Seeing Is Smelling: Visual Images Can Induce Olfactory Imagery and Improve Product Evaluations

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Four studies demonstrate that ads and packages with pictures of scented objects (e.g., lavender) improve product evaluations by evoking olfactory imagery of the associated scent. This effect is moderated by pleasantness of the scent, relevance of scent to the product category, and utilitarian (vs hedonic) nature of the offering.

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A Bouquet of Scents: Olfactory Effects on Product Evaluation & Consumption

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Paper #1: Seeing is Smelling: Visual Images can Induce Olfactory Imagery and Improve Product Evaluations
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Paper #2: I smell it as if it were here: Can scented advertising boost product appeal?
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Paper #3: Follow Your Nose When it Sounds Right: How Brand Names Moderate the Influence of Olfactory Cues on Consumer Preferences
Marina Carnevale, Fordham University, USA
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Paper #4: The Effects of Warm versus Cool Ambient Scents on Calorie Consumption
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SESSION OVERVIEW

The session addresses the broad question of how scents affect product evaluations and consumption. The session serves as a cohesive all-around inquiry, set up in diverse contexts of scent expression, like product scents, scented ads, olfactory imagery and ambient scents. The papers also introduce several novel effects, like scent as a cue for transferring product-essence and for inferring ambient temperature.

Sharma and Estes point out that although scent can be a powerful marketing tool, it is difficult to implement via advertising and packaging. They therefore investigate how pictures of scented objects (e.g., lavender, lemon) in ads and product labels affect product evaluations. Across four studies, they show that pictures of scented objects can evoke olfactory imagery, hence positively impacting product evaluations. However, this visual-olfactory effect occurs only when the scent is pleasant, when scents are relevant to the product, and when the offering is utilitarian. It backfires if the product category is scent-irrelevant or the associated scent is unpleasant.

Ruzeviciute, Kamleitner, and Biswas examine how scented ads improve the appeal and attractiveness of a product. They suggest that scents are able to transfer the essence of the product. In three studies, they show that scents increase the product appeal because of enhanced perceived proximity of the product to the consumer. However, scents increase perceived proximity only when there are scent expectations from the product, whereas the importance of scents to the product and explicitly informing consumers of the scent do not matter. The authors also rule out imagery as a potential alternate mechanism.

Carnevale, Hadi, Pogacar, and Luna focus on how brand names influence consumers’ responses to a product’s scent. In a field experiment and two lab experiments, they show that olfactory cues from a product affect consumer preferences when the brand name is category-congruent, but not when the brand name is category-incongruent. They further show that this effect is mediated by increased fluent processing of category-congruent brand names. On the other hand, unpleasant smelling products (e.g., blue cheese) can benefit from using category-incongruent brand names, as the unpleasant olfactory cues are discounted from evaluations in this case.

Lefebvre and Biswas investigate how warm or cool ambient scents affect food/beverage consumption. In a field experiment and three lab experiments they show that warm ambient scents decrease calorie consumption and reduce the likelihood of choosing high-calorie foods, compared with cool scents. They further show that this effect is due to a difference in perceived ambient temperature by consumers. They theorize that lower perceived temperature in the case of cooler scents might signal higher anticipated energy expenditure, leading to an increase in high calorie food consumption. Surprisingly, this effect reverses with beverages instead of foods.

This session connects scents with product evaluations and consumption with several novel theoretical links, mechanisms and boundary conditions along with relevant practical implications to managers. These papers together show how scents can have broad as well as specific effects, hence illustrating the widespread effects of scent on a multitude of consumer behaviors.

Seeing is Smelling: Visual Images can Induce Olfactory Imagery and Improve Product Evaluations

EXTENDED ABSTRACT

Scented products are increasing in prevalence, so marketers need to advertise and package them effectively. Using scents in ads and in stores improves product evaluations (Morin 2009), but the incorporation of scents is expensive in advertising and impractical in packaging. Alternatively, given that consumers may be “able to experience the sensation of smell when an appropriate stimulus is absent” (olfactory imagery; Stevenson and Case 2005), we investigated whether pictures of scent-inducing objects (like lavender) in ads or product packages can increase product evaluations via olfactory imagery (visual-olfactory effect).

