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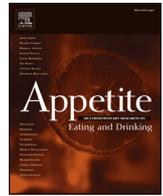
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Watch what you watch: The effect of exposure to food-related television content on the accessibility of a hedonic eating goal

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ABSTRACT

Background: This study examined whether seeing food-related TV content affected the accessibility of a hedonic eating goal differently for people scoring relatively high or low on chronic dieting (i.e., eating restraint) and perceived self-regulatory success (i.e., PSRS).

Methods: Three between-subjects experiments were conducted in which participants were exposed to food-related or non-food related TV content. In Experiment 1 (student sample, $N = 111$) and Experiment 2 (community sample, $N = 69$) participants watched TV commercials for food or non-food products and in Experiment 3 (student sample, $N = 102$) a cooking show or a non-food TV show. Hedonic eating goal accessibility was assessed by means of a lexical decision task (LDT). Eating restraint and PSRS were measured afterwards.

Results: The expected three-way interaction between TV content, eating restraint, and PSRS on hedonic eating goal accessibility was not found in Experiments 1 and 2. In Experiment 3, a three-way interaction was found although effects were short-lived. As expected, watching food-related versus non-food related TV content resulted in more hedonic eating goal accessibility among people relatively high in eating restraint but low in PSRS (i.e., unsuccessful restrained eaters), but in less accessibility among participants relatively high in both eating restraint and PSRS (i.e., successful restrained eaters).

Discussion: As effects were found after watching a cooking show (Experiment 3) but not after watching TV commercials (Experiments 1 and 2), future research should explore whether the type of TV content might play a role in the effects of food-related TV content on hedonic eating goal accessibility, as well as whether the effects found on goal accessibility translate into actual food choices.

1. Introduction

Overweight and obesity have risen steeply over the last decades, and the World Health Organization (WHO) now considers obesity a major global health problem (WHO, 2018). Television (TV) viewing is associated with the development of obesity (Chapman, Benedict, Brooks, & Schiöth, 2012) and one of the reasons for this may be exposure to food-related cues on TV (Boulos, Vikre, Oppenheimer, Chang, & Kanarek, 2012). TV viewers are continually exposed to unhealthy, but palatable foods, for example in a commercial for chocolate or a cooking show (Chapman, Nicholas, & Supramaniam, 2006). A recent meta-analysis showed that exposure to visual food cues (e.g., pictures and videos) results in increased unhealthy food choices and is related to subsequent weight gain (Boswell & Kober, 2016). This suggests that exposure to food cues on TV may indeed contribute to obesity.

Experimental research into the effect of exposure to food cues on TV

(i.e., food-related TV content) on unhealthy food choices in adults has, however, resulted in mixed findings. While some studies have shown that the exposure to food-related TV content can increase unhealthy food choices (Blass et al., 2006; Bodenlos & Wormuth, 2013; Harris, Bargh, & Brownell, 2009), others have been unable to demonstrate such effects (Bellisle, Dalix, Airinei, Herberg, & Péneau, 2009; Martin, Coulon, Markward, Greenway, & Anton, 2009). Furthermore, a recent meta-analysis has failed to find a significant effect of exposure to food commercials on unhealthy food choices among adults (Boyland et al., 2016).

These mixed findings may be explained by individual differences in how susceptible people are to the influence of unhealthy – but palatable – foods on TV. To this date, little research has focused on the possible mechanisms underlying the relation between exposure to food-related TV content and unhealthy food choices. It has been suggested, however, that seeing foods on TV may lead to unhealthy food choices by priming

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the desire to eat palatable foods (i.e., a hedonic eating goal; Harris et al., 2009). This may be especially the case for dieters (i.e., people high in eating restraint) with low self-regulatory skills (Papies, Stroebe, & Aarts, 2008). The goal of the current study therefore was to investigate whether exposure to food-related (vs. non-food related) TV content increased the accessibility of a hedonic eating goal and whether this differed between people relatively high and low in eating restraint and perceived self-regulatory success (PSRS). Increased goal accessibility may subsequently lead to unhealthy food choices (Förster, Liberman, & Friedman, 2007). Although it would be relevant to also assess effects on food choices, as a first step this study only focused on goal accessibility because measuring goal accessibility may influence subsequent food choices and thus play a confounding role in examining the effects of TV content on food choices.

1.1. Priming the goal of hedonic eating

Goals are mental representations of desired states that preexist in one's long-term memory (Bargh, 1990). External cues (e.g., words or images) can serve as primes that can unconsciously and temporarily increase the mental accessibility of a goal (Fishbach, Friedman, & Kruglanski, 2003). This increased mental accessibility can subsequently result in behavior aimed at goal achievement (Förster et al., 2007). Thus, seeing unhealthy but palatable foods on TV might prime a goal of hedonic eating, and in turn lead to unhealthy food choices. Prior research has shown that exposure to palatable food cues (i.e., sentences containing appetizing food words) compared to neutral food cues (i.e., sentences containing neutral food words) indeed results in increased accessibility of a hedonic eating goal, as shown by faster response latencies to words representing the hedonic eating goal (Papies, Stroebe, & Aarts, 2007). The cues in this study (i.e., words), however, are difficult to compare to the food cues we frequently encounter in our daily lives, such as a chocolate commercial on TV. Some initial evidence that mechanisms of goal accessibility also play a role in the effects of food-related TV content on eating behavior was found by Kemps, Tiggemann, and Hollitt (2014). Participants who were exposed to food commercials completed word stems (e.g., “bre...”) more frequently with food-related words (e.g., “bread”), compared to participants who had viewed non-food commercials. This indicates that exposure to food commercials increased the accessibility of food-related thoughts. However, increased accessibility of food-related thoughts is not the same as having the desire or goal to eat certain foods. In sum, there is some indirect evidence that watching palatable, food-related TV content may increase the accessibility of a hedonic eating goal, but this has not been investigated as such.

1.2. Restrained eating and goal accessibility

Seeing palatable foods on TV will likely not result in increased accessibility of a hedonic eating goal for everyone. Research has shown that especially restrained eaters, that is, people who chronically try to control their weight by restricting their food intake, are sensitive to exposure to palatable food cues (Fedoroff, Polivy, & Herman, 2003; Wang et al., 2016). This is because restrained eaters tend to focus on hedonic aspects of food (i.e., taste and texture; Stroebe, Papies, & Aarts, 2008b). As their long-term dieting goal is chronically accessible in the mind of restrained eaters, this goal will usually be dominant and therefore, they tend to eat less under normal circumstances (Lindroos et al., 1997). However, as shown by previous experimental research, exposure to palatable food cues may temporarily increase the accessibility of a short-term hedonic eating goal, and decrease the accessibility of an incompatible, long-term dieting goal in restrained eaters (Papies et al., 2007; Stroebe, Mensink, Aarts, Schut, & Kruglanski, 2008a). This is not the case for unrestrained eaters, who tend to be more focused on informational aspects of food (e.g., nutritional value; Stroebe et al., 2008b).

