Sweet temptation: effects of exposure to chocolate-scented lotion on food intake

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Short Communication

Sweet temptation: Effects of exposure to chocolate-scented lotion on food intake

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ABSTRACT

Food-scented products are widely available, yet it is unclear whether they influence eating behavior. Food-related cues can increase intake; therefore, it was anticipated that conscious exposure to food-scented products (e.g., body lotion) could also influence consumption. Female participants ($n = 58$) were randomly assigned to an exposure condition (labeled chocolate lotion, unlabeled chocolate lotion, or unscented lotion), and their subsequent intake of chocolate-chip cookies was measured. A significant effect of condition on intake emerged. Those who knew that they were evaluating a chocolate-scented lotion ate more than did those exposed to the same (unlabeled) lotion, suggesting that conscious exposure to chocolate-related products may increase food intake.

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1. Introduction

The increase in the prevalence of obesity is leading researchers to investigate the role of the “obesogenic” environment on eating behavior (Swinburn & Egger, 2004). Primary food-related components of this environment include the availability of inexpensive, high-caloric foods and increasing portion sizes (French, Story, & Jeffery, 2001). The pervasiveness of exposure to food-related cues is concerning, given that exposure to food cues increases subsequent food intake. For example, exposure to the smell of pizza increases subsequent pizza intake, particularly in chronic dieters (Fedoroff, Polivy, & Herman, 1997). Similarly, exposure to the taste and sight of food stimulated desire to eat and intake, even when participants ate to satiation just prior to food-cue exposure (Cornell, Rodin, & Weingarten, 1989). This suggests that food-cue exposure can encourage superfluous intake (and potential weight gain).

In addition to the environmental bombardment with typical food cues, there has been a concurrent focus on development of products with food-related scents, including chocolate-scented lotions, soaps, and candles. The popularity of food-scented products may be related to their association with comfort (La Ferla, 2001), though there is little research to provide direct support for this notion. The role that food-scented products may have on food intake has not been inves-

tigated; however, these products may have similar effects as other food cues, with exposure increasing subsequent intake. From a theoretical standpoint, the cue reactivity model (Jansen, 1998) suggests that exposure to food cues leads to intake as a result of conditioning. According to this model, food cues (e.g., sight/smell of food) become conditioned stimuli, which trigger food cravings and cephalic phase responses. Experimental research has supported the effects of food-cue exposure on cravings (e.g., Fedoroff et al., 1997) and cephalic phase responses, such as salivation (Klajner, Herman, Polivy, & Chhabra, 1981).

When considering the possible effects of non-food products with a food-related scent, it is important to investigate whether these food-scented products are indeed associated with food. Recent research demonstrates that conceptual fluency (i.e., ease with which a stimulus comes to mind) enhances product evaluations (Berger & Fitzsimons, 2008; Lee & Labroo, 2004). Conceptual fluency can be facilitated by advertisements featuring contexts that are easily associated with a product's use. Lee and Labroo (2004) demonstrated, for example, that ketchup is evaluated more favorably when it is featured in a fast-food context than in a general supermarket context. Ease of processing leads to more favorable attitudes toward the product. Furthermore, Berger and Fitzsimons (2008) show that ease of processing can be facilitated by an environment containing perceptually- or conceptually-related cues. Products which are more accessible are evaluated more favorably and chosen more frequently. Accordingly, fruit and vegetable consumption is facilitated when participants are exposed to a slogan linking a frequently encountered cue (food tray) with a desired action (eating five fruits and vegetables a day). In our context, presenting “chocolate scented”

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lotion may enhance the ease with which individuals identify and process chocolate and, therefore, increase subsequent intake of chocolate cookies.

