97$) and after (Cronbach’s $\alpha = .98$) the implementation intention manipulation to allow for ruling out the possibility that our manipulation had any motivational effects.

Self-regulatory success. Dieting success was assessed by three items asking to which extent participants a) found it difficult to stay in shape (reverse coded), b) were successful in losing weight and c) were successful in watching their weight (cf. Fishbach et al., 2003; Cronbach’s $\alpha = .64$)¹. The items were answered on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*).

Temptation attractiveness. The attractiveness of temptations was assessed to make sure that the personal temptations provided by participants were considered equally tempting across conditions. Attractiveness of the personal temptations was assessed with 3 items (e.g., “To me, [personal temptation] is a temptation”; Cronbach’s $\alpha = .65$) that were answered on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*).

Demographics. Age, height, current and ideal weight were assessed by self-report.

Experimental manipulation. The experimental manipulation took place during the computer experiment. After filling out the baseline questionnaires, the intention “This week I will watch my weight!” was visible on the screen for both the experimental group and the control group. Participants were instructed to repeat this intention for themselves. This was done to make sure that the goal intentions did not differ across conditions and were strong in all participants. After this, the control group had completed the experiment, whereas the experimental group was instructed to create a specific plan to stick to their dieting goal by creating an implementation intention: “If I see or smell [personal temptation], then I will follow my dieting goal”. Participants were instructed to retype the plan on the screen. On the next screen the implementation intention was shown again and participants were instructed to mentally repeat the plan. After 30 seconds the next screen appeared, where participants were asked to type in their implementation intention once more. Next, their motivation to act on the implementation intention was measured by the following statement: “I am motivated to follow my plan” to which participants could respond on a seven-point scale ranging from 1 (*not at all*) to 7 (*extremely*).

¹ As a confirmation of the validity of our measure of self-regulatory success, Pearson’s correlations between self-regulatory success and BMI revealed a significant negative association between the two; $r = -.44$, $p < .01$, indicating that successful self-regulators indeed had lower BMIs compared to unsuccessful self-regulators.

Follow-up questions.

Self-perceived improvement. After one week, three items were used to assess self-perceived improvement, which constituted our main dependent variable (cf. Adriaanse et al., 2010; Cronbach's $\alpha = .67$). Participants were asked "Compared to the week before you participated in the experiment, a) how often did you succeed in resisting your personal temptation during the past week; b) how well did you succeed in resisting your personal temptation during the past week; and c) how often did you give in to the temptation during the past week [reverse coded]." Items could be answered on a scale from 1 (*never/ not at all*) to 7 (*very often/ very well*).

Control variables. Reflecting possible demand characteristics, we assessed participants' seriousness and dedication to reduce their personal temptation consumption (cf. Adriaanse et al., 2010): "How serious were you about reducing your intake of [personal temptation]" and "How dedicated were you to reduce your intake of [personal temptation]". These items could be answered on a scale from 1 (*not at all*) to 7 (*very much*).

Results

Descriptives and randomization check. Both before ($M = 4.1$, $SD = 1.9$) and after the manipulation ($M = 4.3$, $SD = 1.6$), participants reported to have moderately strong intentions to diet. A repeated measures ANOVA with Condition and Time as independent variables revealed no significant main or interaction effects ($ps > .20$), indicating that dieting intentions did not change for any condition after the manipulation.

The high mean scores for temptation attractiveness ($M = 5.8$, $SD = 0.9$) indicated that the instructions for specifying a temptation were successful. Furthermore, participants who made an implementation intention were strongly motivated to stick to their plan ($M = 4.9$, $SD = 1.7$).

To check whether randomization was successful, separate ANOVAs with Condition (implementation intention vs. intention only) as the independent variable and age, BMI, intention, and temptation attractiveness as the dependent variables were performed. None of the effects reached significance ($ps > .11$).

Control variables. To rule out demand effects, separate ANOVAs were conducted to test the effect of Condition on participants' reported seriousness and dedication to reduce the consumption of their personal temptation. None of the analyses yielded a significant effect of condition ($p's > .38$). However, it was found that self-regulatory success was marginally significantly correlated with dedication ($r = -.22$, $p = .06$), such that less successful dieters were more dedicated to reduce their temptation consumption. In addition, dedication was significantly related to the outcome variable of self-perceived improvement ($r = .50$, $p < .001$). Hence, it was decided to include

dedication as a covariate in the main analysis. Seriousness was not related to self-regulatory success ($p = .09$) nor to the outcome variable ($p = .45$).

Main Analysis. A regression analysis was conducted with self-perceived improvement as the dependent variable and dedication to reduce snack intake, condition, self-regulatory success and the interaction term of the latter two as predictors. Dedication was a significant predictor of self-perceived improvement, $\beta = .54$, $p < .001$. Condition had a marginally significant effect on self-perceived improvement, $\beta = .18$, $p = .07$, showing a trend for participants in the implementation intention condition to report higher self-perceived improvement compared to those in the control condition. The effect of self-regulatory success did not reach significance ($p = .10$). Most importantly, however, a significant interaction was found between condition and self-regulatory success; $\beta = -.32$, $p = .02$. Simple slopes analyses revealed that for participants scoring high on self-regulatory success (+ 1 SD from the mean), the effect of condition on self-perceived improvement was not significant ($p = .69$). For participants scoring low on self-regulatory success (- 1 SD), however, the effect of condition on self-perceived improvement was significant, $p = .004$. The interaction is depicted in Figure 1, showing that for participants who scored low on self-regulatory success, those in the implementation intention condition reported higher perceived improvement compared to those in the control condition.

Discussion

The results from Study 1 confirmed our hypothesis that unsuccessful dieters who formed a temptation-goal implementation intention indicated that they were better able to resist their personal temptations during the following week compared to controls. This study thus provides the first evidence that by means of a rather simple tool – implementation intentions - relatively unsuccessful dieters can be turned into more successful dieters according to their own perceptions. Although we propose that the underlying mechanism for this beneficial effect is that the implementation intention helped to create facilitated temptation-goal associations, the present findings do not provide empirical support for this conclusion. Therefore, the next step was to specifically test the cognitive effects of temptation-goal implementation intentions by showing that implementation intentions yielded facilitated temptation-goal associations, which in turn promoted self-regulatory improvement.

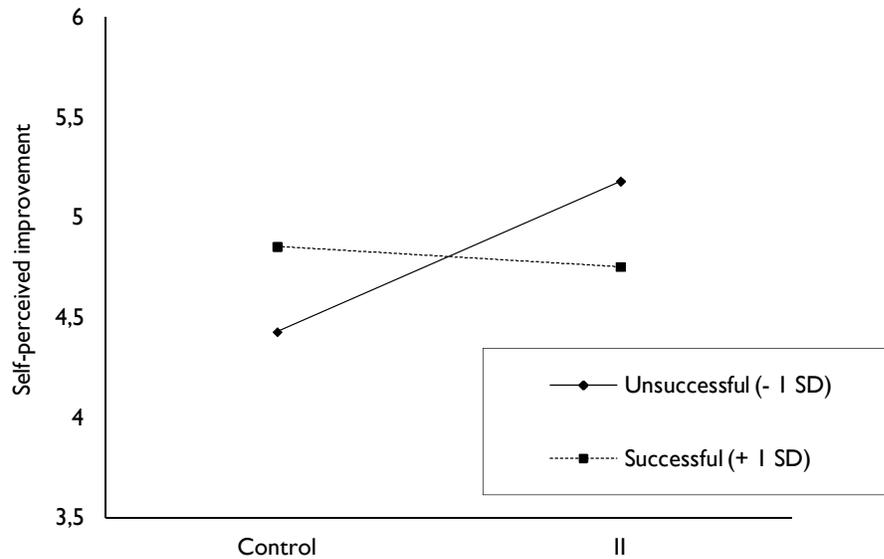


Figure 1. The effect of forming a temptation-goal implementation intention on self-perceived improvement for successful and unsuccessful dieters.