Pictures lie at the heart of advertising and packaging, but the link between pictures and olfactory imagery is unexplored in consumer behavior. Murray et al. (2005) showed that visual exposure to an object can activate representations in other modalities, including smell. Moreover, because visual and olfactory neural circuits overlap substantially (Jadauji et al. 2012), the mere presence of a visual stimulus can evoke olfactory imagery. But does olfactory imagery affect product evaluations?

A large literature on scent suggests a positive impact of pleasant scents on consumer evaluation and behavior (Bosmans 2006; Morin 2009). Olfactory imagery and olfactory perception exhibit highly similar hedonic patterns in the brain (Bensafi et al. 2007), therefore, we expect a positive impact of olfactory imagery on consumer evaluations. For example, Krishna et al. (2014) showed that olfactory imagery of food can increase consumption. We similarly expect a positive impact of olfactory imagery on consumer evaluations in non-food products (without the gustatory sense), avoiding interfering mechanisms like cravings (Kemps et al. 2004) and activation of taste and reward areas in the brain (Simmons et al. 2005).
out an impact of other sensory modalities by using products with limited or no haptic or auditory involvement.

Study 1 tested whether product labels that evoke stronger (versus weaker) olfactory imagery are preferred. 95 participants viewed two product labels of a lemon-scented dishwashing liquid with a picture of either cut lemon or whole lemon. They indicated the label they preferred and rated the olfactory imagery and visual attractiveness of the labels. A significant majority of participants (77%) preferred the label with cut lemons, which evoked stronger olfactory imagery. A logistic regression showed a significant effect of olfactory imagery on likelihood of choosing the cut lemon label (τ=.248,p<.05), controlling for visual attractiveness.

In an ad/package, using pictures to indicate removal of unpleasant scents is common (e.g., air-fresher ads) but are such pictures beneficial or harmful for product evaluation? Study 2 compared pictures of pleasant or unpleasant scented objects, which we expected to increase and decrease product evaluations respectively. 292 respondents saw an oven cleaner with one of three labels between-participants: pleasant (lemon picture), unpleasant (fish picture) and no-scent (oven picture). All packages included the statements: “LEMON SCENTED” and “NEUTRALIZES FISHY SMELL”. A one-way ANOVA confirmed more positive attitudes, F(2,292)=77.79,p<0.001, and more positive olfactory imagery, F(2,292)=142.41,p<0.001, in the pleasant condition than in the control condition, which was higher than the unpleasant condition. Mediation analysis showed that the lemon picture increased product attitudes via olfactory imagery (CI=.08 to .27), whereas the fish picture decreased attitudes via olfactory imagery (CI=-.77 to -.34).

The contextual-correction literature (Bosmans 2006) indicates that when consumers are aware of biasing effects of scents (like pictures impacting evaluations), they discount it while evaluating. We hypothesized that the visual-olfactory effect would be moderated by the relevance of scent to the product category (scent-relevant: cleaning-spray; scent-irrelevant: umbrella), because in the scent-irrelevant condition its biasing effect is apparent to the consumer. In study 3, 392 online respondents were assigned to one of 2(Scent relevance: relevant, irrelevant) * 2(image: present, absent) between-participants conditions. All packages were clearly labeled “LEMON FRAGRANCE”. ANOVA showed a significant interaction on product attitudes, F(1, 388)=11.29, p=.001. The picture of a lemon on the package improved attitudes for the scent-relevant product (cleaning spray), t(191)=2.25,p<.05, but decreased attitudes for the scent-irrelevant product (umbrella), t(197)=2.06,p<.05. A moderated-mediation analysis showed that for the scent-relevant product, the picture increased product attitudes via olfactory imagery (CI=1 to .33), while for the scent-irrelevant product there was no mediation (CI=.04 to .17).

Hedonic offerings are inherently emotional and sensorial (Voss et al. 2003), so counter-intuitively, the addition of a picture may have relatively little benefit to hedonic ads. That is, because hedonic offerings are already highly sensory, an additional sensory attribute (olfactory imagery) may have “diminishing returns” on attitudes. Utilitarian offerings, in contrast, tend to have fewer sensory attributes, so adding a picture could have an especially large effect on olfactory imagery and evaluation. In Study 4, 399 respondents were randomly assigned to one of 2(service type: utilitarian, hedonic)*2(picture: present, absent) between-participant conditions. Participants saw a laundry service ad, with service type manipulated through typeface and textual content to be more utilitarian or hedonic, while a picture of lavender was present or absent from the ad. A 2(service type)*2(picture) ANOVA on product attitudes indicated a marginally significant interaction, F(1, 394)=2.11, p=.053. The picture of lavender improved attitudes for a utilitarian ad, t(200)=2.35, p<.05, but not for a hedonic ad (p=.72). A moderated-mediation analysis showed that the conditional indirect effect of the picture on attitude was significant (CI=-.11 to .29) for the utilitarian ad, but not for the hedonic ad (CI=.01 to .12).