Given the lack of research on the effects of food-scented products on intake, it is not clear whether these products will have similar effects to typical food cues (i.e., sight, smell). The effects of exposure to typical food cues appear to be cue specific, with increased food intake occurring particularly when there is a congruency between the initial cue and the subsequent food (Fedoroff, Polivy, & Herman, 2003). Given that lotion is not associated with food, it is possible that there will be no effects on intake due to a perceived lack of congruency between the cue exposure and the eating opportunity. That being said, there is also evidence that exposure to food-related words increases hunger and desire to eat (Oakes & Slotterback, 2000). Therefore, it is possible that exposure to chocolate-scented lotion in and of itself will not influence intake (because it will not be directly associated with food), but that intake would increase if this lotion is verbally labeled as chocolate-scented (e.g., through conceptual priming, as in Berger & Fitzsimons, 2008). We expected that intake would be higher for those exposed to a labeled chocolate-scented lotion than for the same, unlabeled lotion. Exposure to an unscented lotion was also included, to ensure that the chocolate scent alone did not influence intake. We further wanted to test potential changes in mood after exposure to food-scented products. There has been limited research indicating that ambient odors of chocolate can improve mood (Knasko, 1995). However, research investigating exposure to real food cues demonstrates that exposure decreases positive affect (Coelho, Jansen, Roefs, & Nederkoorn, 2009). We therefore aimed to investigate how exposure to chocolate-scented lotion may influence affect (relative to exposure to an unscented lotion), and to ensure that mood did not mediate any changes in eating in response to the lotion.

2. Method

2.1. Participants

Female undergraduate students ($n = 58$) who were above a minimally healthy body weight [body mass index (BMI) >18.5 , $M = 22.3$, $SD = 2.3$] were recruited to participate. A total of 47 participants were within the normal-weight range (BMI of 18.5–24.9), and 11 participants were overweight (BMI of 25–29.9). Females were selectively recruited given that females are typically more concerned with weight loss than are males (e.g., Fishbach, Friedman, & Kruglanski, 2003), and are the typical consumers of chocolate-scented lotions. Furthermore, women experience more chocolate cravings and consume chocolate more frequently than do males (Rozin, Levine, & Stoess, 1991). Participants were between 18 and 27 years of age ($M = 20.7$, $SD = 1.9$). Participants received course credit in compensation for their participation.

2.2. Measures

Positive and negative affect scales (PANAS; Watson, Clark, & Tellegen, 1988): The PANAS is a 20-item scale which measures current positive and negative affect. Participants rate each item on a 5-point scale (1 = not at all, 5 = completely). The obtained Cronbach's alpha for the positive and negative scales was 0.78 and 0.80, respectively.

Restraint Scale (Polivy, Herman, & Howard, 1988): The Restraint Scale is a 10-item measure used to concern with dieting and weight fluctuations, with higher scores indicating higher weight- and shape-related concerns. The obtained Cronbach's alpha was 0.73. Dietary restraint was measured given that some previous re-

search on food-cue exposure has shown that restrained eaters are differentially susceptible to food-cue exposure than are unrestrained eaters (e.g., Fedoroff et al., 1997).

2.3. Procedure

Participants were informed that they were participating in a market research study in which they would evaluate new products. Participants signed a consent form, and proceeded to complete a 7-point Likert scale assessing their current hunger (embedded among filler items assessing various mood states). Participants were then asked to evaluate a sample of lotion for 5 min. The lotion given to participants depended on the condition to which they were randomly assigned: unscented (control) lotion, unlabeled chocolate lotion or labeled chocolate lotion. Those in the control lotion condition received a small glass bowl containing a sample of Vaseline™ unscented body lotion (Unilever N.V., The Netherlands), while those in a chocolate lotion condition received a sample of chocolate-praline scented body lotion (Sephora, LVMH, France). Participants were informed that this was a new hand and body lotion, and were asked about their impressions of the product. They completed a rating form on which they evaluated various properties of the lotion (e.g., scent, texture, color). Participants were also asked (using a free-response format) to identify the scent of the lotion, and to rate their liking of the lotion smell on a visual analog scale (140 mm), with the anchors 'not at all' and 'totally'. Only those in the labeled chocolate condition were provided with information about the scent of the lotion, and were informed verbally by the experimenter that the lotion had a chocolate praline scent.