Study 2

Like in Study 1, participants were randomly assigned to either an implementation intention or a control condition. It was hypothesized that implementation intentions would lead to facilitated temptation-goal associations, and that any behavioral effects could be predicted by these cognitive effects. The cognitive temptation-goal association was assessed using a primed lexical decision task. To be able to keep the word length of primes equal in the critical and neutral trials (see the Materials section), it was deemed unfeasible to use idiosyncratic temptations in this study. Instead, we specified 'chocolate' as the temptation for all participants. This temptation was chosen as previous research has indicated that chocolate is a favorite snack for many women and is also considered bad for one's diet (e.g., Rozin, Levine, & Stoess, 1991). Another advantage of specifying chocolate as a temptation was that our behavioral measure could now be more specific: Rather than assessing self-perceived improvement, we assessed the self-reported number of chocolate portions consumed. Furthermore, now having theoretical as well as empirical support (see Study 1) that temptation-goal implementation intentions were particularly helpful for people who had previously been unsuccessful, we decided to recruit unsuccessful dieters only (i.e., those who feel unable to resist chocolate as much as they would like).

Methods

Participants. We recruited 57 female participants who would like to eat less chocolate, but who were generally unsuccessful in diminishing their chocolate consumption. For similar reasons as in Study 1, we excluded one participant who was underweight (BMI < 18). The final sample consisted of 56 participants with a mean age of 20.7 ($SD = 2.4$) and a mean BMI of 22.0 ($SD = 2.3$)

Procedure and design. Participants were recruited through flyers asking for “women who would like to eat less chocolate but find it difficult to do so”. On their arrival at the lab, each individual was seated behind a desktop computer on which all instructions were provided. The experiment consisted of four parts: a) baseline questionnaires; b) the implementation intention manipulation; c) a lexical decision task; and d) a follow-up questionnaire that was filled out after seven days.

Material.

Baseline questionnaires. Dieting intentions before and after manipulation (Cronbach’s $\alpha = .97$ and $.98$, respectively), self-regulatory success (Cronbach’s $\alpha = .57$) and temptation attractiveness (Cronbach’s $\alpha = .78$) were assessed similar to Study 1. However, this time temptation attractiveness items focused on chocolate specifically. Furthermore, participants were asked “how many portions of chocolate did you consume on average per day during the past week”, to function as a baseline measure in our analyses. This question was open-ended.

Implementation intentions. Instructions for implementation intentions were the same as in Study 1, except that personal temptations were replaced by ‘chocolate’.

Primed lexical decision task. The lexical decision task consisted of 42 trials comprising a fixation cross (1000 ms), a prime word (50 ms), a backward mask (‘XXXXXXXX’, 500 ms), and a target letter string. The target letter string stayed on the screen until participants pressed the z- or the m-button to indicate that the target was a word or a non-word, respectively. Half of the 42 targets were nonwords, 18 were neutral words (e.g., hanging, pen, bell) and 3 were diet-related words (i.e., dieting, slim, thin). The temptation prime was the word ‘chocolate’ which was presented before each of the three diet-related targets. All other targets were preceded by neutral prime words that appeared three times during the task (just like ‘chocolate’ which appeared prior to each of the three diet-related words). The temptation and neutral primes were matched on word length, as were the diet-related and neutral targets. For the analyses, mean reaction times to diet-related words and to neutral words were computed, including only trials that participants responded to correctly. Extreme reaction times ($> 3 SD$ from the mean) were set to missing. Furthermore, to correct for a non-normal distribution, natural log-transformed reaction times were used in all analyses. For the ease of interpretation, however, non-transformed means are reported.

Follow-up questionnaire.

Self-reported consumption of chocolate. After one week, participants were asked “How many portions of chocolate did you consume on average per day during the last week”. The question was worded similarly to the baseline measure of chocolate consumption, and was open-ended.

Control variables. Similarly to Study 1, we assessed how serious and dedicated participants had been to reduce their chocolate consumption to rule out demand effects. In addition, participants were asked “To what extent did you feel the experimenter wanted you to reduce your chocolate consumption” and “To what extent was the number of reported portions of chocolate consumed truthful”. All questions could be answered on a scale from 1 (*not at all*) to 7 (*very much*).

Results

Descriptives and randomization check. Before the manipulation, participants reported having moderately strong intentions to diet ($M = 4.2$, $SD = 1.7$), and a repeated measures ANOVA with Condition and Time as independent variables revealed that this intention was somewhat further enhanced after the manipulation ($M = 4.6$, $SD = 1.5$), $F(1,54) = 6.21$, $p = .02$, $\eta_p^2 = .10$. Importantly, the Condition \times Time interaction was not significant, indicating that this increase in intention did not differ between the two conditions, $p = .69$. Furthermore, chocolate was considered attractive as expected ($M = 5.1$, $SD = 1.1$).

To make sure that any effect of condition could not be accounted for by coincidental differences between the two groups, separate Analyses of Variances were conducted on age, BMI, diet intentions, attractiveness of chocolate, baseline portions of chocolate consumed, and self-regulatory success. No differences between conditions emerged (all p 's $> .15$), indicating successful randomization.

Control variables. To rule out demand effects, separate ANOVAs were conducted to test the effect of condition on all control variables (i.e., seriousness and dedication to reduce chocolate consumption, truthfulness of responses, and the extent to which participants felt the experimenter wanted them to reduce chocolate intake). None of the analyses yielded a significant effect of condition (all p 's $> .38$). Moreover, correlation analyses showed that none of the control variables significantly correlated with the outcome variable (all p 's $> .16$).

Temptation – goal association. To assess the effect of implementation intentions on the mental association between ‘chocolate’ and the goal ‘to diet’, we conducted an ANCOVA with mean reaction times to neutral words as a covariate and mean reaction times on temptation-goal trials as the dependent variable. The covariate was significant; $F(1, 53) = 61.33$, $p < .001$. A significant difference between conditions was found; $F(1, 53) = 5.58$, $p = .02$, $\eta^2 = .10$. Participants who made an implementation

intention ($M = 624$, $SD = 108$) were significantly faster to respond to diet-related words when primed with chocolate, compared to the control group ($M = 683$, $SD = 175$). A separate ANOVA testing the effect of condition on reaction times to neutral words revealed no significant difference between conditions, $F < 1$.

Cognitive and self-reported behavioral effects. As a first test of the behavioral effects of our manipulation, we conducted an ANCOVA testing the effect of condition on portions of chocolate consumed in the week following the manipulation, controlling for baseline portions of chocolate consumed. The covariate was significant; $F(1, 53) = 18.82$, $p < .001$. A marginally significant effect of condition on portions of chocolate consumed during the following week was found; $F(1, 53) = 3.57$, $p = .06$, $\eta^2 = .06$, indicating that participants in the control condition consumed more portions of chocolate per day ($M = 1.1$, $SD = 1.0$) compared to participants in the implementation intention condition ($M = .7$, $SD = .7$). However, as we specifically expected behavioral effects for individuals in whom a temptation-goal link was successfully created, a stronger test of our hypothesis was to assess the relation between the cognitive effects and the behavioral measure. To do so, we conducted a regression analysis including portions of chocolate consumed during the baseline week prior to the experiment in step 1, and reaction times to temptation-goal trials in the primed lexical decision task in step 2. The dependent variable was self-reported number of portions of chocolate consumed during the following week. Baseline portions of chocolate was a significant predictor ($\beta = .52$, $p < .01$), explaining 27.7 percent of the variance. More importantly, however, reaction times to temptation-goal trials had an additional significant effect on chocolate consumption in the following week ($\beta = .28$, $p = .02$), indicating that lower reaction times (i.e., faster responses to diet-related words), were related to less chocolate consumption. The additional explained variance (R^2 changed) was 8.0 percent.

Discussion

The results were in line with our hypothesis that temptation – goal implementation intentions, compared to goal intentions only, lead to a facilitated mental association between, in this case, chocolate and the dieting goal. Moreover, this mental association was found to be related to self-reported chocolate consumption such that more facilitated temptation-goal associations were related to fewer portions of chocolate consumed during the following week.

General Discussion

Two studies provided empirical support for our hypothesis that, compared to a control condition, using implementation intentions can yield facilitated temptation-goal associations which in turn stimulate successful self-control. It was shown that temptation-goal implementation intentions yielded effects on a cognitive (Study 2) as well as a

behavioral level. Notably, our behavioral measures tapped into participants' subjective evaluation of improvement (Study 1) as well as a more concrete outcome (i.e., self-reported portions of chocolate consumed; Study 2). Being, to the best of our knowledge, the first attempt to create temptation-goal associations in unsuccessful dieters, the current findings are promising and have important theoretical as well as practical implications.

