



Research report

Too tempting to resist? Past success at weight control rather than dietary restraint determines exposure-induced disinhibited eating

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ABSTRACT

As the prevalence of obesity is increasing, many people resort to dieting to achieve a healthy body weight. Such dietary restraint has been suggested to cause counterproductive effects leading to disinhibited eating. However, it is more likely that dietary restraint is a by-product of previous difficulties in weight control and disinhibited eating. If so, disinhibition should be related more strongly to unsuccessful weight control than dietary restraint. This possibility was examined in the present study. Participants were exposed to palatable food or to neutral objects. Before and after exposure, we measured craving, general inhibitory control and inhibition of food-related responses with the Stop-Signal Task (SST), and food consumption during a taste test. Results showed that exposure increased craving in both successful and unsuccessful weight regulators. People who were successful at controlling their weight, however, were better able to regulate this temptation compared to unsuccessful weight regulators: while exposure to palatable food reduced inhibitory control over food-related responses and increased food consumption in unsuccessful weight regulators, successful weight regulators did not show such disinhibition. Dietary restraint did not influence any of these findings. Further, the exposure-induced difference in inhibition between successful and unsuccessful weight regulators was specific for food-related responses, as regulatory success did not influence general inhibitory control. Thus, while successful and unsuccessful weight regulators seem equally tempted by palatable food, those who are successful in controlling their weight seem better able to resist these temptations by exerting inhibitory control over appetitive responses toward palatable food.

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Introduction

As overweight and obesity is constantly increasing worldwide, many people resort to different dieting strategies. Maintaining a healthy weight and reducing one's body weight over an extended period of time, however, seems difficult for most people (e.g., Jeffery et al., 2000; Mann et al., 2007; Wing & Phelan, 2005). Further, many dieters who chronically try to restrict their food intake are characterized by frequent lapses of restraint especially when exposed to palatable food cues (e.g., Fedoroff, Polivy, & Herman, 1997; Herman & Polivy, 1980; Jansen & Van den Hout, 1991), stronger positive attitudes toward palatable food (e.g., Houben, Roefs, & Jansen, 2010), and increased disinhibition (Nederkoorn, Van Eijs, & Jansen, 2004). Research findings such as these contributed to the belief that attempting to control one's food intake and body weight has counterproductive effects and causes a pattern of disinhibited overeating.

In contrast to this idea, dietary restraint in fact generally seems to be related to less overeating and reduced weight in the long-

term rather than increased overeating and weight gain (Johnson, Pratt, & Wardle, 2012). Therefore, it is probably more likely that disinhibited eating causes increased dietary restraint rather than vice versa (Jansen et al., 2003; Johnson et al., 2012; Lowe, 1993; Lowe & Levine, 2005). Specifically, people who experienced difficulty controlling their food intake in the past, are probably more likely to attempt to restrict their food intake in order to attain a reduction in body weight. In this case, dietary restraint should be merely a by-product of unsuccessful weight control and overeating rather than a causal factor leading to disinhibited eating. So what distinguishes people who are successful at controlling their weight from those who are unsuccessful in attaining and maintaining a healthy body weight? One of the key differences between successful and unsuccessful weight regulation probably involves self-control. Self-control (or inhibitory control) refers to the ability to inhibit a behavioral impulse in order to attain higher-order goals, such as weight loss and maintenance. Indeed, research has demonstrated that increased inhibitory control predicts increased weight loss during treatment (Nederkoorn, Braet, Van Eijs, Tanghe, & Jansen, 2006). As such, self-control may be intimately connected to successful weight control so that successful weight regulators are better able to control themselves

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in tempting situations where unsuccessful weight regulators are prone to indulge.

In line with this idea, research has demonstrated that tempting, palatable food activates positive affect to the same extent in successful and unsuccessful weight regulators (e.g., Van Koningsbruggen, Stroebe, & Aarts, 2011). Hence, people who can successfully maintain a healthy body weight appear to be no less tempted by palatable food cues compared to unsuccessful weight regulators. However, in contrast to unsuccessful weight regulators, people who are successful at controlling their weight may be better able to regulate such positive, appetitive responses to palatable food cues. Indirect evidence for this idea comes from studies that have demonstrated that food intake is more easily regulated in line with dieting intentions when self-control resources are high. In contrast, when self-control resources are low, eating behavior is more strongly guided by appetitive reactions to palatable food such as positive affect (e.g., Hofmann & Friese, 2008; Hofmann, Rauch, & Gawronski, 2007). Further, successful weight regulators have been found to activate a dieting goal in response to palatable food cues, while unsuccessful weight regulators seem to inhibit such dieting goals (e.g., Fishbach, Friedman, & Kruglanski 2003; Papies, Stroebe, & Aarts, 2008; Stroebe, Mensink, Aarts, Schut, & Kruglanski, 2008; Van Koningsbruggen, Stroebe, & Aarts, 2011). According to Fishbach and coworkers (2003), such facilitative links between palatable food cues and the higher-order goal of dieting develop when people are repeatedly and successfully able to exert self-control in tempting situations.