Participants then completed the PANAS (Watson et al., 1988), and were subsequently presented with a glass of water, and a large bowl of mini chocolate-chip cookies (Smilde Bakery BV; the weight of each cookie was approximately 3–4 g). Chocolate-chip cookies were chosen to ensure that some congruency existed between the chocolate-scented cue and the subsequent food available for intake (see Fedoroff et al., 2003). Participants were informed that these cookies were a new product under development, and they were invited to taste as much as they wanted to complete their tasting and rating of the cookies (e.g., liking, sweetness, crunchiness, rated on a 100 mm visual analog scale) over a 5-min period. Their intake was surreptitiously measured.

Participants were then asked to report their impressions about the purpose of the research. Individuals who indicated that they suspected that their intake was being measured were excluded from analyses on food intake ($n = 7$). Participants then completed the Restraint Scale (Polivy et al., 1988). Following the approach taken by Bagozzi and Edwards (2000) to identify weight-concerned individuals, they were also asked to classify their weight-related goals within the next month (losing weight, maintaining their weight, gaining weight, or having no weight-related goals). Finally, participants' height and weight was measured and used to calculate their BMI. Participants received a debriefing letter upon conclusion of the study. All procedures were approved by the ethical committee at Maastricht University.

3. Results

3.1. Participant characteristics

The majority of the sample (86%, $n = 50$) reported having weight-related goals (losing or maintaining their weight over the next month). There were no significant differences across conditions in baseline hunger, $F_{2,55} = 1.04$, $p < 0.4$, $\eta^2 = 0.04$, with participants overall reporting medium levels of hunger ($M = 3.2$, $SD = 1.3$).

3.2. Mood ratings

Participants' scores on the positive and negative affect subscales of the PANAS were analyzed with ANOVA; however, no significant effects of condition emerged on either positive ($F_{2,55} = 0.91$, $p < 0.5$, $\eta^2 = 0.03$) or negative affect ($F_{2,55} = 0.58$, $p < 0.6$, $\eta^2 = 0.02$).

3.3. Lotion rating

As part of a manipulation check, participants' free responses about the scent of the lotion were classified as either "food-related" (i.e., participants identified that the lotion smelled like a food item, such as candy or chocolate), or "non-food-related" (i.e., participants reported that the lotion smelled like non-food products, such as soap or sunscreen). Participants' responses across conditions were analyzed using a chi-square, which demonstrated that there was a significant effect of condition on the likelihood of identifying the lotion as food-related [χ^2 (2, $N = 58$) = 25.21, $p < 0.001$]. Participants in the labeled (85%) and unlabeled chocolate lotion conditions (82%) were more likely to identify the lotion as having a food-related scent than were participants who evaluated the unscented lotion (12%). There was no significant difference between the labeled and unlabeled chocolate lotion condition on the likelihood of identifying the lotion as food-related [χ^2 (1, $N = 42$) = 0.08, $p < 0.8$]. However, participants in the labeled chocolate lotion condition were significantly more likely to have indicated that the lotion specifically had a chocolate scent (75%) than were participants in the unlabeled chocolate lotion condition (36%), χ^2 (1, $N = 42$) = 6.31, $p < 0.02$.

Participants' ratings of the extent to which they liked the lotion smell were also evaluated. There was more variance in the chocolate lotion conditions than in the control condition, leading to violations of homogeneity of variance; therefore, Welch's test was used. No significant differences in liking emerged across the three groups, $F_{2,34.27} = 2.38$, $p \leq 0.11$. Given that the primary comparison of interest was between the two chocolate lotion conditions, a Mann-Whitney test was performed, which indicated that there was no significant difference in liking ratings of the lotion between those exposed to the labeled ($M = 67.9$, $SD = 40.1$) and unlabeled lotion ($M = 88.6$, $SD = 40.8$), $z = -1.66$, $p < 0.1$.

