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Short communication

Mere exposure to palatable food cues reduces restrained eaters' physical effort to obtain healthy food ☆

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ABSTRACT

We examined whether exposure to cues of attractive food reduces effortful behavior toward healthy foods for restrained eaters. After manipulating food pre-exposure, we recorded handgrip force while presenting participants with pictures of healthy food objects. Because participants were led to expect that they could obtain each object (not specified beforehand) by squeezing the handgrip as forcefully as possible while the object was displayed on the screen, the recorded handgrip force constitutes a measure of spontaneous effortful behavior. Results show that restrained eaters, but not unrestrained eaters, displayed less forceful action toward healthy food objects (i.e., lower exertion of force) when pre-exposed to tempting food cues. No effects were found on palatability perceptions of the healthy foods. The results provide further insight into why restrained eaters have difficulties in maintaining a low-calorie diet in food-rich environments.

Introduction

The worldwide increase in the prevalence of overweight and obesity (Finucane et al., 2011) suggests that many people experience difficulties in maintaining a healthy low-calorie diet. Our "toxic environment" where palatable and calorically-dense foods are highly visible and easily available has been suggested as a major factor contributing to this difficulty (Hill & Peters, 1998). One group, for which food-rich environments are especially problematic are restrained eaters. Although restrained eaters are generally highly motivated to restrict their food intake and to control their body weight, exposure to attractive food cues easily disrupts their eating regulation and often induces them to indulge in "forbidden" foods (Herman & Polivy, 1980).

Research has shown that restrained eaters are likely to overeat when pre-exposed to cues such as the sight, smell, thought or taste of palatable food whereas unrestrained eaters remain unaffected (e.g., Fedoroff, Polivy, & Herman, 1997; Jansen & Van den Hout, 1991; Rogers & Hill, 1989). Moreover, perceiving or smelling palatable food triggers preparatory responses like cravings for palatable food and increased salivation in restrained eaters (Brunstrom, Yates, & Witcomb, 2004; Fedoroff et al., 1997; LeGoff & Spigelman, 1987; Tepper, 1992). Other research suggests that restrained eaters exert greater effort to obtain palatable food than unrestrained eaters. For instance, Giesen, Havermans, Nederkoorn, Strafaci, and Jansen (2009) used a concurrent schedules task to assess participants' effort to obtain unhealthy (vs. healthy) food. Participants had to earn points for snacks or healthy foods. The amount of work required to earn healthy food points remained the same during the task, but it became more difficult to earn snack points while the task proceeded. They demonstrated that restrained (vs. unrestrained) eaters increased working for snack points (i.e., exerted more effort) when snack points were harder to obtain. Importantly, participants in this study tasted and rated the foods before completing the experimental task which may have acted as a food pre-exposure manipulation. Indeed, recent research replicated the Giesen et al. findings and demonstrated that restrained eaters only exert more effort to obtain palatable food when pre-exposed to tempting food cues, while food pre-exposure did not influence unrestrained eaters (Van Koningsbruggen, Stroebe, & Aarts, 2011a). Thus, cues of attractive food (i.e., food pre-exposure) elicit strong appetitive reactions toward palatable high-calorie food in restrained eaters, which is likely to contribute to their difficulty in controlling their weight.

We approached this issue from a different perspective and scrutinized restrained eaters' effortful behavior toward *healthy* food following food pre-exposure.[1] Since external cues often trigger

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[1] Food pre-exposure refers to the fact that some participants in this study have been exposed to food-related stimuli before completing the dependent measure, while other participants have been exposed to control stimuli (i.e., no pre-exposure condition).

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behavior without much conscious thought or intention (e.g., Aarts & Dijksterhuis, 2000; Bargh & Chartrand, 1999), we used an unobtrusive handgrip-force task that directly taps into people's physical effort to obtain healthy food. Specifically, we tested the hypothesis that food pre-exposure would reduce restrained eaters' effortful behavior toward healthy food objects.