These studies show that pictures of pleasant scented objects can improve evaluations via generation of olfactory imagery (a visual-olfactory effect). Our research extends the multisensory theory of evaluations to imagined scents. This research is the first to demonstrate in consumer research that pictures can implicitly generate olfactory imagery. It is also one of the few studies (e.g., Krishna et al. 2014) establishing positive impacts of pleasant olfactory imagery. Another important contribution of the paper is to establish that olfactory imagery is a controlled process. This effect is activated only when the product is scent-relevant, which strikes a conversation with the scent-congruence literature (Spangenberg et al. 2006). Similarly, we show that the visual-olfactory effect occurs only for utilitarian products.

**Can Scented Advertising Boost Product Appeal?**

**EXTENDED ABSTRACT**

Drawing on the literature on magical contagion and essence transfer (Argo, Dahl, and Morales 2008; Nemeroff and Rozin 1994) we propose that scented advertising copy can boost the advertised product’s appeal. More specifically, we suggest that it does so because scents are able to capture and convey essential qualitative information (Yeshurun and Sobel 2010) or even the very essence of their source (Meir 2005) and thus, serve as a cue for object proximity. Scent molecules are part of the scent emitting object itself (Köster 2002) and they can represent the object in its absence (Nemeroff and Rozin 1994). The ability of scent to traverse immediate experiences could also explain why, from early childhood onwards, certain scents are used for regulating distances to desired people or objects when they are physically absent (Shoup, Streeter, and McBurney 2008). For example, toddlers simulate the presence of the parent by smelling their favorite toy or comfort blanket when staying at a daycare facility (Schaal 1988). Likewise, sniffing at an unwashed partner’s t-shirt enables adults to enhance felt proximity to an absent partner (Shoup et al. 2008). Given that print ads represent physically absent products, we propose that scent behaves similarly in the context of advertising – transfers the essence of the product and, thus, brings about the feeling of its proximity. Notably, as generally liked targets become even more appealing if they are proximate (Kahn and McGaughey 1977; Williams et al. 2014) we further posit that the scent elicited sense of proximity in turn enhances the appeal of the advertised product.

In three experiments, we test perceived proximity as a mechanism through which scented ads may affect advertised product appeal. In addition, we highlight the moderating effect of product category. Specifically, we show that a scented ad enhances proximity and appeal only if it credibly represents the essence of the advertised product. Moreover, we rule out imagery (Lwin, Morrin, and Krishna 2010) as an alternative process account.

In study 1, we tested the hypotheses and explored their robustness across different scent presentation strategies. Participants were randomly exposed to either a lavender scented or unscented soap print advertisement. Additionally, participants who received scented ads were either alerted about the scent on the ad (explicit scent presentation) or not (implicit presentation). All participants reported perceived proximity to (feels close/here), attractiveness
of and purchase intentions for the advertised soap (7-point scales). The results revealed a main effect of scent on perceived proximity ($F(2,114) = 8.38, p < .05$). Scented ads yielded higher perceived proximity ratings than control ads, regardless of scent presentation strategy. As predicted, scent elicited product proximity and in turn increased product attractiveness and purchase intentions (SPSS PROCESS, model 4, 95% CI’s excluded zero).