1.3. Distinguishing between successful and unsuccessful restrained eaters

While most restrained eaters frequently fail to control their food intake in response to tempting food cues, some restrained eaters are successful (Fishbach et al., 2003; Wing & Hill, 2001). This can be explained by different levels of perceived self-regulatory success (PSRS; Fishbach et al., 2003). People with relatively high levels of PSRS (i.e., successful restrained eaters) have repeatedly exerted self-control in response to tempting food stimuli in the past (Fishbach et al., 2003). This has resulted in strong and automatic facilitative links between exposure to tempting foods and accessibility of dieting goals. People with relatively low levels of PSRS (i.e., unsuccessful restrained eaters) have not formed such strong facilitative links. For them, exposure to tempting foods is more likely to result in the increased accessibility of the hedonic eating goal and decreased accessibility of the dieting goal. Evidence was found in a study by Papies et al. (2008). After participants were primed with words representing palatable foods (e.g., chocolate, chips) versus neutral words (e.g., book, office), the dieting goal was more accessible for successful restrained eaters, as shown by their faster responses to diet-related words. Contrastingly, the dieting goal was less accessible for unsuccessful restrained eaters after exposure to these palatable food words (vs. neutral words). In addition, after being primed with palatable food words, compared to neutral words, unsuccessful restrained eaters showed more effort to obtain high-calorie foods, while successful restrained eaters showed more effort to obtain low-calorie foods (van Koningsbruggen, Stroebe, & Aarts, 2013).

To our knowledge, to date this process of increased and decreased hedonic eating goal accessibility in unsuccessful and successful restrained eaters, respectively, has only been studied with written food words. It is important to examine whether the same process applies to actual media content, which is more complex than mere food words. For example, TV content contains both visuals and audio, and the food cues in TV content are usually part of a narrative. Moreover, they can serve to inform or entertain (e.g., cooking show) or they can serve to persuade the audience (e.g., food commercials). The goal of the current study is to investigate whether food-related TV content also results in increased accessibility of a hedonic goal and whether this depends on relative levels of eating restraint and PSRS. If so, it may provide an indication for why a previous meta-analysis did not find effects of food commercials on unhealthy food choices among adults (Boyland et al., 2016). Based on the discussed theory and empirical evidence, the following hypothesis is proposed:

H1. A three-way interaction between TV content, eating restraint, and PSRS is expected. Palatable food-related vs. non-food related TV content results in a more accessible hedonic eating goal among people relatively high in eating restraint but low in PSRS (i.e., unsuccessful restrained eaters) and in a less accessible hedonic eating goal among people relatively high in both eating restraint and PSRS (i.e., successful restrained eaters). Among people relatively low in eating restraint (i.e., unrestrained eaters), accessibility of this goal is unaffected by exposure to food-related TV content, irrespective of PSRS.

1.4. The current study

To test this hypothesis, three experiments were conducted that applied a single factor between-subjects design with TV content (food-related content vs. non-food related content) as the independent variable, and eating restraint and PSRS as continuous moderators. In Experiments 1 and 2, commercials were used as stimulus materials. In Experiment 3, a cooking show segment was used. Hedonic eating goal accessibility was the dependent variable, as measured by means of a lexical decision task (LDT). The LDT is a computerized task that has shown to be able to measure the accessibility of eating-related goals in prior research (e.g., Fishbach et al., 2003; Papies et al., 2007). In the LDT, participants are instructed to decide, as quickly as possible,

whether a letter string appearing on the computer screen is an existing word (e.g., “appetizing”) or a non-word (e.g., “zitepangip”). Faster responses to a word indicate that this word is more accessible (Aarts & Dijksterhuis, 2000). All studies were approved by the Ethics Committee of the Faculty of Social and Behavioral Sciences of the University of Amsterdam and informed consent was obtained from all participants at the beginning of the experiment.

2. Experiments 1 and 2

2.1. Material and methods

Experiments 1 and 2 used the same material and methods, but were conducted among different samples. For Experiment 1, participants were recruited at the university campus. Experiment 2 was a replication of Experiment 1, but a more heterogeneous sample was used. This decision was made based on the relatively low number of unsuccessful restrained eaters in Experiment 1 (only 9% scored above the midpoint of the eating restraint scale and below the midpoint of the PSRS scale) and the low number of people with overweight (only 11% was overweight in Experiment 1). This is much lower than the 50% of people with overweight in the entire population in the Netherlands where the study was conducted (Statistics Netherlands, 2017). In Experiment 2, we therefore recruited participants at a food fair. In Experiment 2, even less participants could be classified as unsuccessful restrained eaters (6%), but the Body Mass Index (BMI) scores of participants in Experiment 2 were higher (46% of the participants were overweight) and more closely resembled the percentage of the Dutch population that is overweight.

A power calculation was performed in G*Power to estimate the required sample size for Experiments 1 and 2. Based on a medium effect size of 0.25 (Papies et al., 2008), α of 0.05 and power of .80 this resulted in a required sample of $N = 128$.

2.1.1. Participants

In total, respectively 148 and 92 participants took part in Experiments 1 and 2. Participants were excluded from the analyses if they indicated to not eat at least two of the three foods present in the commercials due to allergies ($n_{Exp.1} = 9$, $n_{Exp.2} = 5$) or other restrictions (e.g., veganism, religious considerations; $n_{Exp.1} = 6$, $n_{Exp.2} = 0$), or if they strongly disliked at least two of the three foods ($n_{Exp.1} = 1$, $n_{Exp.2} = 5$). Participants with more than 10% incorrect responses in the LDT ($n_{Exp.1} = 21$, $n_{Exp.2} = 3$) were excluded as well (cf. Mollen, Holland, Ruiters, Rimal, & Kok, 2016; for justification for the 10% cut off point see Nosek, Bar-Anan, Sriram, Axt, & Greenwald, 2014). We also ran the analyses including all participants with more than 10% incorrect responses in the LDT, but this did not change the conclusion regarding significance of the three-way interaction (tested at $p < .05$). In addition, several participants in Experiment 2 were excluded due to alcohol intake before participation ($n = 10$). The final sample of Experiment 1 therefore consisted of 111 participants (90 females, 21 males; $M_{age} = 22.30$, $SD_{age} = 4.72$). In exchange for participation, participants received course credit or €2.50. The final sample of Experiment 2 consisted of 69 participants (53 females, 16 males; $M_{age} = 41.28$, $SD_{age} = 16.15$). In exchange for their participation, participants could sign up for a raffle to win a trial subscription to a magazine.

2.1.2. TV content

TV commercials were used as stimulus materials. Participants in the food-related content condition viewed a commercial block consisting of three food commercials and two non-food commercials (with a duration of 1 min and 25 s in total), whereas participants in the non-food related content condition viewed a commercial block consisting of five non-food commercials (1 min and 45 s in total). The five commercials were presented in a random order. The selection of commercials was based

on a pretest among 69 participants (51 females, 18 males; $M_{age} = 21.86$, $SD_{age} = 2.50$). The pretest confirmed that the selected food commercials (Domino's pizza, Milka chocolate, and McDonald's ice cream) were all high in food appeal and desire to eat, but low in perceived healthiness. Furthermore, the commercials in the food-related content condition were equally entertaining as the commercials in the non-food related content condition, $t(225) = 1.41$, $p = .161$, and the brands displayed were equally familiar to the participants, $t(225) = 0.49$, $p = .627$. Details of the ratings can be found in the Supplementary Material (1a and 1b).