Activation of the long-term goal upon confrontation with temptations is an adaptive self-control mechanism, as described by Counteractive Control Theory (Trope & Fishbach, 2000). Prior research has identified an important individual difference factor (i.e., self-regulatory success; Fishbach et al., 2003; Papies et al., 2008) as a determinant of facilitated or inhibitory temptation-goal associations: Only successful self-regulators appeared to demonstrate counteractive control processes. It was still unclear, however, whether counteractive control processes were reserved for these 'lucky few' who were successful self-regulators, or whether temptation-goal associations were amenable to change within individuals. Our results suggest that facilitated temptation-goal associations not only are determined by individual differences, but also can actually be acquired through simple cognitive interventions. This implies that unsuccessful self-regulators are not doomed to fail: Using implementation intentions, they can become successful self-regulators.

Yet, although the current research may imply a causal direction for the relation between facilitated temptation-goal association and self-regulatory success (i.e., temptation-goal associations lead to success), we cannot rule out the possibility that this relation may be bidirectional. In other words, it may well be the case that repeated successful resistance of temptations leads to facilitated temptation-goal associations.

The current research also provides a relevant addition to the implementation intentions literature. Typically, implementation intentions have been applied to link a situational cue to a behavioral response. Although an impressive amount of literature supports the efficacy of this type of plan, the current approach of linking a temptation to a goal has two advantages. First, temptation-goal implementation intentions could be particularly useful in situations where the goal would normally not be active. For example, research on goal conflicts has shown that people tend to temporarily abandon their goal when they are confronted with temptations (Stroebe et al., 2008). Knowing that 'regular' implementation intentions are no longer effective when the goal is abandoned (Sheeran et al., 2005), reactivating the long-term goal in these situations is a promising way to achieving successful self-control.

Second, specifying a goal rather than an alternative behavior in the then-part of the implementation intention has the possible advantage of implementation intentions being more frequently applicable. That is, classic replacement implementation intentions tend to include a specific behavioral alternative to replace the unwanted response (e.g., "If I am watching television, then instead of a candy bar I will eat an apple", Adriaanse et al.,

2009). Although their specificity may help people to automatically perform the 'wanted' behavior, an obvious disadvantage of replacement implementation intentions is that the plan will fail if the behavioral alternative is unavailable (e.g., you ran out of apples). In the case of temptation-goal implementation intentions, however, this problem would not occur as people can make multiple behavioral choices as soon as their long-term goal is activated.

The current studies have some important methodological strengths. First, studies combining cognitive and behavioral measures are relatively rare. Mental associations and (presumably) related behavior are usually assessed in separate studies. The fact that the present research findings were not restricted to behavioral or cognitive effects, but concerned self-reported snack intake as well as the mental accessibility of the long-term goal is an improvement to other studies that reported either implicit measures, or overt behavior. A second methodological strength was the use of predefined temptations (Study 2) to allow for investigating the underlying mechanism, as well as idiosyncratic temptations (Study 1), to enhance the ecological validity of our studies. Last, the inclusion of strict control questions in both studies (e.g., intentions, seriousness and dedication to reduce unhealthy snack intake) allowed for the elimination of the possibility that the effects were driven by motivational differences between conditions.

One limitation of the current studies concerns the generalizability of our findings, as we included only participants with Body Mass Indexes between 18 and 30, with a majority of participants having BMIs in the healthy range (i.e., between 18 and 25 kg/m²). Hence, our findings cannot be generalized to overweight or obese women. In fact, it is plausible that obese participants would yield different effects, as they are known to differ from normal weight individuals in their responses to food cues (Stice et al., 2009), which was exactly the reason for excluding this group in the current studies. Furthermore, our samples consisted of young, highly educated women only. This population was deemed particularly suitable for the current research context, as the struggle with dieting goals is known to be particularly relevant to women (Wardle et al., 2006). Yet, theoretically, we have no reason to suspect that the underlying principles of our research would not apply to other populations. That is, creating associations between temptations and goals could be applicable to all different contexts in which self-control conflicts occur, such as being offered a cigarette when trying to stop smoking, or walking past the pub when having a pile of work to do.

Another limitation is the self-reported consumption of chocolate during one week, which could suffer from biases compromising its reliability. Research has shown that retrospective self-reported food intake may especially suffer from social desirability biases, such that participants who score high on social desirability measures tend to report lower than actual food intake (Hebert, Clemow, Pbert, Ockene, & Ockene, 1995). In our studies we explicitly controlled for social desirability or demand effects. In addition, we tried to

minimize the effect of potential bias by controlling for baseline measures (e.g., cancelling out participants' general tendencies to over- or underestimate chocolate consumption), and showed that intentions and motivation did not differ between conditions. So although it cannot be ruled out that participants may have underreported their unhealthy snack intake (nor, for that matter that all participants already slightly reduced their unhealthy snack intake as a result of monitoring their own behavior), we can be quite confident that underreporting did not differ between conditions. The obtained differences in unhealthy snack intake were therefore especially noteworthy. Yet, it would be interesting to investigate the effects of our manipulation on more objective behavioral measures.

In addition, future research is necessary to examine the long-term effects of temptation-goal implementation intentions to more thoroughly test the idea that unsuccessful self-regulators can be turned into successful ones. As the current behavioral effects were driven by automatic mental associations rather than willpower or other effortful processes, we would predict that our results would hold in the long run. That is, whereas willpower is known to be limited and depleted after multiple instances of successful resistance of temptations, automatic mental associations are not susceptible to such effects and instead are more likely to develop into habits. However, it should be noted that long-term self-regulatory success in the context of healthy eating is for many a complex and lifelong process.

A final remark is to be made with regard to the specificity of the effect. According to counteractive control theory (Trope & Fishbach, 2000), confrontation with a temptation leads to enhanced self-control, but not only with respect to that particular temptation. For example, when people are exposed to pictures of a chocolate cake as compared to a flower, they are not necessarily better at resisting chocolate cake per se, but are also more likely to choose a healthy over an unhealthy cookie on a subsequent occasion (e.g., Kroese et al., 2009). Thus, temptation exposure produces mental activation of the conflicting long-term goal, yielding enhanced self-control in any situation in which the goal is subsequently threatened. In the current studies, we examined subjective resistance and consumption of one specific temptation (i.e., a personal temptation in Study 1, and chocolate in Study 2), but theoretically the effect should generalize to other unhealthy snacks. For example, when you see a candy bar-ad on the train, you may be less likely to buy a cookie once you arrive at the station, because you have been reminded of your dieting goal. This theoretical suggestion has not received much specific attention in empirical work, though. If it is indeed found that the behavioral effects of temptation-goal implementation intentions are generalizable to unhealthy snacking in general, this simple intervention would be especially valuable from a practical point of view, adding onto 'regular' implementation intention interventions of which the specificity may compromise their applicability.

To conclude, the current studies are among the first to demonstrate that facilitated temptation-goal associations (i.e., 'counteractive control processes') can be created and in turn help unsuccessful self-regulators to become more successful at resisting temptations. Our findings are theoretically interesting but also promising from a more practical point of view: It is hopeful to see that unsuccessful dieters are not doomed, and that an easy intervention as such can yield actual 'instant success'.

Author Note

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Chapter 7

Summary and
general discussion

“It is good to be without vices, but it is not good to be without temptations”

– Walter Bagehot

The overall aim of this dissertation was to explore how and when temptations boost self-control. More specifically, we aimed to a) replicate and extend previous findings showing that temptations yield enhanced self-control on cognitive as well as behavioral measures; b) examine the role of temptation strength as a possible moderator of counteractive control processes; and c) explore whether facilitative temptation-goal associations could be established in people having trouble resisting temptations. In this chapter a summary of findings from the empirical chapters will be provided. In addition, we will reflect upon the current dissertation’s contribution to Counteractive Control Theory, as well as its theoretical and practical implications. Finally, limitations and suggestions for future research will be discussed before we present a final conclusion.