Study 2 investigated product category moderation for the previously observed effect. We predicted that scenting an ad should only work if the scent can be considered part of the product. Additionally, we aimed to demonstrate robustness of the effect using different products and scents than in Study 1. Prior literature shows that scents facilitate vivid processing of information (Lwin et al. 2010) and that vivid product imagery leads to favorable product reactions (Kisielius and Sternthal 1986). Therefore, study 2 also addressed product imagery vividness as an alternative process. Participants were randomly assigned to an ad featuring a glass that was either framed as a drinking glass (scent unexpected) or as a glass containing an aroma-candle (scent expected). The ad was either unscented or had a vanilla scent. Using the same measures as in the previous studies, we find the predicted interaction. Scent increased the perceived product proximity ($F(1, 177) = 4.88, p < .05$) only when advertising a candle but not a glass. A moderated mediation analysis (SPSS PROCESS, model 7) confirmed the scent induced proximity mediation on increased product attractiveness and purchase intentions, but only for the product with scent expectations (candle) (95% CI’s excluded zero). We further explored the role of mental imagery (assessed with mental imagery scale, Babin and Burns 1998) in driving product appeal in response to scented ads. However, we neither observed a main effect of scent nor an interaction with the product category ($p’s > .20$). A moderated mediation (model 7) test confirmed the limited role of mental imagery in driving product appeal when using scented ads, regardless of the advertised product (all 95% CI’s included 0).

Even if we typically associate a product with a scent this does not mean that we consider its scent very important. Therefore, study 3 investigated whether the effect of scent on advertised product proximity could generalize across products that generally enjoy high scent expectations, but differ in how important scent is for a product. Study participants were exposed to a scented or unscented soap ad as in study 1. To manipulate importance of scent for a product, we additionally framed the soap as either moisturizing (less important) or aromatherapy (more important). Additionally to the measures used in studies 1 and 2, we assessed willingness to pay a price premium for the advertised soap. The results revealed only a main effect of scent ($F(1,182) = 14.10, p < .001$), signaling the effectiveness of scented ads in boosting product proximity regardless of soap type. A moderated mediation test (model 7) corroborated these findings and showed no evidence for moderation by soap type. Yet as predicted, scented advertising through elicited product proximity increased promoted soap attractiveness, its purchase intentions and the willingness to pay a price premium for it (95% CI’s excluded zero).

Taken together, the studies show that scent can enhance consumer responses to the advertised product because it is able to transfer the essence of the product and thus, acts as its proximity cue. However, the hypothesized process only works for products whose essence could be credibly represented using scent, that is, products that are expected to have embedded scent. These results add to the literatures on multisensory marketing and proximal product experiences.

Follow Your Nose When it Sounds Right: How Brand Names Moderate the Influence of Olfactory Cues on Consumer Preferences

**EXTENDED ABSTRACT**

Product scents can be powerful differentiation tools for marketers, and academic research suggests olfactory cues can profoundly influence consumer memory and evaluations (e.g., Krishna, Lwin, and Morrin 2010). However, while the influence of product scent on consumer behavior has been examined, it has mostly been assessed in isolation, without investigating how other product-based cues may moderate its influence.

We begin to address this gap by examining how brand names might shape consumer responses to a product’s olfactory properties. This examination is practically relevant, given that consumers typically see a product’s brand (e.g., on packaging) before being exposed to its scent. However, this exploration is also theoretically motivated by the phonetic symbolism and olfactory processing literatures. Consumer research in phonetic symbolism suggests that the phonetic properties of a brand name can influence consumer perceptions (e.g., Klink 2000; Lerman and Garbarino, 2002; Lowrey, Shrum, and Dubitsky 2003). For non-word brand names, even the smallest unit of sound can evoke specific meaning. For example, front (back) vowels, such as the English sound “ee” (“o”) are associated with lightness (heaviness) and softness (hardness; Klink 2000). Accordingly, certain brand names may be more or less congruent with particular product categories, and such congruity may influence consumer preferences (with lightness (heaviness) and softness (hardness; Klink 2000). Accordingly, certain brand names may be more or less congruent with particular product categories, and such congruity may influence consumer preferences (Lowrey and Shrum 2007). For instance, if lightness is typical in a category (e.g., tissues), a front vowel (e.g., the brand name “Deetral”) would be category-congruent while a back vowel (e.g., “Dutal”) would be category-incongruent. Importantly, phonetic congruity (versus incongruity) not only affects product perceptions, but can also prompt more fluent (versus disfluent) processing (Topolinski and Strack 2010). The facilitation of fluent processing is critical to the current research, given that sensory cues in general (Stephenson and Palmgreen 2001) and olfactory cues in particular (DeBono 1992) tend to be processed in a peripheral, heuristic manner. Accordingly, a product’s brand name should act as a germane antecedent determining the extent to which consumers rely on subsequent olfactory information when making product-based judgments and choices. Specifically, we propose that category-congruent brand names will encourage more fluent processing and facilitate consumer reliance on a product’s olfactory cues, whereas category-incongruent brand names will generate disfluency, leading consumers to discount subsequent olfactory information.