Our hypothesis is based on the goal conflict model of eating (Stroebe, Mensink, Aarts, Schut, & Kruglanski, 2008) which suggests that restrained eaters' difficulties in resisting palatable food results from a conflict between two incompatible goals: the goal of eating enjoyment and the goal of dieting. According to this model, palatable food cues have a strong positive incentive value for restrained eaters and prime the eating enjoyment goal (Hofmann, Van Koningsbruggen, Stroebe, Ramanathan, & Aarts, 2010; Papies, Stroebe, & Aarts, 2007). Once the hedonic goal of eating enjoyment is activated by exposure to attractive food cues, the conflicting goal of dieting will be inhibited (Stroebe et al., 2008). Consequently, the eating behavior of restrained eaters will be driven by the eating enjoyment goal instead of the dieting goal, thereby increasing the likelihood of overeating when exposed to attractive food cues (e.g., Fedoroff et al., 1997). In line with the model, the eating enjoyment goal activated in restrained eaters upon confrontation with tempting food cues will become the focal goal and exert its influence on motivational behavior. This explains how food pre-exposure leads to increased effortful behavior toward palatable food in restrained eaters. However, it also implies that food pre-exposure is likely to reduce effortful behavior toward healthy, low-calorie food objects among restrained eaters. Because of its decreased accessibility, the dieting goal will exert less influence on motivational behavior. As a result, food pre-exposure should decrease the (relative) motivation of restrained eaters to obtain healthy food.

To test this idea, we recorded handgrip force while presenting participants pictures of healthy food objects after manipulating food pre-exposure. Participants were told that they would see pictures of objects which were not specified beforehand. They were instructed to squeeze the hand grip as quickly as possible when the object appeared on the screen. Because participants were led to expect that they could obtain the object by squeezing as forcefully as possible while the object was displayed on the screen, the recorded handgrip force provides insight into people's spontaneous effortful behavior to obtain the healthy food objects. We hypothesized that food pre-exposure would reduce effortful behavior toward healthy food objects for restrained (but not unrestrained) eaters, as reflected by lower exertion of force to obtain the objects after food pre-exposure.

Moreover, recent findings suggest that the impact of food pre-exposure on responses toward healthy food may be most pronounced for those restrained eaters who perceive themselves to be highly unsuccessful in controlling their weight (Van Koningsbruggen, Stroebe, & Aarts, 2011b). Therefore, we investigated whether perceived self-regulatory success in dieting as assessed with a scale developed by Fishbach, Friedman, and Kruglanski (2003) would moderate the predicted effect.

Methods

Participants

This study used a food pre-exposure (present vs. absent) between participants design, with dietary restraint and perceived self-regulatory success in dieting as continuous predictors. Participants were 37 students (18 female, 19 male; $M_{age} = 22.38$, $SD_{age} = 2.37$), who received either course credit or a small fee. They were assigned randomly to the food pre-exposure or no pre-exposure condition.[2]

Materials and measures

Food pre-exposure manipulation

A letter detection task was used to implement food pre-exposure experimentally. Participants had to indicate as quickly and accurately as possible, by pressing a key, whether a letter presented very briefly on the screen was the letter "A" or "L". Before each decision, a prime word was presented. The letter detection task contained 75 trials, and every trial began with a fixation point (∗) for 1000 ms. In each trial, participants were briefly primed with either a randomly selected tempting food word (food pre-exposure condition) or non-word (no pre-exposure condition). We used five tempting food words (chocolate, cookies, pizza, French fries, chips; all single words in Dutch) and five non-words (jolging, nistierd, bagou, felin, gnefpar), and each word was presented 15 times. The prime word was preceded by a pre-mask (unreadable letter string) that remained for 400 ms. Then the prime was presented for 34 ms, followed by a post-mask (unreadable letter string) for 400 ms. Thus, proper pre- and post-masking rendered the briefly presented primes difficult to recognize, preventing participants from becoming aware of the link between the different tasks. Finally, participants were presented randomly with the letter "A" or "L" for 100 ms, followed by a question mark (?) that remained on the screen until a response was made. When participants responded correctly (vs. erroneously) a green (vs. red) circle was presented for 1000 ms. The inter-trial interval was 500 ms.

Handgrip-force task

Participants were informed that they would see pictures of objects and that their task was to squeeze the handgrip with their dominant hand as quickly as possible when the object appeared on the screen, and to stop squeezing when the object was erased. They were told that they could obtain the object by squeezing the handgrip as forcefully as possible as long as the object was displayed on the screen. Participants responded, in a fixed order, to three objects (selected from a pilot study): an apple, granola bar, and an orange. The objects were not specified beforehand, and participants did not receive performance feedback. Every trial began with a fixation point (∗) for 2000 ms, followed by the object that was displayed for 3500 ms. The inter-trial interval was 7000 ms. The procedure was similar to previous research using this device (Aarts et al., 2008). Handgrip-force was recorded every 5 ms (200-Hz sample rate), and means were computed for the period that each object was displayed. Means of the food objects were averaged and analyzed as a single measure of handgrip-force ($\alpha = .96$).