Summary of findings

In Chapter 2 it was demonstrated that temptations, compared to neutral stimuli, can indeed counteractively boost self-control processes. Two studies showed that participants who were exposed to pictures of temptations, as compared to those who were exposed to neutral pictures, reported to attach greater importance to (Study 2.1) and to have stronger intentions to behave in accordance with (Study 2.2) their healthy eating goal. Moreover, on a behavioral measure it was found that participants in the temptation condition made healthier food choices than participants in the control condition (Study 2.2). Hence, the studies provided support for counteractive control theory and extend previous findings to behavioral outcomes.

Chapter 3, then, set out to investigate the characteristics of the temptation itself that do or do not foster counteractive control processes. Specifically, based on the implications of counteractive control theory and the critical level perspective it was hypothesized that self-control processes would be boosted upon being exposed to strong but not weak temptations. Indeed, Studies 3.1 and 3.2 showed that the mental accessibility of the weight watching goal was inhibited in participants who were exposed to weak temptations, but remained active in participants who were exposed to strong temptations. Corroborating the findings on cognitive measures, Study 3.3 revealed that the effect of temptation strength on self-control processes was also translated into behavior: Paradoxically, participants who were presented with a moderately attractive chocolate cake (i.e., the weak temptation condition) consumed more of the cake as compared to participants who were presented with a highly attractive chocolate cake (i.e., the strong temptation condition).

In Chapter 4 the underlying mechanism for the paradoxical effect of temptation strength on self-control was studied. Based on the critical level perspective, it was

hypothesized that weak temptations are (unjustly) perceived to be less unhealthy compared to strong temptations. As a consequence, weight-conscious people will consume more from weak temptations than from strong temptations, as was also shown in Study 3.3. As predicted, three studies showed that weak temptations were perceived to be less unhealthy (Study 4.1 and 4.2) and contain fewer calories (Study 4.3) compared to strong temptations. Calorie estimates, in turn, were negatively related to consumption such that people consumed more to the extent that their calorie estimates were lower (Study 4.3). Hence, we indeed replicated our previous finding that people consumed more from weak temptations than from strong temptations (Study 4.4).

Still, our findings with regard to the effect of temptation strength on food consumption seem to be difficult to reconcile with mere intuition as well as with the implications derived from classical theories such as the hot/cool systems model which would predict that strong, rather than weak, temptations yield higher consumption. Chapter 5 aimed to unite these conflicting predictions by considering the role of cognitive resources (i.e., 'mental energy'), as this is a factor that is known to influence the extent to which behavior is guided by impulses. It was shown that when cognitive resources were high, participants consumed more from weak than from strong temptations, replicating our previous findings. However, when cognitive resources were low, the opposite pattern was found and participants consumed more from strong than from weak temptations. Hence, these results suggest that with low cognitive resources, counteractive control processes may be absent or overruled by hedonic impulses in terms of behavioral outcomes. At that point, then, 'classic' predictions based on the idea that temptations trigger the hot impulsive system and yield hedonic indulgence, and strong temptations more strongly do so, will apply. In this way, the two seemingly opposing predictions regarding the effect of temptation strength on self-control were shown to exist next to each other and to apply in different situations.

Finally, in Chapter 6, it was explored whether it was possible to install counteractive control processes (i.e., create cognitive temptation-goal associations) in dieters who had previously been unsuccessful. Dieting success was taken into account as an individual difference factor, as it had been shown in previous studies that counteractive control processes were only found in successful but not unsuccessful dieters. Implementation intentions were used as a tool to create mental associations. Indeed, Study 6.1 provided initial support by showing that unsuccessful dieters who made an implementation intention linking a personal temptation to their dieting goal (i.e., "If I see or smell [my personal temptation], then I will follow my dieting goal!"), compared to those in an intention-only control condition ("I will follow my dieting goal"), reported higher improvement with regard to resisting their personal temptation in the following week. In Study 6.2 it was shown that unsuccessful dieters who made an implementation intention linking a temptation (i.e., chocolate) to the dieting goal, as compared to those who only

formulated the intention to diet, indeed displayed facilitated mental accessibility of the dieting goal upon being primed with temptations, as assessed with a primed lexical decision task. Moreover, we were able to show that the strength of the cognitive temptation-goal association was related to actual chocolate intake in the following week. Hence, temptation-goal implementation intentions appeared to be a suitable tool to foster counteractive control processes in previously unsuccessful dieters, leading to 'instant success'.

Contribution to Counteractive Control Theory

This dissertation extends previous work on Counteractive Control Theory on several aspects. Counteractive control theory was only introduced approximately ten years ago, and research on this intriguing perspective on temptations and goals has been scarce. Hence, a first important contribution of our work is the replication of counteractive control effects, showing that temptations can indeed enhance goal-directed behavior, in Chapter 2. It is especially noteworthy that we were able to demonstrate counteractive control effects on a behavioral measure as subtle as choosing between two largely similar cookies of which one was considered healthier than the other. Compared to other studies employing food choice measures in which participants have to choose between more explicit healthy and unhealthy options, for example an apple or a candybar, our subtle cookie choice is deemed less sensitive to social desirability or demand effects, giving additional credibility to the findings and thereby importantly extending previous work.

Second, our studies highlight the role of temptation strength in counteractive control processes. Although Counteractive Control Theory suggests that the (anticipated) magnitude of obstacles standing in the way of long-term goal pursuit determines the level of self-control that is elicited in the sense that large obstacles (cf., strong temptations) require and thus elicit more self-control compared to small obstacles (cf., weak temptations), empirical evidence of this relation in the context of temptations was limited. Trope and Fishbach (2000) showed that the magnitude of short-term costs that people need to endure (i.e., doing something you don't like), for example, the level of discomfort of diagnostic tests, was associated with counteractive control processes such that moderate but not extremely small or extremely large anticipated costs elicited self-control. However, the effect of the magnitude of temptations that need to be resisted (i.e., not doing something you like) on self-control was not directly tested. As a first indication of empirical support, previous research had shown that self-control is elicited in response to temptations that are accessible for consumption ('actionable') but not in response to mere pictures of temptations ('inactionable temptations'; Geyskens, DeWitte, Pandelaere, & Warlop, 2008). Along the same lines, Coelho do Vale, Pieters, and Zeelenberg (2008) demonstrated that people consume more from small compared to large package sizes of

crisps. Our studies add to previous work by approaching temptation strength as a function of attractiveness, which comprises one of the two core dimensions in our definition of temptation. This conceptual operationalization of temptation strength allowed for a strict test of the theoretical implications that were put forward by counteractive control theory. In that sense, our studies were the first to directly establish the role of temptation strength and confirm that strong temptations elicit self-control to a larger extent compared to weak temptations, without involving other, possibly confounding, factors such as different modalities or portion sizes.

While we showed that strong temptations yielded better self-control outcomes compared to weak temptations, we did not set out to test for the inverted U-shape function that would describe the relation between temptation strength and self-control according to Counteractive Control Theory. That is, we did not investigate the suggestion that 'extremely strong' temptations would no longer elicit counteractive control processes. It should be noted in this regard that temptation strength as a factor is difficult to standardize and is often operationalized relatively: One temptation can be stronger than the other, but no uniform scale of temptation strength exists. While others have theorized that 'real' food temptations that are available for consumption (i.e., 'actionable temptations') are strong, whereas pictures of food temptations (i.e., 'inactionable temptations'; Geyskens et al., 2008) can be considered weak, we showed differential effects of weak and strong temptations also within these modalities, employing word primes, texts, and pictures as well as real products as temptation manipulations. As mentioned before, to operationalize temptation strength we used our conceptual definition stating that temptation strength is determined by the product of its attractiveness and its forbiddenness (Kroese et al., 2011). Hence, by varying the attractiveness of the temptations while keeping the forbiddenness constant, we were able to distinguish weak and strong temptations. It is important to note that we did not vary the forbiddenness of temptations, as this would interfere with our measures of goal activation: As the forbiddenness of temptations in the current context is reflected by the extent to which they are in conflict with the weight watching goal (e.g., foods with more calories would be more forbidden), manipulating this factor may directly prime weight watching concerns, making it difficult to distinguish associative priming effects from functional self-control processes when assessing weight watching goal activation. That being said, although we would indeed predict that extremely strong temptations do not activate counteractive control processes, it is difficult to establish what exactly constitutes an 'extremely strong' temptation. It is relevant, however, to acknowledge that there may be situations in which the temptation is too overwhelming to trigger successful self-control. In fact, we suggest that it would not be adaptive to perform self-control attempts in these situations, as they would likely be without chance. Similarly, there may be situations in which people do not even attempt to control their desire as they feel licensed

to indulge, especially when confronted with strong temptations (De Witt Huberts, Evers, & De Ridder, in press; 2011). In these cases we would not expect to find counteractive control processes, and even less so to the extent that temptations are strong.