Together, these findings suggest that successful weight regulators are better able to inhibit appetitive responses to palatable food cues in situations where unsuccessful weight regulators exhibit disinhibition. Further, if dietary restraint is indeed merely a by-product of unsuccessful weight control, this relationship between inhibitory control and successful weight control should be uninfluenced by dietary restraint status. The aim of the present study was to test this hypothesis. Here, successful and unsuccessful weight regulators were either exposed to palatable food or to neutral objects. It was expected that such exposure to tempting, palatable food would reduce inhibitory control in unsuccessful weight regulators, but not in successful weight controllers, indicating that unsuccessful weight regulators are less able to regulate their behavior in tempting situations. Moreover, since the problem of disinhibited eating specifically pertains to the food domain, we also examined whether exposure to palatable food decreases general inhibitory control, or more specifically inhibitory control over food-related responses, in unsuccessful compared to successful weight regulators. Finally, we expected an increase in food consumption following exposure to palatable food in unsuccessful weight regulators but not in successful weight regulators.

Method

Participants

Fifty-three female participants completed the study. Inspection of the data, however, revealed two influential outliers (Leverage $>3(k+1)/n$) and one participant did not follow the instructions during the computer task. These participants were therefore excluded, and the final sample consisted of 50 participants (age: $M = 21.54$, $SD = 3.18$; Body Mass Index (BMI: kg/m^2): $M = 22.52$, $SD = 2.81$). Participants were randomly assigned to one of two conditions: Exposure ($n = 26$) or control ($n = 24$). The two conditions did not differ significantly in age or BMI (both $F < 1$). The study was approved by the Ethics Committee of the Faculty of Psychology and Neuroscience, Maastricht University.

Materials and measures

Exposure to food vs. control

During the food exposure (cf. Nederkoorn et al., 2004), three large bowls of food were presented to participants. One bowl contained two kinds of crisps (natural flavor and paprika flavor), the second bowl contained two kinds of party nuts (paprika flavor and bacon-cheese flavor), and the third bowl contained two kinds of chocolate (dark chocolate and milk chocolate). First, participants were asked to look at the first bowl of food. They were then instructed to imagine how the food would taste. Next, they were asked to smell the food thoroughly and then they tasted a small piece of the food. The same procedure was then repeated with the second and third bowl of food. In total, the food exposure lasted 10 min. At the end of the exposure, the bowls of food were placed beside the computer and participants were told that they would be free to eat as much of the food as they wanted at the end of the experiment. In the control condition, participants performed a similar exposure, but now the bowls of food were replaced with bowls containing neutral objects (tree bark, bath salts, and bath pearls). Participants were instructed to look at the bowls, to imagine using these objects, and to smell the objects. The neutral exposure also lasted 10 min. At the end of the exposure, the three bowls were placed beside the computer screen.

Stop-Signal Task (SST)

The SST (Logan, Schachar, & Tannock, 1997) was used to measure inhibitory control. The SST involves two concurrent tasks: A go task, which is a choice reaction time task, and a stop task, which involves a stop signal that requires participants to inhibit their responses to the go task. Here, we used two variants of the SST: One to measure general response inhibition ability, and another to measure response inhibition specifically for food. During the general SST, the letter O or the letter X was presented for 1000 ms, preceded by a 500 ms fixation point. During go trials, participants had to respond as fast as possible to the X and the O using a left and a right response key on the keyboard (e.g., press left for X and press right for O; instructions were counterbalanced across participants). During the food-specific SST, four pictures of food (crisps, chocolate, party nuts, and chocolate chip cookies) were presented for 1000 ms, either in landscape format or in portrait format. During go trials, participants had to respond as fast as possible to these pictures using a left and a right response key on the keyboard (e.g., press left for portrait and press right for landscape; instructions were counterbalanced across participants).

In both the general SST, and the food-specific SST, an auditory stop signal was presented (through headphones) on 25% of the trials. Participants were instructed not to respond when this stop signal was presented. Both SST variants consisted of two practice blocks without stop signals, one practice block with stop signals, and two test blocks of 64 trials. In the test blocks, the delay between the go signal (X or O for the general SST; food pictures for the food-specific SST) and the stop signal was initially set at 250 ms. Depending on the performance of the participants, a tracking procedure adapted the stop-signal delay dynamically: If participants succeeded in inhibiting their response, the stop-signal delay was increased by 50 ms, thereby making it more difficult to inhibit the next trial. If participants failed to inhibit their response, stop-signal delay was decreased by 50 ms, thereby making it easier to inhibit the next trial. The SST was designed to enable participants to correctly inhibit 50% of the stop trials.

The assumption underlying this task is that response inhibition succeeds or fails depending on the relative finishing time of two parallel processes that race against each other: a go process triggered by the go signal, and a stop process triggered by the stop signal. If the stop process finishes before the go process, subjects

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