2.1.3. Measures

Eating restraint. Eating restraint was measured using the Concern for Dieting subscale of the Restraint Scale (Jansen, Oosterlaan, Merckelbach, & van den Hout, 1988). The Concern for Dieting subscale consists of six items, such as “How conscious are you of what you are eating?” (1 = *not at all*, 4 = *extremely*) and “How often are you dieting?” (1 = *never*, 5 = *always*). The possible range of the summed score was 6–25. The mean summed score was 13.23 in Experiment 1 ($SD = 3.30$, $\alpha = 0.77$) and 12.54 ($SD = 2.57$, $\alpha = 0.67$) in Experiment 2.

PSRS. PSRS was measured with a scale consisting of three items: “How successful are you in losing weight?” (1 = *not successful*, 7 = *very successful*), “How successful are you in watching your weight?” (1 = *not successful*, 7 = *very successful*), and “How difficult do you find it to stay in shape?” (1 = *not difficult*, 7 = *very difficult*, reversed coding; Fishbach et al., 2003). The mean score was 4.50 in Experiment 1 ($SD = 1.07$, $\alpha = 0.61$) and 4.31 in Experiment 2 ($SD = 1.07$, $\alpha = 0.56$).

Hedonic eating goal accessibility. An LDT was used to measure hedonic eating goal accessibility. Every trial in the LDT started with a fixation cue (*), which was presented in the middle of the screen for 500 ms. Next, a letter string appeared on the screen. If the letter string was an existing Dutch word, participants were supposed to press the right shift key on the key board with their right hand. If the letter string was a non-word, the left shift key had to be pressed with their left hand. As soon as the participant made a decision, there was a blank screen for 1000 ms. After 10 practice trials, participants responded to a block of 48 different letter strings, consisting of 24 existing words (6 goal words, 6 neutral words, 12 filler words) and 24 non-words. The goal words that served to measure the hedonic eating goal (e.g., tasty, appetizing) were based on a study by Papies et al. (2007). Each of the goal words was matched with a neutral, office-related word of equal length (e.g., table, stationary). None of the goal or neutral words appeared – visually or audibly – in the commercials. All letter strings were randomly presented, but every seventh word was a goal word to be certain that they were not presented too closely after each other (Aarts, Custers, & Holland, 2007). After a 30 s break following the first block, participants performed a second block of trials. This second block comprised of the same 48 trials, again presented in a random order.

Hedonic eating goal accessibility was operationalized by subtracting the response latencies (in ms) of the goal words from the response latencies of the matched neutral words for every participant (Haynes, Kemps, Moffitt, & Mohr, 2014). This way, the scores for accessibility of the hedonic eating goal words were relative to those of the neutral words, thereby minimizing individual differences in response latencies. Higher scores (above zero) indicated faster responses to the goal words, relative to the neutral words, thus more accessibility of the hedonic eating goal. Before calculating these scores, all incorrect responses to the goal words and neutral words were removed. Additionally, all responses with latencies lower than 300 ms and higher than 1200 ms were removed to reduce the influence of extreme responses (Aarts et al., 2007). After data trimming, the mean score was 9.29 ms ($SD = 44.63$) in Experiment 1 and 13.60 ms ($SD = 38.19$) in Experiment 2, indicating that the hedonic eating goal words were slightly more accessible in both experiments compared to the neutral words overall.

Other variables. Participants were asked to report their age, sex,

mother tongue, handedness (left/right), hunger, body height, and weight. BMI was calculated afterwards as weight in kilograms divided by height in meters squared. In Experiment 2, educational level was also measured. All of these variables were assessed before exposure to the commercials, except for BMI.¹

2.1.4. Procedure

In Experiment 1, data collection took place at the university lab. Upon arrival at the lab, participants were individually seated in a cubicle in front of a desktop computer. In Experiment 2, the data were collected at a food fair aimed at consumers interested in food trends and cooking. Participants were seated in front of a laptop in a quiet area at the fair. As part of the cover story participants were told that the experiment pertained to attention for media content. After providing consent, participants answered a short questionnaire in which background variables were assessed. Next, participants were randomly assigned to either the food-related or the non-food related content condition and watched the commercial block. In Experiment 2, a short video clip of the weather forecast was shown prior to exposure to the stimulus materials. This was done to decrease the possibility that the response latencies in the LDT were due to other food cues present at the fair. Showing the weather forecast also fitted the cover story (i.e., attention for media content). The LDT immediately followed the commercials. After completing the LDT, participants completed a second questionnaire assessing eating restraint and PSRS. Finally, participants were asked what they thought the goal of the experiment was. In Experiments 1 and 2, respectively two and one participants showed insight into the goal of the experiment, but excluding these participants from the dataset did not change the conclusion regarding significance of the three-way interaction (tested at $p < .05$). The participants were therefore retained.

2.1.5. Analyses

Initial checks showed that the data met the assumptions for parametric statistics. Regression analyses and one-way ANOVAs were then performed to check the influence of the background variables on hedonic eating goal accessibility. To test **H1**, we used PROCESS as a macro in SPSS (Hayes, 2013). A moderated moderation model (number 3) was chosen with TV content as the independent variable, eating restraint and PSRS as continuous moderators and hedonic eating goal accessibility as the dependent variable. This was done for the first and the second block of the LDT together, but also separately to get a more detailed insight into (the durability of) the results. The same analyses were conducted in Experiment 3.

¹ We also measured the variables below for descriptive and/or exploratory purposes. The influence of the potential moderating variables and variables related to underlying processes was assessed. However, none of these variables led to different conclusions regarding the predicted three-way interaction, so they are not further discussed. **Background variables:** participants' study program they currently followed (Exp. 1), study status (Exp. 1,2), country of origin (Exp. 1,2,3), profession, reason for attending the food fair (where the study took place), how long ago (in minutes) they had last eaten and drank something (all Exp. 2), use of glasses/contact lenses (Exp. 3). **Variables related to the stimulus materials:** entertainment value of the TV content, familiarity with (the brands displayed in) the TV content (both Exp. 1,2,3). **Potential moderating variables:** experienced difficulty in resisting food in tempting situations (Exp. 2), impulsivity, current dieting status, self-control (all Exp. 2,3), success in dieting and losing weight, The Dutch Eating Behavior Questionnaire (DEBQ), depletion before watching the stimulus materials (all Exp. 3). **Variables related to underlying processes:** hunger after exposure to the TV content (Exp. 1,2,3), the use of self-control and concentration during performing the LDT, and – only in the food-related condition – how appealing the foods present in the cooking show were, and whether participants felt the desire to eat these foods (all Exp. 3). **Filler questions:** levels of stress, tiredness, energy, happiness, and fullness, to mask the purpose of asking about hunger levels before and after exposure to the TV content (Exp. 1,2,3).