Third, the current research provides insight into the malleability of counteractive control processes. We were the first to show that the working of counteractive control processes, or at least their behavioral outcomes, may depend on the availability of cognitive resources such that the effect of temptation strength on self-control as derived from counteractive control theory was only found when cognitive resources were high, whereas a reversed effect was found when resources were low. The extent to which counteractive control processes still function when cognitive resources are low remains an interesting avenue for future research. As far as counteractive control processes are automatized, according to the theory no moderating effect of cognitive resources would be expected. Still, our findings with regard to the interaction between cognitive resources and temptation strength may suggest otherwise, although it is noted that this effect was only demonstrated in a single study and only on a behavioral outcome measure. We will return to the role of cognitive resources in counteractive control processes in our suggestions for future research.

Another perspective on the malleability of counteractive control processes comes from the evidence that facilitative temptation-goal associations can be *created* in previously unsuccessful self-regulators, increasing their subsequent success at resisting temptations. This novel insight (see also Van Koningsbruggen, Stroebe, Papies, & Aarts, 2011, who provided initial evidence for the effectiveness of implementation intentions linking temptations to the conflicting goal) provides a relevant contribution to the literature by showing that our knowledge concerning adaptive counteractive control mechanisms can actually be used to develop fruitful interventions, rather than merely being observed among those who are successful self-regulators.

Theoretical Implications

Returning to the broader framework of this dissertation, a number of theoretical considerations with regard to the topic of temptations and self-control should be discussed. First of all, our research demonstrates that, counterintuitively, temptations are not always bad. In fact, someone who is watching her weight may be better off being confronted with temptations from time to time, as it will remind her of her goal and boost self-control. Although Counteractive Control Theory may have raised many questions, the idea that self-control processes will be activated upon being exposed to temptations is quite sensible. That is, self-control will only be observed when it is necessary to display (i.e., when facing temptations). Moreover, counteractive control mechanisms automatically activating the long-term goal upon confrontation with temptations, without requiring conscious effort, are very adaptive as they allow for successful goal pursuit. It should be

kept in mind that people are not constantly struggling in a world full of temptations, but are very often well able to pursue their goals when they are, for example, finishing their work instead of watching funny movies on the internet all day, putting money in their savings account instead of buying a new pair of shoes every month, or declining alcoholic drinks when they are the designated driver. If all of this would require much effort, it would be more surprising that many people function so well than it is that many people have trouble weight watching. In addition, it should be noted that the paradoxical effects of temptation strength on self-control may be counterintuitive but not illogical, simply because strong temptations require more self-control compared to weak temptations.

At first sight, however, Counteractive Control Theory seems to be in contrast with classic self-regulation theories suggesting that temptations directly trigger hedonic impulses and require effortful control to be resisted (i.e., not encountering temptations would always be better). Importantly, though, we argue that the two perspectives should be seen as complementary rather than contrasting. Whereas classic research has focused mostly on instances of self-control failure, Counteractive Control Theory illustrates self-control success. That is, temptations can activate 'hot' hedonic impulses as well as the 'cool' long-term goal with successful resistance being more likely in the latter case. In other words, whereas self-control theory and dual process models mostly focus on an effortful reflective route towards resistance of temptations, Counteractive Control Theory considers an alternative automatic pathway. From a broader point of view it could be argued that the classic dual process models of self-regulation may no longer suffice. Though to some extent implicit, these models roughly suggest that there are two outcomes when confronted with temptations, and each outcome is reached through a different route: Temptations either lead to indulgence through the elicitation of hedonic impulses, or, when enough resources are available, temptations will be resisted based on reflective considerations that counter the impulse. However, we argue that resistance of temptations is not always a rational consideration, and that indulging temptations is neither always driven by impulses. Instead, alternative routes are possible, leading impulsively (or automatically) to resistance of temptations, or leading reflectively (based on a conscious decision) to indulgence. The impulsive-resistance route is illustrated by Counteractive Control Theory and the work in the current dissertation: Temptations were shown to directly boost self-control and yield goal-directed behavior even more so than neutral control stimuli. Also, recent research has provided evidence for the reflective-indulgence route, showing that people actively engage in finding justifications for subsequent indulgence (De Witt Huberts et al., in press). This exciting novel perspective on possible roads toward self-regulatory failure or success warrants future research as well as a theoretical reconsideration of self-regulation models, for example to distinguish individual differences and/or situational characteristics that determine which road is taken upon confrontation with temptations.

Practical Implications

Besides contributing to theoretical knowledge on temptations and goals, the current research also has some practical implications. Most importantly, our studies suggest that temptations do not need to be avoided at all times. People are not helplessly overwhelmed by their hedonic impulses, but are well able to resist temptations when counteractive control processes are activated. Moreover, we showed that temptations can provide a self-control boost such that people who are exposed to food temptations actually make healthier choices compared to those who are not exposed to temptations. In addition, our studies imply that people should especially be alert towards weak temptations. As people tend to have an 'attractive = unhealthy' bias, through which the unhealthiness of less attractive food products tends to be underestimated, weak temptations fail to 'ring the alarm bells' to signal the need for defensive action. Hence, paradoxically, people are more likely to indulge in weak temptations as compared to strong temptations which, by being perceived as a greater 'threat', are more likely to be successfully counteracted. A similar bias is also reflected in findings showing that people tend to overeat from foods that are presented as 'low-fat' (e.g., Wansink & Chandon, 2006), or as 'healthy' (e.g., Provencher, Polivy, & Herman, 2009; Finkelstein & Fishbach, 2010). Presumably, these products appear to be minor threats towards the weight watching goal, and hence do not signal the need for self-control. In this view, dieters should not try to help themselves by only buying their least favorite cookies in the hopes of eating less, as it is possible (but foolish) that they will eat just as much or even more from those than from their most favorite ones. Altogether, it may be comforting to see that people tend to possess adaptive mechanisms that enable them to resist temptations.

Limitations

Before coming to conclusions, it should be noted that the research in this dissertation suffers from a number of limitations. First of all, the samples we used in our studies were drawn from a selective population of young, highly-educated females. Importantly, young females represent an ideal population for the current context of our studies, as a large portion of this group is known to be concerned about her weight (Wardle, Haase, & Steptoe, 2006). Besides having a common weight watching goal, young females also appear to share a love-hate relationship with chocolate (Wansink, Cheney, & Chan, 2003; Rozin, Levine, & Stoess, 1991). Therefore, our temptation manipulations, often containing chocolate, were particularly appropriate for this homogenous group of young females. Among people who do not have a weight watching goal, or who would not experience temptation, we would not expect to find the same counteractive control effects. Yet, we would expect to find similar results in different contexts involving a temptation (e.g., going out for drinks) that is in conflict with a long-term goal (e.g., writing

a dissertation). Hence, it is essential to replicate the current findings using different samples and research contexts.

A second limitation is that all studies were conducted in lab settings. In order to prevent experimenter demand effects we used cover stories hiding the actual purpose of the studies, and employed dependent measures that were either covered by filler items (e.g., our assessment of goal importance in Study 2.1) or even completely unknown by participants (e.g., participants were unaware that the amount of food they consumed was measured in Study 3.3, 4.3, 4.4, and 5.1; and they did not know the actual purpose of the lexical decision tasks used in Study 3.1, 3.2, and 6.2). Hence, we were confident that participants were not aware of our specific hypotheses and could not adjust their behavior accordingly. Still, we should acknowledge the possibility that participants behave differently in an unnatural lab setting than they would at home, or in the 'real world'. Although the controlled circumstances in the lab are ideal to isolate the specific processes that were under study, it is essential to investigate whether the same behavioral effects can also be observed in natural environments. We will return to this point in our suggestions for future research.

