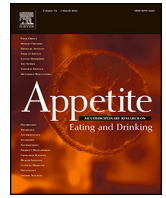




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Research report

Targeting impulsive processes of eating behavior via the internet. Effects on body weight[☆]

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ABSTRACT

Because eating behavior can take on an impulsive nature many people experience difficulty with dieting to lose weight. Therefore, an experiment was conducted to test the effectiveness of two interventions targeting impulsive processes of eating behavior to facilitate weight loss: Implementation intentions to remind people about dieting versus a go/no-go task to change impulses toward palatable foods. Dieters performed an online training program (four times in 4 weeks) in which they were randomly assigned to a 2 (implementation intention condition: dieting versus control) × 2 (go/no-go task condition: food versus control) design. They formed either dieting implementation intentions (e.g., If I open the fridge I will think of dieting!) or control implementation intentions. Furthermore, they received either a go/no-go task in which behavioral stop signals were presented upon presentation of palatable foods (food go/no-go task), or upon control stimuli. Participants' weight was measured in the laboratory before and after the intervention. Strength of participants' dieting goal and their Body Mass Index (BMI; as a proxy for impulsiveness toward food) were examined as moderators. Results showed that both dieting implementation intentions and the food go/no-go task facilitated weight loss. Moreover, dieting implementation intentions facilitated weight loss particularly among people with a strong current dieting goal, whereas the food go/no-go task facilitated weight loss independent of this factor. Instead, the food go/no-go task, but not formation of dieting implementation intentions, was primarily effective among dieters with a relatively high BMI. These results provide the first preliminary evidence that interventions aimed at targeting impulsive eating-related processes via the internet can facilitate weight loss.

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Many people experience difficulty with restraining their consumption of palatable food that is very visible and easily available in the environment (e.g., Swinburn et al., 2011; WHO, 2000). This difficulty is reflected by the fact that many people gain weight despite having strong intentions to maintain or reduce their body weight (e.g., Klesges, Isbell, & Klesges, 1992). For some people this is such a problem that they are chronically trying to diet and lose weight (Herman & Polivy, 1980; Stroebe, 2008). However, there is a large literature showing that dieting intentions are often not effective for regulating one's consumption behavior (Elfhag & Rössner, 2005; Jeffery et al., 2000; Mann et al., 2007).

Consensus is growing that an important contributing factor to problems with eating regulation is the fact that mere perception of palatable foods in the environment can trigger consumption independent of people's dieting goals, and thus eating behavior can occur in a rather impulsive² fashion (Hall, 2012; Hofmann, Friese, & Wiers, 2008; Strack & Deutsch, 2004). Therefore, we tested whether reducing the influence of impulsive processes on eating behavior may be effective in facilitating people's weight loss attempts (Marteau, Hollands, & Fletcher, 2012; Shalev & Bargh, 2011; Sheeran, Gollwitzer, & Bargh, 2013). Specifically, the aim of the present research is testing whether two recently developed interventions to reduce impulsive eating behavior can influence an important health outcome, i.e., weight loss among dieters. By testing both intervention approaches within one experimental design, the current research extends earlier

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² We use the term impulsive eating for eating that is facilitated by a motivational approach orientation (e.g., because of people's appetite or because of the rewarding or hedonic properties of foods or eating situations) or associative links (such as habits; Strack & Deutsch, 2004).

studies that mainly tested the effectiveness of the two intervention approaches in isolation. Furthermore, previous work investigated outcomes other than weight loss – the ultimate goal of most interventions.

Two general approaches to reducing the influence of impulsive processes of eating behavior can be distinguished. First, one approach aims to shift the balance from impulsive behavior to more goal-directed control of behavior by directing people's attention to their (often) long-term health goals (e.g., [Adriaanse, De Ridder, & De Wit, 2009](#); [Fujita & Han, 2009](#); [Houben, Nederkoorn, Wiers, & Jansen, 2011](#); [Papies & Hamstra, 2010](#)). Previous work suggests that this shift may be accomplished by the formation of implementation intentions that remind people of their dieting goal ([Kroese, Adriaanse, Evers, & De Ridder, 2011](#); [Van Koningsbruggen, Stroebe, Papies, & Aarts, 2011](#)). Implementation intentions are behavioral plans following an if–then structure creating a strong link between a specified situation and a response, making people select this response when entering the specified situation (e.g., [Gollwitzer, 1999](#); [Webb & Sheeran, 2007](#)). Studies using this planning procedure to prompt a dieting goal (e.g., “If I am tempted to consume palatable foods, I will think of dieting!”) have been found to activate the dieting goal in response to food temptations, and to decrease consumption of palatable foods among (chronic) dieters for a period of up to 2 weeks ([Kroese et al., 2011](#); [Van Koningsbruggen et al., 2011](#)). These strong effects of dieting reminders on consumption behavior may hence provide a means to overrule the impulsive nature of eating and to facilitate attempts at weight loss (cf., [Luszczynska, Sobczyk, & Abraham, 2007](#)).