2.2. Results

2.2.1. Influence of background variables

To check for possible confounding variables, the relationship between the background variables and hedonic eating goal accessibility was examined. In Experiment 1, hedonic eating goal accessibility was not related to age, sex, handedness, hunger, or BMI (all $ps > .10$). However, the hedonic eating goal was more accessible among participants whose mother tongue was the same as the language of the LDT (i.e., Dutch) compared to participants with a different mother tongue ($p = .048$). Mother tongue was therefore included as a covariate in the main analyses of Experiment 1. In Experiment 2, hedonic eating goal accessibility was related to educational level ($p = .075$): the hedonic eating goal was more accessible among people with a low education compared to people with a high education. Educational level was therefore included as a covariate in the main analyses of Experiment 2. The main results are presented including covariates. The analyses were also conducted without including the covariates, but this did not change the conclusion regarding significance of the three-way interaction (tested at $p < .05$).

2.2.2. Hedonic eating goal accessibility

H1 stated that exposure to food cues on TV, compared to no exposure to food, results in more accessibility of the hedonic eating goal among people relatively high in eating restraint but low in PSRS (i.e., unsuccessful restrained eaters), in less accessibility of this goal among people relatively high in both eating restraint and PSRS (i.e., successful restrained eaters), and does not affect accessibility of this goal among people relatively low in eating restraint (i.e., unrestrained eaters). No significant main or two-way interaction effects were found. Furthermore, in contrast to expectations, the three-way interaction between TV content, eating restraint, and PSRS was not significant either in Experiment 1, $B = -3.31$, $t(102) = -1.31$, $p = .195$, 95% *CI* $[-8.33, 1.72]$, or in Experiment 2, $B = -2.10$, $t(59) = -0.58$, $p = .563$, 95% *CI* $[-9.30, 5.11]$. In line with these results, no significant effects were found when Block 1 and 2 were analyzed separately. **H1** was therefore not supported. A more detailed overview of all results can be found in the [Supplementary Material \(2a and 2b\)](#).

2.3. Discussion

The aim of Experiments 1 and 2 was to test whether exposure to palatable food commercials would affect the accessibility of a hedonic eating goal and whether this depended on eating restraint and PSRS. This was examined in a student sample (Experiment 1) and in a more heterogeneous sample (Experiment 2). In Experiment 2 less participants could be classified as unsuccessful restrained eaters compared to Experiment 1, however the BMI scores of participants were higher and more closely resembled the percentage of the Dutch population that is overweight. In neither of the samples, however, did exposure to food-related TV content result in different levels of hedonic goal accessibility.

A possible explanation for the nonsignificant findings is that the food cues in our experiments were not salient enough to affect hedonic eating goal accessibility. Exposure to the food cues in the food-related content condition was quite brief: participants only watched three food commercials, with a total duration of 40 s. People might be more susceptible to food cues on TV if exposure to these cues is longer (Armel, Beaumel, & Rangel, 2008), for example in a cooking show. Watching such a cooking show is also more likely to be engaging and less likely to evoke resistance in its viewers compared to watching food commercials, as viewers are usually aware that commercials have persuasive intent (Boush, Friestad, & Rose, 1994). The aim of Experiment 3 was therefore to test whether exposure to food cues that are more salient, in TV content that is likely more engaging, affected goal accessibility. Instead of using food commercials as stimulus materials, a cooking show was

used in Experiment 3.

3. Experiment 3

3.1. Material and methods

3.1.1. Participants

To estimate the sample size in Experiment 3, the same power calculation was used as in Experiments 1 and 2, resulting in a required sample of $N = 128$. In total, 151 participants were recruited at the university and took part in the experiment. Again, participants were excluded if they did not eat the foods present in the TV show due to allergies ($n = 14$) or other restrictions ($n = 7$), or if they strongly disliked the foods ($n = 17$). They were also excluded if they had more than 10% incorrect responses in the LDT ($n = 11$). As in Experiments 1 and 2, including participants with more than 10% incorrect responses in the LDT did not change the conclusion regarding significance of the three-way interaction (tested at $p < .05$). The final sample therefore consisted of 102 participants (78 females, 24 males; $M_{age} = 21.05$, $SD_{age} = 2.77$). In exchange for their participation, participants received course credit or €5.

3.1.2. TV content

Two short segments of a talk show called “The Rachael Ray Show” were used as stimulus materials. Participants in the food-related content condition viewed a cooking show segment of 4 min and 57 s in which a TV chef baked a mocha cake and a strawberry cake, together with talk show host Rachael Ray. Participants in the non-food related content condition viewed a segment of 4 min and 38 s in which a scientist, together with Rachael Ray, conducted several funny science experiments. The segments were selected based on a pretest among 22 participants (18 females, 4 males; $M_{age} = 26.82$, $SD_{age} = 2.09$). The pretest confirmed that the Rachael Ray Show was generally unfamiliar ($M = 1.09$, $SD = 0.43$ on a scale from 1 [*unfamiliar*] to 7 [*very familiar*]), thus it was unlikely that participants had prior knowledge about the content of the show which could influence their responses. Furthermore, the cakes in the selected segment scored high on food appeal and on desire to eat, but low on perceived healthiness. The food segment and the non-food segment were also rated as equally entertaining, $t(21) = 0.36$, $p = .972$. Details of the ratings can be found in the [Supplementary Material \(1c and 1d\)](#).

3.1.3. Measures

Eating restraint. Eating restraint was measured in the same way as in Experiments 1 and 2 ($M = 13.51$, $SD = 3.28$, $\alpha = 0.69$). **PSRS.** PSRS was also measured in the same way as in Experiments 1 and 2 ($M = 4.24$, $SD = 1.29$, $\alpha = 0.65$).

Hedonic eating goal accessibility. After data trimming, which was done in the same way as in Experiments 1 and 2, the mean score was -5.03 ms ($SD = 53.22$), indicating that the hedonic eating goal words were slightly less accessible compared to the neutral words overall.

Other variables. Again, age, sex, mother tongue, handedness, hunger, body height, and weight were measured. All background variables were assessed before exposure to the cooking show.

3.1.4. Procedure

The procedure was similar to that of Experiments 1 and 2. However, four words in the LDT were replaced: three of them because more than 10% of the participants gave the incorrect response to these particular words in Experiment 1 (Experiment 1 was used as reference because a similar sample was used) and one word because it appeared in the TV show. With regard to the study goal, one participant showed insight into the experiment's goal. This participant was retained in the dataset, as excluding this participant from the dataset did not change the conclusion regarding significance of the three-way interaction (tested at $p < .05$).

3.2. Results

3.2.1. Influence of background variables

Hedonic eating goal accessibility was not related to age, sex, handedness, hunger, or BMI (all $ps > .10$). However, the hedonic eating goal was more accessible among participants whose mother tongue was the same as the language in which they completed the LDT (either in Dutch or in English) compared to participants with a different mother tongue ($p = .001$). Mother tongue was therefore included as a covariate in the main analyses. The results are presented including this covariate, but the analyses were also conducted without this covariate. Excluding the covariate slightly changed the conclusion regarding significance of the three-way interaction (tested at $p < .05$): when analyzing the two blocks together, a marginally significant interaction effect between TV content, eating restraint, and PSRS emerged (from $p = .113$ to $p = .078$). Excluding the covariate did not change the conclusion of the three-way interaction when analyzing Blocks 1 and 2 separately.