Finally, it should be noted that our manipulations of temptation, or probably temptation manipulations in general, are sensitive to individual differences between participants. That is, the extent to which something is perceived as tempting may differ as a function of individual preferences and experiences but also situational states such as deprivation (e.g., hunger) or mood. Although we did employ idiosyncratic temptations in Study 6.1, this was unfortunately not possible in other studies due to practical constraints. As mentioned before, reducing individual differences was one of our main reasons for conducting our studies in a homogenous group of participants, and using chocolate, which was found to be most women's favorite treat in prior research (Wansink et al., 2003), as the temptation in most studies. Furthermore, we assessed hunger levels to be able to control for this factor in our analyses. Nonetheless, while the differences between conditions that were found in our studies are still valid, it is important to realize that the level of temptation that participants experienced may have varied between individuals.

Suggestions for Future Research

Keeping in mind that the work on Counteractive Control Theory is still young, the current studies give rise to many questions for future research. First of all, as touched upon before, translating the current knowledge on counteractive control processes towards the 'real world' is an important step in exploring the ecological validity of our and others' findings. For example, it would be interesting to see whether someone who walks past a billboard advertising ice cream would be less likely to enter the snack bar at the end of the street, or whether a dieter who posts a picture of chocolate cakes on her fridge will have less trouble refraining from fatty foods. More specifically, we suggest that it is

important to investigate what happens to people's long-term goals upon *repeated exposure* to temptations. In real life, unlike in the experiments that have been conducted so far, people may be confronted with temptations multiple times a day: Will counteractive control processes still show after the third or tenth confrontation with temptations, or will the mechanism wear out after multiple attempts? According to self-control theory, it would be predicted that repeated exposure to temptations increases the likelihood of indulgence as self-control resources will get depleted. However, this would only apply when cognitive resources are involved in counteractive control processes, which is theoretically unlikely but yet unknown (see also our next point for future research). Alternatively, recent insights point towards the possibility that self-control performance gets better after repeated attempts, as long as similar self-control dilemmas are involved: That is, self-control will decrease when two dissimilar tasks are involved (e.g., solving anagrams and resisting temptations, such as repeatedly demonstrated in ego depletion research), but it will be enhanced when consecutive self-regulatory decisions involve similar self-control processes (e.g., resisting temptations; Dewitte, Bruyneel, & Geyskens, 2009). Thus, given the pressing need for knowledge from a societal and ecological perspective on the one hand, and the remaining theoretical and empirical ambiguity on the other, future research on repeated exposure to temptations is most relevant and deserves high priority.

A related point for future research is the role of cognitive resources in counteractive control processes. Although the automatic nature of the temptation-goal associations as demonstrated by Fishbach and colleagues (2003) suggests that the mechanism functions without the need for cognitive resources, this has never been empirically tested. Instead, our research (Chapter 5) suggests that the availability of cognitive resources moderates at least the effect of temptation strength on self-control. Whereas our findings regarding the effect of temptation strength on self-control were in line with the predictions based on Counteractive Control Theory when cognitive resources were high, this was no longer the case (in fact, the pattern of results was reversed) when resources were low. Hence, the current work implies that cognitive resources affect the working of counteractive control processes. More research is needed, however, to be able to more firmly draw this conclusion. It could also be worthwhile to investigate the relation between implicit cognitive effects and behavioral outcomes in this regard. It is noted again that Counteractive Control Theory predicts the activation of (cognitive) self-control mechanisms in reaction to temptations but is mute about the behavioral outcomes. It is possible that in certain cases, for example when cognitive resources are low, counteractive control processes are not translated into behavior as hedonic impulses will have greater room to overrule self-control attempts. This interplay between counteractive control processes and hedonic impulses needs further attention in future research.

Last, it is suggested to further study the applicability of interventions aiming to install facilitative temptation-goal associations in previously unsuccessful self-regulators. In addition to the use of implementation intentions as we did in Chapter 6, theoretically any technique creating cognitive associations could be applicable. Whereas interventions promoting health behavior are still mostly targeting goal setting, planning or self-efficacy (e.g., Maes & Karoly, 2005), it seems worthwhile to shift our focus towards techniques that can influence implicit cognitive associations. For example, in the area of addiction, researchers have reported impressive results of the so-called ‘re-training’ of implicit cognitive processes in alcohol addicts such that alcohol-approach tendencies were transformed to avoidance responses, leading to a reduction of alcohol intake even over a 1-year period (Wiers, Eberl, Rinck, Becker, & Lindenmeyer, 2011). Along these lines, it would be interesting to study if and how unsuccessful dieters can be re-trained to associate temptations with avoidance (e.g., by activating the conflicting long-term goal) instead of hedonic approach tendencies. In this way, we may be able to develop programs that help people resist temptations in a way that requires less cognitive effort compared to typical approaches involving motivation and planning. In general, we suggest that future research on self-regulation interventions should be directed towards low-effort strategies of resisting temptations, being installed either in the individual or in the environment, as this seems to be the most promising way forward.

Conclusion

Based on the current research it is concluded that temptations are not always bad. Rather than being subjected to their hedonic impulses, people are often well able to resist temptations when appropriate defensive self-regulation mechanisms are activated. What’s more, temptations can in fact remind people of their long-term goals and yield ‘better’ subsequent behavior in terms of goal attainment as compared to a situation in which no temptation was present. Yet, though counterintuitive, it is important to realize that people should be especially alert when facing weak temptations, as these may be the ‘tricky treats’.

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Nederlandse samenvatting (Dutch summary)

Verleidingen worden typisch gezien als 'slecht': Als Eva niet van de appel had gegeten, zou ze niet zijn verbannen uit het paradijs. Niet alleen in de Bijbel, maar ook in het dagelijks leven hebben mensen het idee dat verleidingen gevaarlijk zijn, en dat je ze daarom maar beter zoveel mogelijk kunt vermijden. Wanneer iemand wordt geconfronteerd met verleidingen, worden alle verstandige voornemens gauw vergeten, zo wordt gedacht. Niet voor niets wordt onze huidige 'obesogene' voedselomgeving, waar het aanbod van – veelal ongezond - eten overweldigend is, vaak verantwoordelijk gehouden voor de stijgende prevalentie van overgewicht en obesitas: Mensen worden nou eenmaal continu verleid.

In dit proefschrift laten we echter zien dat mensen ook vaak adequaat kunnen omgaan met verleidingen, en dat verleidingen soms zelfs goed zijn. Hierbij kijken we naar de context van eetgedrag, waarbij ongezond, maar lekker eten in conflict staat met iemands goede voornemens om zijn of haar gewicht te beheersen. We zullen laten zien dat verleidingen goede voornemens niet altijd doen 'vergeten', maar ons juist kunnen helpen herinneren aan onze doelen. Op die manier kan een confrontatie met verleidingen er juist voor zorgen dat mensen méér doelgericht (d.w.z. gezonder) gedrag gaan vertonen.

Wat is een verleiding?

Hoewel in de psychologische literatuur geen duidelijke definitie wordt gegeven van verleidingen, bestaat er consensus dat een verleiding altijd in conflict staat met een doel. Om het nog specifieker te maken stellen wij voor dat een verleiding per definitie twee componenten heeft: een verleiding is verleidelijk omdat het aantrekkelijk is en tegelijkertijd op een bepaalde manier 'verboden'. Als je iets heel aantrekkelijk vindt, maar je hebt geen reden om het niet te willen, is het volgens onze definitie geen verleiding. Een chocoladetaart is dus bijvoorbeeld alleen een verleiding voor iemand die houdt van chocoladetaarten maar tegelijkertijd graag op zijn gewicht wil letten.

Klassieke theorieën: Nadruk op bewuste zelfcontrole

De twee kanten van het verleidingsdilemma zijn ook terug te vinden in sociaal- en gezondheidspsychologische theorieën over zelfregulatie. Zelfregulatie is "de capaciteit om het eigen gedrag aan te passen aan bepaalde normen, doelen of idealen" (Baumeister & Vohs, 2007). Om zelfregulatieprocessen te illustreren zijn verschillende zogenaamde 'dual-process modellen' voorgesteld: Het gedrag van mensen wordt bepaald door een interactie tussen twee verschillende systemen. Aan de ene kant is er een 'heet' systeem dat snel en emotioneel is, en dat wordt gedreven door impulsen. Aan de andere kant bestaat er een 'koel' systeem, dat juist langzaam en rationeel is, en dat gericht is op het behalen van lange-termijn doelen (Metcalf & Mischel, 1999).