Study 1 (N=191) was a field experiment with a 2(Brand Name: Congruent vs. Incongruent) x 2(Scent: Unscented vs. Pleasant Scent) between-subjects design. Experimenters set up a table in a public space and offered passersby $5 to sample a lip balm. The lip balm was either unscented or vanilla-scented (a pretest suggested vanilla was a desirable scent for this product category), and was packaged with a brand name pretested as being either congruent (“Frosh”) or incongruent (“Frisch”) with the lip balm category. After trying the lip balm, participants were told they could either “purchase” it for $1 of their compensation, or relinquish it and receive full compensation. Logistic regression results revealed a significant interaction of Brand Name x Scent on purchase likelihood ($\chi^2=5.41, p=.02, \text{Odds ratio}=5.83$). Specifically, when the brand name was category-congruent, participants were significantly more likely to purchase the vanilla (versus unscented) lip balm (52% vanilla vs. 8% unscented; $\chi^2=17.62, p<.001, \text{Odds ratio}=0.08$). However, when the brand name was category-incongruent, there was no significant difference in
purchase likelihood between the two scent conditions (36% vanilla vs. 21% unscented; \(\chi^2=2.50, p=.1\), Odds ratio=0.48).

Study 2 (N=140) was a laboratory experiment with a 2(Brand Name: Congruent vs. Incongruent) x 2(Scent: Congruent vs. Incongruent) between-subjects design. Participants sampled a hand lotion that had either a category-congruent (lavender) or category-incongruent (pine) scent (previous research suggests category-congruent olfactory cues are preferred, e.g., Krishna, Lwin, and Morrin, 2010), and was packaged with a brand name that was pretested as being either category-congruent (“Sait”) or category-incongruent (“Sool”). After sampling the product, participants were given the option to either keep the product, or choose an alternative lotion to take home with them. Results confirmed a significant interaction of Brand Name x Scent on Product Choice (\(\chi^2=3.95, p<.05\), Odds ratio=11.66), and the pattern of contrasts mirrored those of study 1: when the brand name was category-congruent, participants chose the lavender (versus pine) lotion more often (23% lavender vs. 5% pine; \(\chi^2=4.05, p<.05\), Odds ratio=0.18). However, when the brand name category-incongruent, there was no significant difference in choice likelihood between the two scent conditions (6% lavender vs. 11% pine; \(\chi^2=7.0, p<.1\), Odds ratio=2.13).

Our final study (N=121) was a laboratory experiment with a 2(Brand Name: Congruent vs. Incongruent) x 2(Scent: Pleasant vs. Unpleasant) between-subjects design. The objective was to investigate the underlying mechanism and test whether an incongruent brand name might attenuate negative effects of mildly aversive product scents. Participants sampled a hand sanitizer that had either a pleasant (orange) or unpleasant (musty pine) scent (according to pretest results), and was packaged with pretested category-congruent (“Gimmel”) or category-incongruent (“Gommel”) brand names. After sampling the product, participants evaluated it on a series of bipolar dimensions (e.g., good-bad), and their evaluation time was measured as a proxy for processing fluency (Schwarz 2004). Results confirmed a significant Brand Name x Scent interaction on Product Evaluation (\(F(17)=4.68, p<.05\)). When the brand name was category-congruent, participants evaluated the orange (versus musty pine) sanitizer more highly. However, when the brand name was category-incongruent, there was no significant difference in evaluation between scent conditions. Further, a moderated mediation analysis (Model 8 of Hayes 2013) confirmed that when the brand name was congruent, processing fluency explained the effects of scent on evaluation (95% CI=−.37,−.01), but this was not the case when the brand name was category-incongruent (95% CI=−.02; .23).

Our research suggests that brand names can play a pivotal role in determining the influence of olfactory cues on consumers’ judgements and behaviors, and this has important managerial implications. For instance, when scent is an important selling point in a product (e.g., candles), category-congruent brand names may enhance consumer valuation of the scent. However, for products with inherently bad scent (e.g., nail polish, blue cheese), marketers may benefit from category-incongruent brand names, so that the influence of unpleasant olfactory cues on consumer responses is attenuated.