3.2.2. Hedonic eating goal accessibility

Block 1 and 2 together. Main effects of eating restraint ($p = .046$) and PSRS ($p = .023$) were found, as well as an interaction effect between eating restraint and PSRS ($p = .025$). The other main and two-way interaction effects were not significant, and neither was the expected three-way interaction between TV content, eating restraint, and PSRS, $B = 3.90$, $t(93) = 1.60$, $p = .113$, 95% CI [-0.94 , 8.73]. Details of all results can be found in the [Supplementary Material \(2c\)](#).

Block 1. Main effects of TV content ($p = .034$), eating restraint ($p = .003$), and PSRS ($p < .001$) were found in Block 1. In addition, interaction effects were found between TV content and eating restraint ($p = .022$), between TV content and PSRS ($p = .014$), and between eating restraint and PSRS ($p < .001$). These lower order effects were qualified by the hypothesized three-way interaction between TV content, eating restraint, and PSRS, $B = 9.13$, $t(93) = 2.66$, $p = .009$, 95% CI [2.31 , 15.96].

To further explore the significant three-way interaction, simple slopes were estimated at high (+1 SD from the mean) and low (−1 SD from the mean) levels of eating restraint and PSRS. At high levels of eating restraint, a marginally significant interaction between TV content and PSRS on hedonic eating goal accessibility was found, $B = 29.40$, $t(93) = 1.95$, $p = .055$, 95% CI [-0.58 , 59.38]. As expected, exposure to the cooking show, compared to the non-food TV show, resulted in more accessibility of a hedonic eating goal among participants with low PSRS (i.e., unsuccessful restrained eaters), but in less accessibility among participants with high PSRS (i.e., successful restrained eaters; see [Fig. 1](#)). It should be noted that the individual slopes were not significant when the food-related content condition was compared to the non-food related content condition ($p = .167$, and $p = .221$ for successful and unsuccessful restrained eaters, respectively). This indicates that the responses of successful and unsuccessful restrained eaters to the different content conditions only differ in comparison to each other, but not when solely examining the effect of TV content for each of the levels of PSRS.

Contrary to our expectations, at low levels of eating restraint a marginally significant interaction between TV content and PSRS on hedonic eating goal accessibility was found as well, $B = -30.43$, $t(93) = -1.74$, $p = .085$, 95% CI [-65.14 , 4.28]. Exposure to the cooking show, compared to the non-food TV show, resulted in less hedonic eating goal accessibility among participants with low PSRS (i.e., unsuccessful unrestrained eaters), but in more accessibility among participants with high PSRS (i.e., successful unrestrained eaters). The individual slope comparing the food-related content condition to the non-food related content condition was marginally significant for successful unrestrained eaters ($p = .090$), but it was not significant for unsuccessful unrestrained eaters ($p = .382$). This again indicates that the responses of successful and unsuccessful unrestrained eaters to the

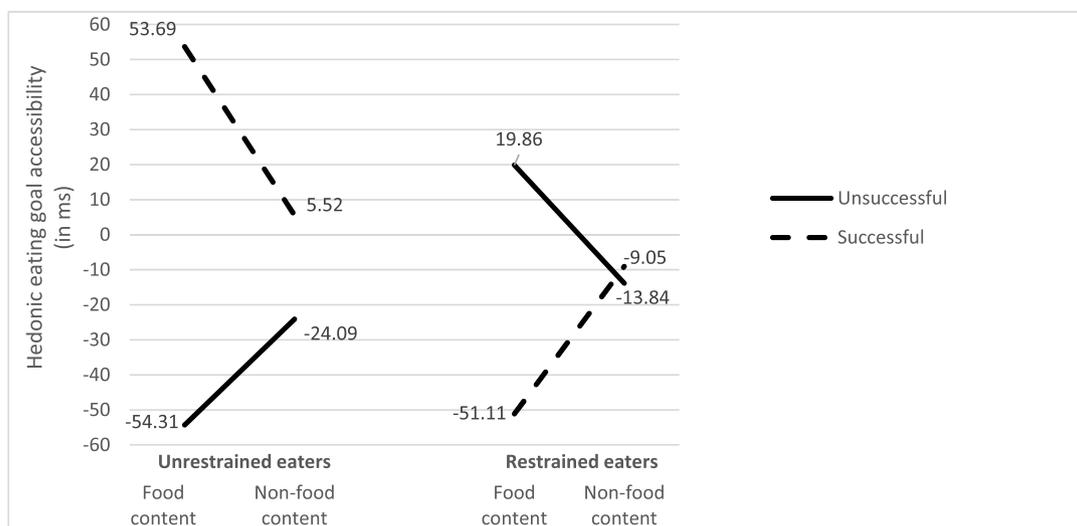


Fig. 1. Hedonic eating goal accessibility (in ms) in the first LDT block after exposure to food-related TV content and non-food related TV content at low (-1 SD) and high ($+1$ SD) levels of eating restraint and PSRS. Higher scores (above zero) reflect more accessibility.

different content conditions mainly differ in comparison to each other.

In sum, the three-way interaction between TV content, eating restraint, and PSRS was marginally significant at high levels of eating restraint, but there was also an unexpected, marginally significant interaction at low levels of eating restraint. **H1** was therefore partly supported in Block 1 of the LDT.

Block 2. No significant main or two-way interaction effects were found in Block 2. The three-way interaction between TV content, eating restraint, and PSRS was also not significant, $B = -1.75$, $t(93) = -0.54$, $p = .589$, 95% CI $[-8.17, 4.67]$. **H1** was thus not supported when analyzing the two blocks of the LDT together or in the second block, but it was partly supported in the first block.

3.3. Discussion

The aim of Experiment 3 was to explore whether exposure to other (i.e., likely more salient and engaging) food-related TV content affected hedonic eating goal accessibility, by exposing participants to a cooking show instead of food commercials. In this third experiment, our hypothesis was partially supported: exposure to a cooking show, compared to a non-food TV show, resulted in more hedonic eating goal accessibility among unsuccessful restrained eaters while the opposite pattern was observed among successful restrained eaters. These findings align with theory on eating restraint and self-regulatory success in response to palatable food cues (Fishbach et al., 2003; Stroebe et al., 2008b) as well as with previous empirical studies (Papies et al., 2008; van Koningsbruggen et al., 2013). It should be noted, however, that effects were only found in the first LDT block and not in the second block. Possible reasons and implications thereof will be further discussed in the general discussion.