Importantly, the effectiveness of improving dieting behavior through activation of the dieting goal via implementation intentions depends on people's current motivation to diet, because this intervention focuses on increasing opportunities for volition to influence behavior, and not on changing people's motivation ([Sheeran, Webb, & Gollwitzer, 2005b](#)). Accordingly, in the present research we expected that forming implementation intentions to think of dieting across different eating occasions would reduce eating behavior and hence facilitate weight loss among dieters, and that this effect would become stronger as a function of people's current strength of their dieting goal.

A second way to change impulsive eating behavior is by targeting behavioral impulses evoked upon the mere exposure to palatable food ([Hofmann, Friese, & Strack, 2009](#); [Seibt, Häfner, & Deutsch, 2007](#); [Veenstra & de Jong, 2010](#); [Veling, Holland, & van Knippenberg, 2008](#)). Recent work suggests that impulses triggered by palatable food and drinks can be reduced by linking images of such stimuli to behavioral stop signals in a go/no-go task (e.g., [Houben et al., 2011](#); [Veling & Aarts, 2009](#); [Veling, Aarts, & Papies, 2011](#)). Specifically, participants are presented with images of objects on screen and are requested to perform or withhold a response depending on a concurrently presented go or stop signal (e.g., a tone or a letter). In the experimental condition palatable foods are always presented with stop signals (hereafter referred to as food go/no-go task or fNoGo), whereas participants do not withhold their behavior toward such stimuli in the control condition (hereafter referred to as cNoGo). Work from different laboratories has found that the fNoGo is effective in reducing choice for or consumption of palatable food and alcoholic beverages ([Houben, 2011](#); [Houben & Jansen, 2011](#); [Houben et al., 2011](#); [Jones & Field, 2013](#); [Veling et al., 2011](#); [Veling, Aarts, & Stroebe, 2013](#)). In the case of food this effect is especially strong for people who are supposed to be more prone to the impulsive nature of eating behavior (e.g., [Houben, 2011](#); [Veling et al., 2011](#)), such as people who are overweight (e.g., [Batterink, Yokum, & Stice, 2010](#); [Nederkoorn, Coelho, Houben, Guerrieri, & Jansen, 2012](#); [Nederkoorn, Houben, Hofmann, Roefs, & Jansen, 2010](#)).

While dieting implementation intentions and fNoGo have mostly been studied in isolation, recent research compared the effective-

ness of both interventions in reducing self-selected portion size of palatable food (i.e., sweets; [Van Koningsbruggen, Veling, Stroebe, & Aarts, in press](#)). In the fNoGo, participants learned to withhold a behavioral response on being presented with four different pictures of each of these sweets. In the dieting implementation intention condition, participants formed the implementation intention to think of dieting the next time they were tempted to eat sweets. In an apparently unrelated experiment, participants were then given the opportunity to select as many of the sweets as they wanted in a sweet shop-like environment. Results of two studies demonstrated that, although combining the interventions did not lead to additive effects, both interventions significantly reduced the amount of sweets participants selected for themselves.

The aims of the present study are much more ambitious than those of the study by [Van Koningsbruggen et al. \(in press\)](#). Instead of targeting portion size selection of a limited set of sweets, the present study aims at reducing people's weight over a 4-week period. Thus, having demonstrated that these two interventions were effective in reducing self-selected portion size under laboratory conditions and with a very limited set of food items, the present study was designed to test whether offering these two interventions via the internet would help dieters to lose weight.

Overview of the study

We presented the go/no-go task and implementation intention interventions online to examine whether presenting these interventions in an easy accessible format that could potentially reach many people is an effective way to facilitate weight loss ([Kazdin & Blase, 2011](#)). The training program was repeated for 4 consecutive weeks, and involved one training session per week that lasted for about 30 minutes. Before and after the intervention participants' weight was measured in the laboratory.

We predicted that participants receiving one (fNoGo only or dieting implementation intentions only) or both (fNoGo and dieting implementation intentions) experimental conditions would lose more weight than participants receiving both control conditions. Moreover, we explored whether the implementation intention intervention, but not the go/no-go task intervention, is moderated by dieting goal strength (e.g., [Sheeran et al., 2005b](#)). Instead, the go/no-go task intervention may be particularly effective among participants with a relatively high BMI (e.g., [Veling et al., 2011](#)).

Method

The study was conducted, and written informed consent of each participant was obtained in compliance with the principles contained in the Declaration of Helsinki.

Randomization, design, and participants

Experimenters were blind to condition during measurement in the laboratory, and participants were randomly assigned to one of four conditions of the 2 (implementation intention: control versus dieting) \times 2 (go/no-go task: cNoGo versus fNoGo) between-subjects design. Randomization was accomplished by providing participants at the end of the first session with randomly generated personal codes to log into the online intervention program (these codes ensured that participants would enter a specific condition of the design). Participants were recruited through advertisements across the university campus across three consecutive weeks.

Because the current study involves a first test of the effects of stop signals and dieting implementation intentions on weight loss, we examined a relatively homogeneous sample of participants who indicated they completed at least a school of higher general secondary education, and without severe obesity (defined as BMI >35).

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