Palatability

We assessed palatability of the food objects by asking participants to indicate on a 7-point scale how palatable the food objects were for them at that moment (1 = *not at all palatable*, 7 = *highly palatable*; $M = 4.23$, SD = 1.07).

Dietary restraint

As recommended in previous research (Stroebe et al., 2008) we assessed participants' chronic motivation to control their weight by dieting with the Concern for Dieting subscale of the Revised Restraint Scale (Herman & Polivy, 1980; Jansen, Oosterlaan, Merckelbach, & Van den Hout, 1988). The scale assesses participants' motivation to restrain their eating by six items such as "How often

[2] Age, gender, dietary restraint, perceived self-regulatory success, palatability and hunger ratings did not differ between conditions, *Fs* < 1–2.86, *ps* = .67–.10, all $\eta_p^2 s < .08$

are you dieting?" and "How conscious are you of what you are eating?" (α = .66). The score is the sum of ratings with a possible range of 0–19 (M = 6.22, SD = 2.54; Mode = 7.00, range 0–12).

Perceived self-regulatory success

Perceived self-regulatory success in dieting was assessed with the three-item scale developed by Fishbach et al. (2003) by asking participants to indicate on a 7-point scale how successful they were in losing weight, watching their weight, and how difficult they found it to stay in shape (α = .64). The score is the mean of ratings (M = 3.86, SD = 1.16; Modes = 3.50 and 4.00, range 1–6).

Hunger

Hunger was measured by asking participants to indicate on a 7-point scale how hungry they were at that moment (1 = *not at all*, 7 = *very much*; M = 3.73, SD = 1.73).

Procedure

Participants were tested individually and the research was described as consisting of several separate unrelated parts. Participants first completed the letter detection task that was presented as research on speed and accuracy of people in detecting letters. They then completed the handgrip-force task that was announced as a study to examine the suitability of a new research instrument: the handgrip device. Finally, participants rated the palatability of the food objects, completed the dietary restraint and perceived success scales, and indicated how hungry they were. Participants then were extensively debriefed and thanked for participating. None of the participants reported seeing the word primes or guessed the true nature of the study.

Results

Handgrip-force (N)

The mean force participants displayed across the three handgrip trials was analyzed in the General Linear Model (GLM) with food pre-exposure (present vs. absent) as between-participants factor, and dietary restraint and perceived success (standardized) as continuous predictors. Palatability and hunger ratings were included as covariates. The analysis revealed a marginally significant main effect of restraint, $F(1, 27) = 3.26$, $p = .08$, $\eta^2_p = .11$. Overall, restrained eaters exerted less force (M = 185, SE = 26.24) than unrestrained eaters (M = 255, SE = 23.29). Importantly, the analysis also revealed a significant Pre-exposure × Restraint interaction, $F(1, 27) = 5.88$, $p = .022$, $\eta^2_p = .18$. None of the covariates and other main or interaction effects were significant, $Fs < 1–1.56$, $ps = .91–.22$, all $\eta^2_p s < .06$. To test our hypothesis, we examined the effect of food pre-exposure for restrained and unrestrained eaters separately (+1 SD vs. −1 SD of the mean of restraint; Aiken & West, 1991). For restrained eaters, the effect of food pre-exposure was significant, $F(1, 31) = 6.34$, $p = .017$, $\eta^2_p = .17$. Restrained eaters in the food pre-exposure condition exerted less force (M = 154, SE = 20.80) than those in the no pre-exposure condition (M = 258, SE = 35.91). As expected, the effect of food pre-exposure was not significant for unrestrained eaters, $F(1, 31) = 1.76$, $p = .20$, $\eta^2_p = .05$ ($M_{\text{food pre-exposure}}$ = 277, $SE_{\text{food pre-exposure}}$ = 32.64; $M_{\text{no pre-exposure}}$ = 225, $SE_{\text{no pre-exposure}}$ = 21.85).[3,4] Additional analyses showed that dietary restraint was negatively related to mean force in the food pre-exposure condition ($r = -.60$, $p = .008$), and unrelated to mean force in the no pre-exposure condition ($r = .16$, $p = .50$). The difference between the correlations was significant, $z = 2.38$, $p = .017$. Success was unrelated to handgrip-force in both conditions ($r_{\text{food pre-exposure}} = .33$, $p_{\text{food pre-exposure}} = .18$; $r_{\text{no pre-exposure}} = .06$, $p_{\text{no pre-exposure}} = .82$). Figure 1 displays the mean pattern of force across the handgrip trials (for technical reasons, the values for restrained and unrestrained eaters are based on a median split).