Unexpectedly, a marginally significant interaction effect between TV content and PSRS on hedonic goal accessibility was also found among unrestrained eaters, even though they are generally thought to be less sensitive to exposure to palatable food cues (Stroebe et al., 2008b). The results showed that after watching the cooking show compared to the non-food TV show, the hedonic eating goal was more accessible among successful unrestrained eaters, and less accessible among unsuccessful unrestrained eaters. Even though it might seem irrelevant to distinguish between successful and unsuccessful non-dieters, and we only distinguished between unrestrained eaters relatively low or high in PSRS for statistical reasons (i.e., to be able to interpret the significant three-way interaction), earlier studies also found differences between successful and unsuccessful unrestrained

eaters (Nguyen & Polivy, 2014; van Koningsbruggen et al., 2013). Thus, even for people who are not concerned with their weight, the extent to which they perceive themselves as successful at self-regulation may still influence how they respond to food cues on TV.

4. General discussion

With three experiments, this study investigated whether exposure to food-related (vs. non-food related) TV content resulted in more accessibility of a hedonic eating goal among unsuccessful restrained eaters and in less accessibility of such a goal among successful restrained eaters. No support for this hypothesis was found when participants were exposed to food commercials (Experiments 1 and 2), but partial support was found when participants were exposed to food cues in a cooking show (Experiment 3). After watching a cooking show, compared to a non-food TV show, unsuccessful restrained eaters' hedonic eating goal was more accessible, while this goal was less accessible for successful restrained eaters, although it should be noted that these effects were short-lived (i.e., they were only found in the first block of the LDT).

The results of Experiments 1 and 2 did not confirm previous theoretical and empirical research on goal accessibility in successful and unsuccessful restrained and unrestrained eaters in response to palatable food cues (Fishbach et al., 2003; Papies et al., 2008; Stroebe et al., 2008b; van Koningsbruggen et al., 2013).

Furthermore, they did not provide an explanation for why a meta-analysis did not find effects of food commercials on unhealthy food choices among adults (Boyland et al., 2016). In contrast, the findings of Experiment 3 did provide some evidence supporting previous research. To our knowledge, this was the first study that investigated the process of hedonic eating goal accessibility in successful and unsuccessful restrained and unrestrained eaters with actual media content. Together, the findings of the current study contribute to the existing knowledge base because they suggest that previous findings on effects of food words (Papies et al., 2008; van Koningsbruggen et al., 2013) cannot simply be applied to food cues in actual media content. Specifically, results of the current study suggest that whether exposure to food cues on TV affects the accessibility of a hedonic eating goal may be explained by salience of the food cues in the different types of TV content (food commercials vs. cooking show) or by the way that both types of content are viewed by individuals.

Previous research has already found that exposure to more salient food cues results in more unhealthy food choices compared to exposure

to less salient food cues (e.g., repeated vs. one-time exposure), especially in restrained eaters (Coelho, Jansen, Roefs, & Nederkoorn, 2009; Coelho, Nederkoorn, & Jansen, 2014). Cue salience might therefore explain why in our study no effects were found of exposure to food commercials, but only after exposure to a cooking show. As is usually the case, exposure to the food cues in the cooking show was much longer in duration, and therefore likely more salient, as compared to exposure to food cues in the commercials (297 vs. 40 s). Another, related explanation for the differential effects of food commercials and cooking shows on hedonic eating goal accessibility may be that the way they are viewed differs. Research showed that commercials often evoke resistance, as viewers are generally well aware that the goal of these commercials is to persuade them to purchase the promoted product (Boush et al., 1994). Moreover, because a cooking show has a narrative, and people will generally enjoy watching a cooking show more than commercials, viewers are more likely to be immersed in this type of TV content (Moyer-Gusé, 2008). As a result, food cues in a cooking show may be more likely to influence the accessibility of a hedonic eating goal. Thus, resistance to or engagement with the TV content may also explain why exposure to the cooking show, but not exposure to the commercials, influenced hedonic eating goal accessibility in our study.

Nevertheless, it should be noted that a direct comparison between the different types of TV content was not made in this study and it is therefore possible that other factors caused differences between the experiments. However, because the same methods and procedure were used across the experiments and a similar sample was recruited in Experiments 1 and 3, we deem this unlikely. Also, foods in the commercials and in the cooking show were comparable on food appeal scores. Notwithstanding, future studies should investigate whether the differences in our study can be explained by type of content and, specifically, by salience of the food cues and how attentively the content – in which these food cues are embedded – is watched.

In line with this, an interesting direction for future research would be to examine whether people's visual attention for food cues differs between food commercials and cooking shows (e.g., with eye-tracking research) and whether this affects hedonic eating goal accessibility. Previous research has already found a relation between visual attention for food cues and food choices and intake (Armel et al., 2008; Folkvord, Anshütz, Wiers, & Buijzen, 2015). Further investigation is required to explore how these findings relate to goal accessibility and visual attention in different types of food-related TV content.

In addition to food commercials and cooking shows, it would be interesting to examine food cues in other TV content as well. For example, food cues are often present in reality TV shows (e.g., when characters have dinner together) or in talk shows (e.g., when snacks are presented on the table in front of the talk show hosts), but these cues are usually more subtle compared to commercials and cooking shows, as the food cues in such TV shows are not central to the content of the show. Investigating other TV content in addition to food commercials and cooking shows may therefore further help to understand the effects of different types of TV content on hedonic eating goal accessibility.

The findings of the current study should also be discussed in light of previous research regarding effects of food cues on the accessibility of hedonic eating goals. Taking the findings of our three experiments together, this study shows that the process of priming the accessibility of a hedonic eating goal with food words, as is done in most prior studies (Papies et al., 2008; van Koningsbruggen et al., 2013), cannot simply be applied to actual media content. As we only found effects after exposure to a cooking show and not after exposure to food commercials, our study shows that media content is more heterogeneous than words representing food. It may therefore result in nuanced effects (i.e., potentially depending on the type of content). To what extent theories of goal accessibility can be applied to other food primes on TV and more generally, to other media content, should be further investigated.

Furthermore, hedonic eating goal accessibility in response to watching a cooking show was present only in the first LDT block. This

means that the effects were short-lived and disappeared a few minutes after watching the cooking show. This raises the question whether such relatively brief increased goal accessibility will actually result in unhealthy food choices. In addition, prior research on goal accessibility suggests that an accessible goal – in contrast to a semantic concept – persists over time or can become even more accessible and will only disappear upon goal achievement (Förster et al., 2007). Thus, instead of accessibility of a goal, it might also be the case that accessibility of the semantic concept of hedonic eating was measured in our study. Whether the cooking show indeed resulted in increased accessibility of a hedonic eating goal instead of increased accessibility of the semantic concept of hedonic eating requires further investigation. Other potential explanations for finding effects in the first, but not in the second block should thereby also be ruled out. This includes practice effects (i.e., participants may become better in performing the task overall and as a result the effect of TV content may be smaller in the second block) and priming effects (i.e., exposure to hedonic eating goal words in the first block may prime the hedonic eating goal for all participants, again diminishing the effect of TV content in the second block). By systematically varying the time between exposure to the TV content and the measurement of hedonic eating goal accessibility, the duration of the effect could be tested (Förster et al., 2007). This may potentially rule out these alternative explanations, leading to a better understanding of the effects found in the current study.