Een verleiding appelleert in eerste instantie aan het verlangen voor snelle bevrediging, en activeert dus het hete systeem. Het lange-termijndoel, dat wordt

ondersteund door het koude systeem, raakt hierbij op de achtergrond. Om weerstand te bieden aan de verleiding moet de hedonische impuls worden onderdrukt door het koele systeem. Het onderdrukken van impulsen wordt 'zelfcontrole' genoemd. Deze zelfcontrole wordt niet alleen gebruikt bij het weerstaan van verleidingen, maar ook bijvoorbeeld bij het onderdrukken van emoties, of bij het tonen van doorzettingsvermogen bij een vervelende taak (zie bijv. Muraven, Tice, & Baumeister, 1998). In de meest prominente theorie over zelfcontrole wordt een vergelijking gemaakt met de werking van een spier: voor het uitoefenen van zelfcontrole is mentale energie ('kracht') nodig die verbruikt wordt uit een beperkte bron. Bij herhaaldelijke uitoefening van zelfcontrole raakt de energiebron uitgeput, en zullen mensen hun impulsen niet langer kunnen beheersen, totdat hun mentale energie na een periode van rust weer is aangevuld (Muraven & Baumeister, 2000). Zo blijkt bijvoorbeeld uit onderzoek dat wanneer mensen twee opeenvolgende taken moeten uitvoeren die beide zelfcontrole vereisen (bijv. het onderdrukken van emoties tijdens het zien van een film, en het werken aan onoplosbare puzzels), zij consequent slechter presteren op de tweede dan op de eerste taak (zie bijvoorbeeld Vohs & Heatherton, 2000). Vanuit dit perspectief is dus goed te verklaren waarom mensen zo vaak falen in het weerstaan van verleidingen. Door de grote nadruk die in de literatuur is gelegd op het falen van zelfregulatie, is echter onderbelicht gebleven hoe en wanneer mensen wél succesvol zijn in het weerstaan van verleidingen.

Counteractive Control: Nadruk op automatische zelfcontrole

Het idee dat zelfcontrole altijd moeite kost lijkt niet bepaald functioneel: Als mensen zich bij elke verleiding zo snel van de wijs laten brengen is het een wonder dat we ons toch ook vaak wél aan onze goede voornemens weten te houden. Trope en Fishbach (2000; 2004) stellen daarom in de 'Counteractive Control Theory' dat verleidingen ook automatische zelfcontroleprocessen kunnen oproepen, om zo het lange-termijn doel te beschermen. Belangrijk om op te merken is dat deze processen dus geen energie kosten. Verschillende studies hebben inderdaad aangetoond dat mensen, zeer functionele, mentale verleiding-doel associaties hebben. Dat betekent dat een confrontatie met een verleiding er direct voor zorgt dat het conflicterende doel wordt geactiveerd in het brein: het lange-termijn doel raakt door de aanwezigheid van verleidingen niet op de achtergrond, maar komt juist sneller naar voren (Fishbach, Friedman, & Kruglanski, 2003). Hoe groter de mentale toegankelijkheid van een doel, hoe groter de kans dat het gedrag hierdoor wordt bepaald (Bargh et al., 2001). Op deze manier worden zelfcontroleprocessen in werking gesteld die ertoe bijdragen dat mensen gericht blijven op hun lange-termijndoelen en verleidingen succesvol kunnen weerstaan ('counteractive control'). Hoewel counteractive control effecten met name zijn aangetoond op cognitieve uitkomstmaten (bijv. evaluaties van de verleiding en het doel, of mentale activatiepatronen), zijn er ook indicaties dat deze processen daadwerkelijk hun uitwerking hebben op gedrag. Zo maakten bijvoorbeeld

mensen die werden blootgesteld aan plaatjes van lekker eten gezondere voedselkeuzes dan mensen die neutrale plaatjes te zien kregen (Fishbach et al., 2003). Onderzoek naar counteractive control effecten op gedrag is echter schaars. Het eerste doel van dit proefschrift is dan ook dit onderzoek te repliceren en verder uit te bouwen.

Hoewel de Counteractive Control Theory een fascinerende en vernieuwende kijk biedt op het succesvol weerstaan van verleidingen, kent de theorie ook zijn beperkingen. Het idee dat verleidingen zorgen voor doelgericht gedrag is natuurlijk zeer functioneel, maar lijkt tegelijkertijd te mooi om waar te zijn. Als verleidingen zo gemakkelijk zijn te weerstaan, kan niet worden verklaard waarom zoveel mensen moeite hebben met het behouden van een gezond gewicht. Dit roept de vraag op welke omstandigheden counteractive control processen kunnen bevorderen: wanneer roepen verleidingen doelgericht gedrag op. Eerder onderzoek (e.g., Fishbach et al., 2003) heeft al laten zien dat verleidingen alleen zelfcontroleprocessen activeren als mensen dit doel ook daadwerkelijk *belangrijk* vinden. In dit proefschrift nemen we deze voorwaarde voor counteractive control processen al mee in onze definitie van een verleiding: iets is alleen een verleiding als het in conflict staat met een – belangrijk - doel. Ons onderzoek richt zich - door te kijken naar de invloed van de sterkte van de verleiding – op de centrale premissen van de theorie. De drie voornaamste doelstellingen van dit proefschrift worden hieronder toegelicht.

Doelstellingen

De centrale onderzoeksvraag van dit proefschrift was hoe en wanneer verleidingen zelfcontrole kunnen activeren. Hiertoe zijn drie specifieke doelstellingen geformuleerd.

De eerste doelstelling van dit proefschrift was om te testen of de zelfcontroleprocessen die worden opgeroepen door verleidingen, ook kunnen leiden tot daadwerkelijk doelgericht *gedrag*. Hiermee werd eerder onderzoek dat merendeels effecten van verleidingen op *cognitieve* zelfcontrole processen heeft laten zien, op een belangrijke manier verbreed.

Ten tweede werd de invloed van de sterkte van de verleiding onderzocht. Hoewel intuïtief aannemelijk lijkt dat mensen zich beter kunnen beheersen bij het zien van zwakke dan bij sterke verleidingen, verwachten we op basis van een 'critical level' perspectief (Gilbert, Lieberman, Morewedge, & Wilson, 2004) precies het tegenovergestelde. Volgens deze visie komen mensen, door het activeren van zelfcontrolemechanismen, eerder in actie naarmate de bedreiging voor het lange-termijn doel groter is. Kleine bedreigingen (zwakke verleidingen) worden snel onderschat, waardoor men geen adequate verdedigingsmechanismen in werking stelt om het lange-termijndoel (gewichtbeheersing) te beschermen. De hypothese was dan ook dat zwakke verleidingen als een minder grote bedreiging zullen worden gezien en leiden tot een lagere

activatie van het langetermijn doel dan sterke verleidingen. Bovendien verwachtten we dat mensen die geconfronteerd worden met een zwakke voedselverleiding daar méér van eten dan mensen die een sterke verleiding krijgen voorgeschoteld.

De derde doelstelling tot slot was te onderzoeken of het mogelijk is de mentale verleiding-doel associaties, die kenmerkend zijn voor mensen die succesvol zijn in het weerstaan van verleidingen (Fishbach et al., 2003), ook te creëren bij mensen die niet succesvol zijn in het weerstaan van verleidingen. We hebben dit gedaan door mensen specifieke plannen (implementatie intenties) te laten formuleren die een persoonlijke verleiding koppelen aan een lijndoel. Vervolgens maten we of deze mensen op cognitief niveau inderdaad een associatie hadden gecreëerd tussen hun verleiding en het doel, en of dit er dan ook toe leidde dat zij hun persoonlijke verleidingen in de periode daarna beter konden weerstaan.