3.4. Food intake and cookie rating

An analysis of covariance on chocolate-chip cookie intake was conducted, with the lotion condition as the independent variable. Following the approach taken by Kroese, Evers, and De Ridder

(2009), both BMI and dietary restraint were entered as possible covariates; however, only BMI had a significant effect and was kept in the analysis, $F_{1,46} = 9.8$, $p < 0.005$, $\eta^2 = 0.18$. There was a significant effect of condition on intake,¹ $F_{2,46} = 3.9$, $p < 0.05$, $\eta^2 = 0.15$ (see Fig. 1). Bonferroni-corrected pairwise comparisons indicated that those in the labeled chocolate lotion condition ate more cookies than did those in the unlabeled chocolate condition ($p < 0.05$). The intake of controls did not differ significantly from the other conditions.²

An ANCOVA was also conducted on ratings of the liking of the taste of the cookies, with BMI entered as a covariate. There were no significant differences across groups in ratings, $F_{2,54} = 0.154$, $p < 0.9$, $\eta^2 = 0.006$. The overall mean liking of the cookies (averaged across all groups) was 67.1 ($SD = 23.3$).

4. Discussion

Exposure to chocolate-scented lotion increased intake when the lotion was identified as chocolate-scented relative to the same unlabeled lotion. There were no differences in intake between the controls and those exposed to the unlabeled chocolate lotion, indicating that the scent alone was not sufficient to influence intake. Given that labeling the chocolate scent of the lotion increased intake relative to exposure to the same (unlabeled) lotion, it appears that exposure to the verbal cue "chocolate" in conjunction with exposure to the chocolate scent was important in increasing intake. This findings generally fit within the predictions of the cue reactivity model (Jansen, 1998), indicating that food-related cues stimulate intake.

These results are in contrast to the predictions of the counteractive-control model (Fishbach et al., 2003), which predicts that exposure to food-related temptations activates dieting goals and diet-congruent behavior. Recent research has supported this model, demonstrating that exposure to food temptations increase dieting goals and lead to choice of a healthy food over an unhealthy food in weight-concerned individuals (Kroese et al., 2009). However, the food cues used the study conducted by Kroese et al. were direct food cues (i.e., pictures of cake), which are likely perceived as diet-threatening. In contrast, food-scented lotions, which are not directly associated with consumption, are likely not perceived as threatening and therefore may not activate dieting goals. If food-scented products are more associated with beauty aspects (e.g., skin care) than food-related aspects (chocolate), then this may leave individuals vulnerable to temptations. Further research is warranted into how consumers classify ambiguous products (e.g., food-scented beauty products), and how this classification affects their behavior in the face of competing goals (i.e., enjoying high-caloric palatable foods while also trying to lose weight). Similarly, it is important to investigate whether this phenomenon is specific to women, who are likely to be the typical consumers of chocolate-scented lotions, or whether the current pattern of results would also appear with males.

¹ This analysis was re-run excluding the eight individuals who reported having no weight-related goals within the next month, and the pattern of results was unchanged. Furthermore, these eight individuals had a mean score on the restraint scale of 9.5 ($SD = 4.0$), which approaches the median typically found in Dutch samples (e.g., Jansen, Huygens, & Tenney, 1998). This suggests that even those without direct weight-related goals had some dieting/weight concerns, which (in conjunction with the fact that dietary restraint was not associated with intake) led us to maintain these individuals in analyses.

² The current design was not a balanced design, in that labeling of the lotion scent was not performed for the control (unscented) lotion. When repeating the ANCOVA with the two unlabelled conditions (unscented lotion and unlabeled chocolate lotion) combined into a "control, unlabeled" condition, a significant effect of labeling on subsequent intake emerges, $F_{1,47} = 5.67$, $p \leq 0.03$, $\eta^2 = 0.108$, with those in the labeled chocolate condition consuming more cookies ($M = 18.9$ g, $SD = 9.17$), than those in the combined unlabelled control condition ($M = 12.3$ g, $SD = 9.14$).

Fig. 1. Mean chocolate-chip cookie intake (with standard error) for individuals who evaluated the labeled chocolate lotion ($n = 16$), the unlabeled chocolate lotion ($n = 18$) and the unscented lotion ($n = 16$).