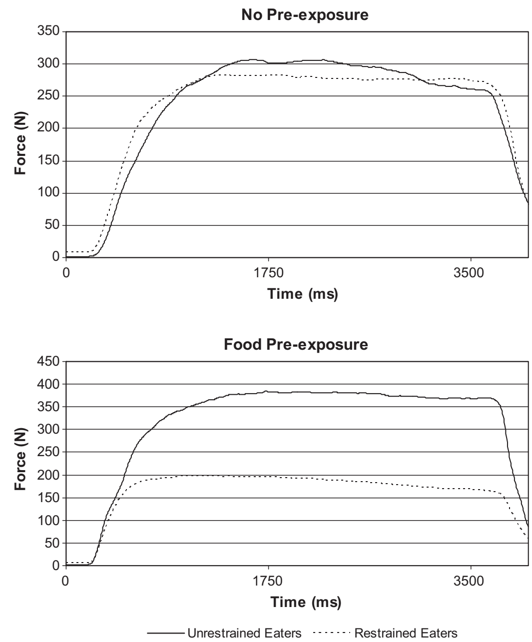

Fig. 1. Mean pattern of force across the three handgrip trials as a function of dietary restraint in the no pre-exposure (top panel) and food pre-exposure conditions (bottom panel).

Palatability

A GLM analysis with food pre-exposure, restraint, and perceived success as predictors on the palatability ratings of the healthy food objects revealed no significant effects, $Fs < 1–2.38$, $ps = .71–.13$, all $\eta^2_p s < .08$. Additional analyses showed that dietary restraint was unrelated to the palatability ratings in both the food pre-exposure ($r = -.10$, $p = .70$) and no pre-exposure condition ($r = .33$, $p = .18$). Palatability ratings were also unrelated to handgrip-force ($r_{\text{food pre-exposure}} = -.02$, $p_{\text{food pre-exposure}} = .94$; $r_{\text{no pre-exposure}} = .07$, $p_{\text{no pre-exposure}} = .78$) and success ($r_{\text{food pre-exposure}} = .33$, $p_{\text{food pre-exposure}} = .19$; $r_{\text{no pre-exposure}} = -.15$, $p_{\text{no pre-exposure}} = .54$).

Hunger

A GLM analysis with food pre-exposure, restraint, and perceived success as predictors on the hunger rating revealed no significant effects, $Fs < 1–2.46$, $ps = .98–.13$, all $\eta^2_p s < .08$. Additional analyses showed that dietary restraint was unrelated to hunger in both the food pre-exposure ($r = -.09$, $p = .73$) and no pre-exposure condition ($r = -.13$, $p = .61$). Hunger was also unrelated to handgrip-force ($r_{\text{food pre-exposure}} = .15$, $p_{\text{food pre-exposure}} = .54$; $r_{\text{no pre-exposure}} = .05$, $p_{\text{no pre-exposure}} = .84$), palatability ratings ($r_{\text{food pre-exposure}} = .34$, $p_{\text{food pre-exposure}} = .17$; $r_{\text{no pre-exposure}} = .35$, $p_{\text{no pre-exposure}} = .14$), and success ($r_{\text{food pre-exposure}} = .35$, $p_{\text{food pre-exposure}} = .16$; $r_{\text{no pre-exposure}} = .05$, $p_{\text{no pre-exposure}} = .85$).

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[3] Including gender in the analyses revealed a main effect of gender, $F(1, 27) = 13.02$, $p = .001$, $\eta^2_p = .33$, while the reported Pre-exposure x Restraint interaction remained significant, $F(1, 27) = 5.08$, $p = .033$, $\eta^2_p = .16$. No other effects were significant. Overall, males displayed greater mean force (M = 265, SE = 18.76) than females (M = 157, SE = 23.37).

[4] Analyzing each food object separately revealed similar results.