A limitation of this study is that the final sample sizes were relatively low in all three experiments, particularly in Experiment 2. It is possible that more significant effects would be found with larger sample sizes, as this would increase statistical power to detect potential effects.

Another limitation is the low internal consistency of the PSRS scale across all three studies (Cronbach's alpha between .56 and .65). This low internal consistency has also been reported in some previous studies (Meule, 2016; van Koningsbruggen, Stroebe, & Aarts, 2012). A reason for this may be that the questions of this scale, especially “How successful are you in losing weight?” might be difficult to answer for people who are not concerned with losing weight, however, adding a “not applicable” option does not improve internal consistency of the scale (Meule, Papies, & Kübler, 2012). Future research should aim to develop more internally consistent measures to assess self-regulation in the eating domain. This research should address the bigger issue that it is difficult to theoretically distinguish between successful and unsuccessful unrestrained eaters, by finding a measure that is suitable for both restrained and unrestrained eaters.

Moreover, in the current study we did not assess how TV content affected actual food choices. Even though the aim of this study was to investigate whether watching food-related TV content led to hedonic eating goal accessibility, ultimately we do seek to explain whether this goal accessibility underlies the relationship between viewing palatable foods on TV and unhealthy food choices. A logical next step is therefore to examine whether watching food-related TV content actually leads to unhealthy food choices for unsuccessful restrained eaters. In the current study, it was decided not to assess food choices because participation in the LDT, more specifically exposure to the hedonic eating goal words in this task, makes it unlikely that we would be able to ascribe potential effects on food choices exclusively to exposure to the TV content. This is because exposure to these words in the task in itself may prime the hedonic eating goal, thereby affecting subsequent food choices independently of exposure to food-related TV content.

5. Conclusions

The goal of this study was to investigate whether exposure to food-related TV content affected the accessibility of a hedonic eating goal, depending on eating restraint and PSRS. To our knowledge, this study was the first to explore this process with actual media content. Together, the findings of three experiments show inconclusive evidence for increased accessibility of a goal to eat palatable foods in

unsuccessful restrained eaters after exposure to food-related TV content. The results of Experiment 3 showed that watching a cooking show temporarily leads to more accessibility of unsuccessful restrained eaters' hedonic eating goal, but to less accessibility of this goal among successful restrained eaters. However, no such effects were found after watching food commercials (Experiments 1 and 2). This shows that findings of prior studies using food words (Papies et al., 2008; van Koningsbruggen et al., 2013) do not simply generalize to actual media content. Instead, our findings suggest that the type of food-related TV content (e.g., commercials, cooking shows) may potentially play a role in the effects of food cues on TV. Future research needs to examine whether the type of food-related TV content influences hedonic eating goal accessibility by directly comparing different types of TV content. Moreover, examining whether increased accessibility of the hedonic eating goal among unsuccessful restrained eaters also translates to actual unhealthy food choices is of importance, particularly because effects found in the current study were short-lived. Exploring these questions in future research will help to further unravel how seeing palatable, but unhealthy food cues on TV may lead to unhealthy food choices and to subsequent overweight and obesity.

Declarations of interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.appet.2018.11.034>.