Existing research is ambiguous as to when food cues increase intake, according to the cue reactivity model (e.g., Fedoroff et al., 1997), and when these cues lead to activation of dieting goals and healthier food choices, consistent with the counteractive-control model (e.g., Kroese et al., 2009). Recent research suggests that food intake increases only when participants focus on food cues (Coelho et al., 2009). This finding may also account for the results of the current study – when participants were focused on evaluating a chocolate-related lotion, they ate more relative to when they were evaluating an unlabeled lotion. Meanwhile, when participants were exposed to the unlabeled chocolate scent they ate (non-significantly) less than the control participants. Perhaps this incidental exposure to food cues, without specific labeling of the food-related aspect of the cue, activates counteractive control (as in Fishbach et al., 2003).

While it was initially hypothesized that exposure to food-scented products may lead to changes in affect, there were no significant differences in affect across the different conditions. We can therefore rule out the possibility that differences in intake across the chocolate lotion groups were mediated by affect. Previous research which demonstrated a reduction in positive affect (e.g., Coelho et al., 2009) used exposure to real food which the participants were not initially allowed to taste. The current experiment did not use real food during the exposure, nor were participants restricted from trying the chocolate-scented lotion. However, the current study also failed to demonstrate positive mood changes after exposure to chocolate-scented lotion, while previous research has suggested that chocolate scents improve mood (Knasko, 1995). Anecdotally, within the current study, the free responses provided on the rating forms for the lotion indicated that some found the smell of the lotion “artificial” and “too strong” while others reported the product odor to be particularly appealing. Individual differences may play a role in affinity towards food-scented products, which may subsequently moderate emotional reactions in response to exposure to these products. The large variability obtained within liking ratings of the chocolate lotion supports the notion that individual differences may influence liking of food-related scents. However, no significant differences in liking of the product scent emerged across the labeled and unlabeled chocolate lotion exposure conditions.

One limitation of the current study is that we cannot rule out the possibility that the increased intake in the labeled (relative to the unlabeled) chocolate lotion condition was dependent on the verbal presentation of the scent (i.e., the experimenter saying the words “chocolate praline”), and was not associated with the actual exposure to the chocolate-scented lotion. The fact that combining the two unlabeled lotions into one control ‘unlabeled’ condition demonstrated a significant effect on intake (see Footnote 2) suggests that labeling may indeed have been the critical factor. However, all participants were exposed to verbal presentation of the word “chocolate” later in the study, when the experimenter presented the cookies to participants. Therefore, all participants were exposed to a verbal chocolate cue, yet only those who also received the chocolate-scented lotion subsequently ate more. A follow-up study with a fully-balanced design (manipulating both scent and labeling) is necessary to verify that exposure to the chocolate-scented lotion in conjunction with the labeling of the scent is the critical factor. The fact that the labeling of the chocolate scent did not increase the subsequent liking of either the lotion or the cookies does not provide clear support for the presence of conceptual priming (Berger & Fitzsimons, 2008); however, ease of processing of chocolate-related concepts was not assessed in the current study, and therefore this mechanism cannot be excluded. Future research would benefit from inclusion of measures that would allow for a direct comparison and testing of the different possible mechanisms thought to play a role in the effects of

food-cue exposure (i.e., conceptual fluency, cue reactivity, and counteractive control). Systematic evaluation of the longevity of the effects of food-cue exposure on subsequent intake is also warranted. Research in this area typically measures food intake within minutes after pre-exposure to a food-related cue. The duration of effects of exposure may be relatively short-lived, which in turn would limit their impact during real-life exposure (where food may not be directly available).

The obesogenic environment appears to be particularly pervasive, given that individuals who knew that they were testing a chocolate-scented lotion ate more than did those exposed to the same lotion without knowing that it had a chocolate scent. Furthermore, the fact that individuals spontaneously associated the scent of the lotion as food-related further supports the notion that these food-scented products are a part of the obesogenic environment. Food-scented personal care products have been marketed as a way to enjoy chocolate without the calories. For example, a recent newspaper article describes a chocolate body wrap as “the new way to get a chocolate fix without the calories” (Hardy, 2010). However, the current research indicates that conscious exposure to chocolate-related products (or labeled chocolate-scented products) increases intake. Further research on the effects of these food-scented products on cravings and eating behavior, and the role of labeling the scent is warranted.

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