Discussion

We examined the impact of food pre-exposure on effortful behavior toward healthy food using an unobtrusive handgrip-force task measure that directly taps into people's physical effort to obtain healthy food. Results showed that restrained eaters exerted less force to obtain the healthy food objects following food pre-exposure. Food pre-exposure had no influence on unrestrained eaters' exertion of force upon perceiving healthy food. Consistent with our hypothesis, these findings suggest that exposure to cues of attractive food reduces restrained eaters' effortful behavior toward healthy food objects. No effects were observed on perceptions of palatability of the healthy foods, suggesting that food pre-exposure specifically affects the motivation of restrained eaters in obtaining healthy food.

The present findings are consistent with the goal conflict model of eating (Stroebe et al., 2008), which suggests that restrained eaters spontaneously activate the hedonic goal of eating enjoyment in response to tempting food cues and inhibit the conflicting dieting goal. Because of its decreased accessibility, the dieting goal exerts less influence on motivational behavior. As a result, healthy food objects should elicit less effortful behavior. Indeed, the current results show that restrained eaters display less forceful action toward healthy food objects following food pre-exposure. Whereas a great deal of previous research focused on responses to palatable food and suggested that food pre-exposure increases effortful behavior toward such foods and the likelihood of overeating (e.g., Fedoroff et al., 1997; Giesen et al., 2009; Jansen & Van den Hout, 1991; Rogers & Hill, 1989; Van Koningsbruggen et al., 2011a), our study adds to this work by addressing the other side of the coin, namely scrutinizing responses to healthy food objects following food pre-exposure. Together with the strong appetitive reactions toward palatable foods elicited by tempting environments in restrained eaters, the observed decrease in forceful action toward healthy foods may pave the way for unhealthy eating behavior.

Whereas some recent research suggests that the impact of food pre-exposure on responses toward healthy food should have a less pronounced effect for successful restrained eaters (Van Koningsbruggen et al., 2011b), the current findings did not support this assumption. They are therefore more in line with the general literature on restrained eating, which demonstrates that restrained eaters have difficulty in keeping to a healthy diet (Stroebe, 2008). The preponderance of such negative effects suggests that successful restrained eaters are usually a minority in samples of restrained eaters. The unusually high negative correlation between restraint and success in the present sample ($r = -.53$), compared to Van Koningsbruggen et al., (2011b, Study 2, $r = -.28$) indicates that this might have been particularly true in the current study.

A limitation of our study is that we only assessed the impact of food pre-exposure on effortful behavior toward healthy food. Although previous research suggests that restrained eaters increase effort to obtain palatable food following food pre-exposure (Giesen et al., 2009; Van Koningsbruggen et al., 2011a), it has not yet been investigated whether handgrip-force toward palatable food is increased by food pre-exposure. Additionally, future studies could prime participants with dieting or healthy food words to test whether this increases restrained eaters' effort to obtain healthy food: According to the goal conflict model of eating (Stroebe et al., 2008), increasing accessibility of the dieting goal should increase the success of restrained eaters. Another important direction for future research would be to develop intervention strategies that boost effortful behavior toward healthy food for restrained eaters in tempting situations. This may be accomplished by establishing or strengthening an associative link between temptations and dieting thoughts in restrained eaters (Van Koningsbruggen, Stroebe, Papies, & Aarts, 2011).

In conclusion, this study showed that exposure to cues of attractive food reduces effortful behavior of restrained eaters toward healthy food objects. Even though many places where people make food choices increasingly offer healthy food alternatives, people who are chronically concerned about their weight seem, without being aware of it, less likely to invest effort to get such foods when surrounded by attractive alternatives. Therefore these results provide further insight into why restrained eaters may have difficulties in maintaining a low-calorie diet in food-rich environments.

References

Aarts, H., Custers, R., & Marien, H. (2008). Preparing and motivating behavior outside of awareness. *Science, 319*, 1639. doi:10.1126/science.1150432.

Aarts, H., & Dijksterhuis, A. (2000). Habits as knowledge structures. Automaticity in goal-directed behavior. *Journal of Personality and Social Psychology, 78*, 53–63.

Aiken, L. S., & West, S. G. (1991). *Multiple regression. Testing and interpreting interactions*. London: Sage Publications.

Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist, 54*, 462–479. doi:10.1037//0003-066X.54.7.462.

Brunstrom, J. M., Yates, H. M., & Witcomb, G. L. (2004). Dietary restraint and heightened reactivity to food. *Physiology and Behavior, 81*, 85–90. doi:10.1016/j.physbeh.2004.01.001.

Fedoroff, I. C., Polivy, J., & Herman, C. P. (1997). The effect of pre-exposure to food cues on the eating behavior of restrained and unrestrained eaters. *Appetite, 28*, 33–47. doi:10.1006/appe.1996.0057.