Resultaten

De onderzoeksvragen die voortvloeien uit bovengenoemde doelstellingen zijn behandeld in vijf empirische hoofdstukken (Hoofdstuk 2 t/m 6). In Hoofdstuk 2 werd aangetoond dat proefpersonen die een verleiding (een chocoladetaart) zagen, hun langetermijn doel (gezond eten) belangrijker vonden, en sterkere voornemens hadden zich gezond te gedragen in de toekomst dan proefpersonen die een neutraal plaatje (een bloem) zagen. Bovendien kozen proefpersonen in de verleidingsconditie wanneer zij moesten kiezen tussen een gezond en een ongezond koekje, vaker voor het gezonde koekje, dan proefpersonen in de neutrale conditie. Uit deze resultaten blijkt dat verleidingen lange termijndoelen kunnen activeren, en zo aanzetten tot gezond gedrag. De studies ondersteunen de Counteractive Control Theory en gaan een stap verder door te laten zien dat de positieve effecten van verleidingen op zelfcontrole ook naar voren komen in gedrag.

In Hoofdstuk 3 keken we naar de rol van de sterkte van de verleiding bij het activeren van zelfcontrole. In drie studies vonden we ondersteuning voor de hypothese dat sterke verleidingen meer zelfcontrole activeren dan zwakke verleidingen. Dit resultaat zagen we zowel op een cognitief als op gedrags niveau. Met betrekking tot het cognitieve aspect vonden we dat de mentale toegankelijkheid van het lange termijndoel groter was na confrontatie met sterke verleidingen, dan met zwakke verleidingen. Op gedragsniveau lieten we zien dat participanten die een matig aantrekkelijke taart (zwakke verleiding) kregen aangeboden méér aten van de taart dan participanten die werden blootgesteld aan de verleiding van een zeer aantrekkelijke taart.

In Hoofdstuk 4 werd vervolgens het onderliggende mechanisme van deze bevinding behandeld. Op basis van de implicaties van het zogeheten 'critical level' perspectief kwamen we tot de hypothese dat zwakke verleidingen worden onderschat. Met andere woorden, mensen schatten in dat zwakke (minder aantrekkelijke) verleidingen

minder 'slecht' zijn voor de lijn (hun lange-termijndoel) dan sterke verleidingen. In dit hoofdstuk staan 4 experimenten beschreven die inderdaad lieten zien dat zwakke verleidingen werden gezien als minder ongezond en minder calorierijk dan sterke verleidingen, zelfs als de beide verleidingen in werkelijkheid evenveel calorieën bevatten. Bovendien toonden we aan dat het aantal ingeschatte calorieën van een product negatief samenhangt met de hoeveelheid die mensen van dit product eten: hoe meer calorieën mensen denken dat er in een product zitten, hoe minder ze ervan eten. Samengevat denken mensen dus dat zwakke verleidingen minder calorieën bevatten, en dit zorgt er voor dat ze er meer van eten dan van sterke verleidingen.

Hoewel we zowel in Hoofdstuk 3 als in Hoofdstuk 4 hebben aangetoond dat mensen meer eten van zwakke verleidingen dan van sterke verleidingen, stroken deze bevindingen niet met de intuïtief plausibele zelfcontroletheorieën. Deze impliceren immers dat mensen juist meer zullen eten van sterke verleidingen omdat deze sterkere hedonische impulsen (een grotere druk op het 'hete' systeem) oproepen. In Hoofdstuk 5 werd gesteld dat het effect van verleidingssterkte op zelfcontrole beide kanten op kan gaan en afhankelijk is van de hoeveelheid mentale energie ('cognitive resources') die iemand beschikbaar heeft. Hoe minder mentale energie beschikbaar is, hoe meer iemands gedrag bepaald zal worden door (hedonische) impulsen. Er is een experiment uitgevoerd waarbij zowel de hoeveel beschikbare mentale energie, als de verleidingssterkte werd gemanipuleerd. De resultaten lieten zien dat participanten die veel mentale energie hadden, inderdaad meer aten van zwakke verleidingen dan van sterke verleidingen. Hiermee werden onze eerdere bevindingen gerepliceerd: sterke verleidingen wisten in deze situatie meer zelfcontrole te activeren. Participanten die daarentegen weinig mentale energie hadden, aten juist meer van sterke verleidingen dan van zwakke verleidingen. Dit is in overeenstemming is met de implicaties die volgen uit klassieke theorieën: in deze situatie hadden hedonische impulsen de overhand, waarbij een hogere aantrekkelijkheid van de verleiding leidt tot meer eten. Op deze manier is aangetoond dat de twee tegengestelde verwachtingen die op basis van de literatuur geformuleerd konden worden elkaar niet per se tegenspreken, maar naast elkaar kunnen bestaan.

In hoofdstuk 6 bleek dat de mentale verleiding-doel associaties die ten grondslag liggen aan counteractive control processen, ook gecreëerd konden worden bij participanten die voorheen niet succesvol waren in het weerstaan van verleidingen. Participanten die een persoonlijke verleiding koppelden aan het doel om te lijnen door middel van een als-dan plan ("als ik chocola zie of ruik, dan volg ik mijn doel om te lijnen") bleken vervolgens inderdaad een sterkere verleiding-doel associatie te hebben dan participanten in de controleconditie die alleen de intentie om te lijnen hadden geformuleerd. Dit werd gemeten met een zogeheten lexicale decisietaak, waarbij de reactiesnelheid van participanten op doel-gerelateerde woorden zoals "lijnen" en "slank" werd gemeten nadat een snelle flits te zien was van het verleidingswoord "chocola": Hoe

sneller men reageerde, hoe sterker de associatie tussen verleiding en doel. Bij participanten die een verleiding-doel plan hadden gemaakt, kwam het lijndoel dus sneller in hun gedachten na confrontatie met een verleiding. Belangrijker nog was dat we in een tweede studie vonden dat de sterkte van de verleiding-doel associatie ook daadwerkelijk gerelateerd was aan de mate waarin participanten in de week volgend op het onderzoek, hun verleiding konden weerstaan: Hoe sneller het doel om te lijnen werd geactiveerd na het zien van het woord “chocola”, hoe minder chocola door participanten werd gegeten in de week volgend op het onderzoek. Op deze manier kunnen we dus met behulp van een relatief simpele interventie zorgen voor meer succesvolle zelfcontrole.

Conclusie

Op basis van de bevindingen in dit proefschrift kan worden geconcludeerd dat verleidingen niet altijd slecht zijn. Mensen vallen niet altijd hulpeloos ten prooi aan hedonische impulsen, maar zijn vaak heel goed in staat om verleidingen te weerstaan en zo hun lange-termijn doelen te beschermen. Sterker nog, doordat verleidingen mensen helpen herinneren aan hun lange termijndoel kunnen ze soms juist leiden tot ‘goed’ gedrag. Tot slot is het raadzaam vooral alert te zijn op zwakke verleidingen: omdat mensen de neiging hebben deze te onderschatten, zijn de zwakke verleidingen uiteindelijk de meest verraderlijke.

Dankwoord

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Dankwoord

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Floor Kroese,

Utrecht, januari 2012

Curriculum Vitae

Floor Maria Kroese was born on August 30, 1984 in Eindhoven, The Netherlands. She attended secondary education at the Lorentz Casimir Lyceum, Eindhoven, and graduated from Saratoga Highschool, California, United States of America, in 2002. In 2005, she obtained a Bachelor's degree (cum laude) in Psychology at Utrecht University. She continued her studies in Utrecht with the Psychological Health Research Master program which lead to a MSc degree (cum laude) in 2007. Being inspired by the work on her Master's thesis on temptations and goals, Floor successfully applied for a Toptalent grant from the Netherlands Organization for Scientific Research (NWO). Under supervision of prof. dr. Denise de Ridder and dr. Catharine Evers, Floor conducted her PhD research in the self-regulation lab at the department of Clinical and Health Psychology at Utrecht University.

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- Kroese, F.M.**, Adriaanse, M.A., & De Ridder, D.T.D. Boosters, anyone? Exploring the added value of booster sessions in a self-management intervention.
- Kroese, F.M.**, Adriaanse, M.A., & De Ridder, D.T.D. Are self-management interventions suitable for all? Comparing obese vs. non-obese type 2 diabetes patients

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- Kroese, F.M., Evers, C., & De Ridder, D.T.D. (2011, December). How temptation strength and cognitive resources interact to determine self-control outcomes. Oral presentation at the 1st general meeting of the Association of Researchers in Psychology and Health: Lunteren, The Netherlands.
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