

## Research article

# 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. Copyright © 2010 John Wiley & Sons, Ltd.*

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 toward 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; Papiés, 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

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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), e.g., 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 1

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; Papiés 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; Papiés 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<sup>2</sup> ( $SD = 2.4$ ), 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*<sup>1</sup> 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.

<sup>1</sup>Stimuli used in Studies 1 and 2 can be obtained from the authors upon request.

*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 three 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.

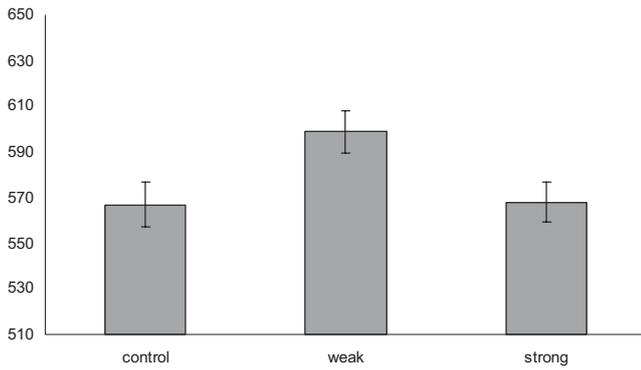
*Moderators and Descriptives* Goal importance (e.g., "To what extent is it important for you to lose weight?") and weight watching success (e.g., "To what extent are you successful in watching your weight?") were assessed with two and three items, respectively, that could be answered on a 5-point scale 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

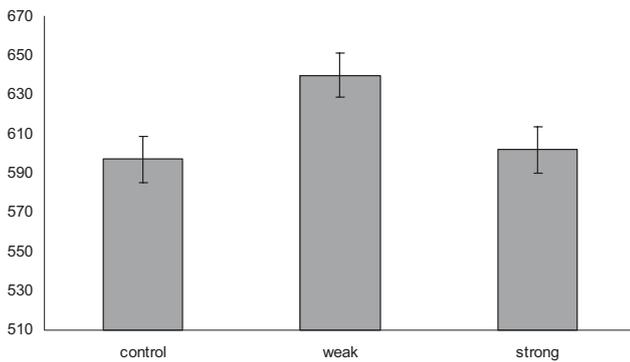
Reaction times were analyzed using an Analysis of Covariance (ANCOVA), testing the effect of condition on reaction times to diet words, with reaction times to neutral words included as a covariate. The covariate was significant;  $F(1, 63) = 55.68$ ,  $p < .001$ . The analysis revealed a significant 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 Analysis of Variance (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 ( $F_s < 1$ ).

(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.

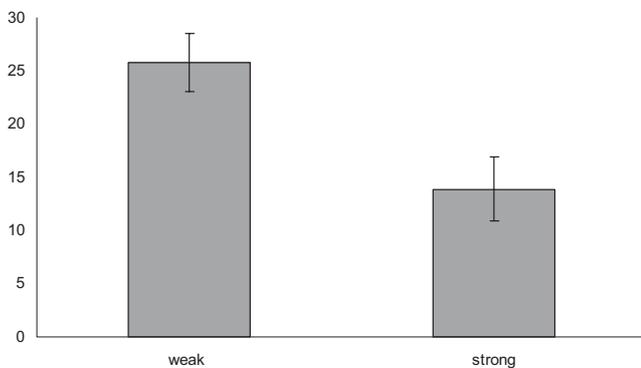


Figure 1. (a) Mean reaction times (+SE) to diet words in Study 1. (b) Mean reaction times (+SE) to diet words in Study 2. (c) Percentage of consumed chocolate cake (+SE) in Study 3

## 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. Afterward, 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 Strength<sup>1</sup>** 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 1 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;  $F < 1$ .

### 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 Studies 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 section 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 ( $\approx 800$  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 four 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 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  $ps > .25$ ), 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 toward 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 toward 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.

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