Finucane, M. M., Stevens, G. A., Cowan, M. J., Danaei, G., Lin, J. K., & Paciorek, C. J. (2011). National, regional, and global trends in body-mass index since 1980. Systematic analysis of health examination surveys and epidemiological studies with 960 country-years and 9 1 million participants. *The Lancet, 377*, 557–567. doi:10.1016/S0140-6736(10)62037-5.

Fishbach, A., Friedman, R. S., & Kruglanski, A. W. (2003). Leading us not unto temptation. Momentary allurements elicit overriding goal activation. *Journal of Personality and Social Psychology, 84*, 296–309. doi:10.1037/0022-3514.84.2.296.

Giesen, J. C. A. H., Havermans, R. C., Nederkoorn, C., Strafaci, S., & Jansen, A. (2009). Working harder to obtain more snack foods when wanting to eat less. *Behaviour Research and Therapy, 47*, 13–17. doi:10.1016/j.brat.2008.09.007.

Herman, C. P., & Polivy, J. (1980). Restrained eating. In A. J. Stunkard (Ed.), *Obesity* (pp. 208–225). Philadelphia: Saunders.

Hill, J. O., & Peters, J. C. (1998). Environmental contributions to the obesity epidemic. *Science, 280*, 1371–1374. doi:10.1126/science.280.5368.1371.

Hofmann, W., Van Koningsbruggen, G. M., Stroebe, W., Ramanathan, S., & Aarts, H. (2010). As pleasure unfolds: Hedonic responses to tempting food. *Psychological Science, 21*, 1863–1870. doi:10.1177/0956797610389186.

Jansen, A., Oosterlaan, J., Merckelbach, H., & Van den Hout, M. A. (1988). Nonregulation of food intake in restrained, emotional, and external eaters. *Journal of Psychopathology and Behavioral Assessment, 10*, 345–354.

Jansen, A., & Van den Hout, M. (1991). On being led into temptation. "Counterregulation" of dieters after smelling a "preload". *Addictive Behaviors, 16*, 247–253. doi:10.1016/0306-4603(91)90017-C.

LeGoff, D. B., & Spigelman, M. N. (1987). Salivary response to olfactory food stimuli as a function of dietary restraint and body weight. *Appetite, 8*, 29–35. doi:10.1016/S0195-6663(87)80024-7.

Papies, E. K., Stroebe, W., & Aarts, H. (2007). Pleasure in the mind. Restrained eating and spontaneous hedonic thoughts about food. *Journal of Experimental Social Psychology, 43*, 810–817. doi:10.1016/j.jesp. 2006.08.001.

Rogers, P. J., & Hill, A. J. (1989). Breakdown of dietary restraint following mere exposure to food stimuli. Interrelationships between restraint, hunger, salivation, and food intake. *Addictive Behaviors, 14*, 387–397. doi:10.1016/0306-4603(89)90026-9.

Stroebe, W. (2008). *Dieting, overweight, and obesity. Self-regulation in a food-rich environment*. Washington, DC: American Psychological Association.

Stroebe, W., Mensink, W., Aarts, H., Schut, H., & Kruglanski, A. W. (2008). Why dieters fail. Testing the goal conflict model of eating. *Journal of Experimental Social Psychology, 44*, 26–36. doi:10.1016/j.jesp. 2007.01.005.

Tepper, B. J. (1992). Dietary restraint and responsiveness to sensory-based food cues as measured by cephalic phase salivation and sensory specific satiety. *Physiology and Behavior, 52*, 305–311. doi:10.1016/0031-9384(92)90276-8.

Van Koningsbruggen, G. M., Stroebe, W., & Aarts, H. (2011a). Food pre-exposure boosts restrained eaters' effort to obtain palatable food. *Unpublished data, Utrecht University, Utrecht*.

Van Koningsbruggen, G. M., Stroebe, W., & Aarts, H. (2011b). Through the eyes of dieters: Biased size perception of food following tempting food primes. *Journal of Experimental Social Psychology, 47*, 293–299. doi:10.1016/j.jesp. 2010.10.012.

Van Koningsbruggen, G. M., Stroebe, W., Papies, E. K., & Aarts, H. (2011). Implementation intentions as goal primes: Boosting self-control in tempting environments. *European Journal of Social Psychology, 41*, 551–557. doi:10.1002/ejsp. 799.