References

- Aarts, H., Custers, R., & Holland, R. W. (2007). The nonconscious cessation of goal pursuit: When goals and negative affect are coactivated. *Journal of Personality and Social Psychology*, 92(2), 165–178. <http://doi.org/10.1037/0022-3514.92.2.165>.
- Aarts, H., & Dijksterhuis, A. (2000). Habits as knowledge structures: Automaticity in goal-directed behavior. *Journal of Personality and Social Psychology*, 78(1), 53–63. <http://doi.org/10.1037/0022-3514.78.1.53>.
- Armel, K. C., Beaumel, A., & Rangel, A. (2008). Biasing simple choices by manipulating relative visual attention. *Judgement and Decision Making*, 3(5), 396–403.
- Bargh, J. A. (1990). Auto-motives: Preconscious determinants of social interaction. In E. T. Higgins, & R. M. Sorrentino (Eds.). *Handbook of motivation and cognition: Foundations of social behavior* (pp. 93–130). New York, NY: Guilford Press.
- Bellisle, F., Dalix, A., Airinei, G., Hercberg, S., & Péneau, S. (2009). Influence of dietary restraint and environmental factors on meal size in normal-weight women. A laboratory study. *Appetite*, 53, 309–313. <http://doi.org/10.1016/j.appet.2009.07.006>.
- Blass, E. M., Anderson, D. R., Kirkorian, H. L., Pempek, T. A., Price, I., & Koleini, M. F. (2006). On the road to obesity: Television viewing increases intake of high-density foods. *Physiology & Behavior*, 88, 597–604. <http://doi.org/10.1016/j.physbeh.2006.05.035>.
- Bodenlos, J. S., & Wormuth, B. M. (2013). Watching a food-related television show and caloric intake. A laboratory study. *Appetite*, 61, 8–12. <http://doi.org/10.1016/j.appet.2012.10.027>.
- Boswell, R. G., & Kober, H. (2016). Food cue reactivity and craving predict eating and weight gain: A meta-analytic review. *Obesity Reviews*, 17, 159–177. <http://doi.org/10.1111/obr.12354>.
- Boulos, R., Vikre, E. K., Oppenheimer, S., Chang, H., & Kanarek, R. B. (2012). ObesiTV: How television is influencing the obesity epidemic. *Physiology & Behavior*, 107, 146–153. <http://doi.org/10.1016/j.physbeh.2012.05.022>.
- Boush, D. M., Friestad, M., & Rose, G. M. (1994). Adolescent skepticism toward TV advertising and knowledge of advertiser tactics. *Journal of Consumer Research*, 21(1), 165–175. <http://doi.org/https://doi.org/10.1086/209390>.
- Boydell, E. J., Nolan, S., Kelly, B., Tudur-Smith, C., Jones, A., Halford, J. C. G., et al. (2016). Advertising as a cue to consume: A systematic review and meta-analysis of the effects of acute exposure to unhealthy food and nonalcoholic beverage advertising on intake in children and adults. *American Journal of Clinical Nutrition*, 103(2), 519–533. <http://doi.org/10.3945/ajcn.115.120022>.
- Chapman, C. D., Benedict, C., Brooks, S. J., & Schiöth, H. B. (2012). Lifestyle determinants of the drive to eat: A meta-analysis. *American Journal of Clinical Nutrition*, 96, 492–497. <http://doi.org/10.3945/ajcn.112.039750>.
- Chapman, K., Nicholas, P., & Supramaniam, R. (2006). How much food advertising is there on Australian television? *Health Promotion International*, 21(3), 172–180. <http://doi.org/10.1093/heapro/dal021>.
- Coelho, J. S., Jansen, A., Roefs, A., & Nederkoorn, C. (2009). Eating behavior in response to food-cue exposure: Examining the cue-reactivity and counteractive-control models. *Psychology of Addictive Behaviors*, 23(1), 131–139. <http://doi.org/10.1037/a0013610>.
- Coelho, J. S., Nederkoorn, C., & Jansen, A. (2014). Acute versus repeated chocolate exposure: Effects on intake and cravings in restrained and unrestrained eaters. *Journal of Health Psychology*, 19(4), 482–490. <http://doi.org/10.1177/1359105312473787>.
- Fedoroff, I., Polivy, J., & Herman, C. P. (2003). The specificity of restrained versus unrestrained eaters' responses to food cues: General desire to eat, or craving for the cued food? *Appetite*, 41, 7–13. [http://doi.org/10.1016/S0195-6663\(03\)00026-6](http://doi.org/10.1016/S0195-6663(03)00026-6).
- 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(2), 296–309. <http://doi.org/10.1037/0022-3514.84.2.296>.
- Folkvord, F., Anschutz, D. J., Wiers, R. W., & Buijzen, M. (2015). The role of attentional bias in the effect of food advertising on actual food intake among children. *Appetite*, 84, 251–258. <http://doi.org/10.1016/j.appet.2014.10.016>.
- Förster, J., Liberman, N., & Friedman, R. S. (2007). Seven principles of goal activation: A systematic approach to distinguishing goal priming from priming non-goal constructs. *Personality and Social Psychology Review*, 11(3), 211–233. <http://doi.org/10.1177/1088868307303029>.
- Harris, J. L., Bargh, J. A., & Brownell, K. D. (2009). Priming effects of television food advertising on eating behavior. *Health Psychology*, 28(4), 404–413. <http://doi.org/10.1037/a0014399>.
- Hayes, A. F. (2013). *Introduction to Mediation, Moderation, and Conditional Process Analysis*. New York, NY: Guilford Press.
- Haynes, A., Kemps, E., Moffitt, R., & Mohr, P. (2014). Resisting temptation of unhealthy food: Interaction between temptation-elicited goal activation and self-control. *Motivation and Emotion*, 38, 485–495. <http://doi.org/10.1007/s11031-014-9393-6>.
- Jansen, A., Oosterlaan, J., Merckelbach, H., & van den Hout, M. (1988). Nonregulation of food intake in restrained, emotional, and external eaters. *Journal of Psychopathology and Behavioral Assessment*, 10(4), 345–354. <http://doi.org/10.1007/BF00960627>.
- Kemps, E., Tiggemann, M., & Hollitt, S. (2014). Exposure to television food advertising primes food-related cognitions and triggers motivation to eat. *Psychology and Health*, 29(10), 1192–1205. <http://doi.org/10.1080/08870446.2014.918267>.
- van Koningsbruggen, G. M., Stroebe, W., & Aarts, H. (2012). Mere exposure to palatable food cues reduces restrained eaters' physical effort to obtain healthy food. *Appetite*, 58, 593–596. <http://doi.org/10.1016/j.appet.2011.11.020>.
- van Koningsbruggen, G. M., Stroebe, W., & Aarts, H. (2013). The rise and fall of self-control: Temptation-elicited goal activation and effortful goal-directed behavior. *Social Psychological and Personality Science*, 4(5), 546–554. <http://doi.org/10.1177/1948550612471061>.
- Lindroos, A., Lissner, L., Mathiassen, M. E., Karlsson, J., Sullivan, M., Bengtsson, C., et al. (1997). Dietary intake in relation to restrained eating, disinhibition, and hunger in obese and nonobese Swedish women. *Obesity Research*, 5(3), 175–182. <http://doi.org/10.1002/j.1550-8528.1997.tb00290.x>.
- Martin, C. K., Coulon, S. M., Markward, N., Greenway, F. L., & Anton, S. D. (2009). Association between energy intake and viewing television, distractibility, and memory for advertisements. *American Journal of Clinical Nutrition*, 89, 37–44. <http://doi.org/10.3945/ajcn.2008.26310>.
- Meule, A. (2016). Dieting and food cue-related working memory performance. *Frontiers in Psychology*, 7, 1944. <http://doi.org/10.3389/fpsyg.2016.01944>.
- Meule, A., Papies, E. K., & Kübler, A. (2012). Differentiating between successful and unsuccessful dieters. Validity and reliability of the perceived self-regulatory success in dieting scale. *Appetite*, 58, 822–826. <http://doi.org/10.1016/j.appet.2012.01.028>.
- Mollen, S., Holland, R. W., Ruiter, R. A. C., Rimal, R. N., & Kok, G. (2016). When the frame fits the social picture: The effects of framed social norm messages on healthy and unhealthy food consumption. *Communication Research*, 1–33. <http://doi.org/10.1177/0093650216644648>.
- Moyer-Gusé, E. (2008). Toward a theory of entertainment persuasion: Explaining the persuasive effects of entertainment-education messages. *Communication Theory*, 18, 407–425. <http://doi.org/10.1111/j.1468-2885.2008.00328.x>.
- Nguyen, C., & Polivy, J. (2014). Eating behavior, restraint status, and BMI of individuals high and low in perceived self-regulatory success. *Appetite*, 75, 49–53. <http://doi.org/10.1016/j.appet.2013.12.016>.
- Nosek, B. A., Bar-Anan, Y., Sriram, N., Axt, J., & Greenwald, A. G. (2014). Understanding and using the brief implicit association test: Recommended scoring procedures. *PLoS One*, 9(12), e110938. <http://doi.org/10.1371/journal.pone.0110938>.
- 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(5), 810–817. <http://doi.org/10.1016/j.jesp.2006.08.001>.
- Papies, E. K., Stroebe, W., & Aarts, H. (2008). Healthy cognition: Processes of self-regulatory success in restrained eating. *Personality and Social Psychology Bulletin*, 34(9), 1290–1300. <http://doi.org/10.1177/0146167208320063>.
- Statistics Netherlands (2017). Lengte en gewicht van personen, ondergewicht en overgewicht; vanaf 1981 [Length and weight of persons, underweight and overweight; from 1981]. Retrieved from <http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=815655NED>.
- Stroebe, W., Mensink, W., Aarts, H., Schut, H., & Kruglanski, A. W. (2008a). Why dieters fail: Testing the goal conflict model of eating. *Journal of Experimental Social Psychology*, 44, 26–36. <http://doi.org/10.1016/j.jesp.2007.01.005>.
- Stroebe, W., Papies, E. K., & Aarts, H. (2008b). From homeostatic to hedonic theories of eating: Self-regulatory failure in food-rich environments. *Applied Psychology: An International Review*, 57, 172–193. <http://doi.org/10.1111/j.1464-0597.2008.00360.x>.
- Wang, Y., Dong, D., Todd, J., Du, J., Yang, Z., Lu, H., et al. (2016). Neural correlates of restrained eaters' high susceptibility to food cues: An fMRI study. *Neuroscience Letters*, 631, 56–62. <http://doi.org/10.1016/j.neulet.2016.08.017>.
- WHO (2018). Obesity and overweight. Retrieved from <http://www.who.int/mediacentre/factsheets/fs311/en/>.
- Wing, R. R., & Hill, J. O. (2001). Successful weight loss maintenance. *Annual Review of Nutrition*, 21, 323–341. <http://doi.org/10.1146/annurev.nutr.21.1.323>.