**The Effects of Warm versus Cool Ambient Scents on Calorie Consumption**

**EXTENDED ABSTRACT**

Can the temperature dimension of ambient scent influence total calories consumed? That is, can warm versus cool ambient scents (Krishna, Elder, and Caldara 2010; Madzharov, Block, and Morrin 2015) impact how much food a consumer eats? The results of four studies show that warm (e.g., cedarwood) versus cool (e.g., eucalyptus) ambient scents influence the amount of food consumed and even choices between high versus low-calorie food options. Overall, we examine the sensory cross-modal influences of olfactory cues on haptic perceptions, which in turn influence gustatory factors.

The human physiological system attempts to maintain an optimal core body temperature (at ~98°F). Research within physiology shows when ambient temperature becomes colder, the body evokes thermal regulation by increasing activities that will generate heat (e.g., shivering). As a result, there is greater energy expenditure and an increase in appetite to counteract the loss of stored calories (Moellerling and Smith 2012; Warwick and Busby 1990; Westerterp-Plantenga et al. 2002). As a corollary, an increase in ambient temperature leads to loss of appetite due to reduced desire for activity (Herman 1993; Murray 1987).

Very little research has examined a temperature dimension of scent, with the two notable exceptions being Krishna, Elder, and Caldara (2010) and Madzharov, Block, and Morrin (2015); however, neither of which studies examine the effects of warm/cool scents within a food context. We build on these two studies to develop our conceptual framework. From an evolutionary/historical perspective, scents associated with fire (e.g., sandalwood, cinnamon) came to be associated as warm scents and subsequently used during winter, while scents associated with watery properties (e.g., eucalyptus, peppermint), became associated as being cool scents and subsequently used for their cooling properties (Zarzo 2013).

Building on the physiological effects of ambient temperature and the emerging literature on the temperature dimension of scent, we hypothesize that ambient scents that induce warmer (vs. cooler) temperatures will lead to decreased calorie consumption and reduced choice likelihood of caloric foods. We test our hypotheses with the help of a field experiment and a series of lab studies.

Study 1a, a field experiment at an optometrist’s office, had two manipulated conditions (ambient scent: warm vs. cool). For the experimental manipulations, two commercial grade scent nebulizers were placed at the opposite ends of the retail store, which also functioned as the waiting area for patients. A glass bowl with individually wrapped chocolates was placed on the reception desk where all customers were required to sign in. There was a main effect of ambient scent on calories consumed (M warm = 29.55 vs. M cool = 54.87; F(1, 2) = 47.09, p < .05) supporting our primary hypothesis.

Study 1b replicated the findings of study 1a in a controlled laboratory environment with a mindless eating task. Consistent with the results of study 1a, participants in the warm (vs. cool) ambient scent condition consumed a lower amount of calories from the bite-sized breakfast biscuits (M warm = 53.21 vs. M cool = 101.0; F(1, 51) = 10.31, p < .01). The results replicate the main effects of study 1a in a controlled lab setting. Next, study 2 examines the extension of the effect of scent on choice and the underlying process.

Study 2 investigated the effect of ambient scent on food choice and the underlying process of perceived ambient temperature. Participants were given the choice of a low versus high calorie choice and asked to rate the temperature in the room as cold versus warm. We found those in the warm scent chose the low calorie item significantly more than those in the cold scent (Wald = 3.37, p = .066; \(P_{warm} = 78\% \) vs. \(P_{cold} = 56\%\)). Mediation tests showed that the total indirect effect of a temperature dimension of ambient scent through the mediator, perceived ambient temperature, on food choice had a bootstrap 90% CI of .0168 to .7169 with an estimate of .861, supporting mediation.

Study 3 examined the effects of warm/cool ambient scents on consumption of food versus beverages. We propose that the
effects will be in opposite directions for foods versus non-alcoholic beverages. This is because in hot environments additional beverage consumption cools the body and hence an increased ambient temperature is associated with a higher amount of beverage consumption (Wansink 2004). Participants were told in appreciation for their participation in the lab, they were provided with either a snack or a beverage. Results revealed a significant interaction effect of ambient scent and food/beverage on consumption volume (F (1, 93) = 13.07, p < .001). Follow-up analysis showed that in the “food” conditions, participants in the cool ambient scent consumed more (Mcool = 50.2%) than those in the warm ambient scent (Mwarm = 20.54%; F(1, 93) = 13.03, p < .001). In the “beverage” condition those in the warm ambient scent drank more (Mwarm = 28%) than those in the cool ambient scent (Mcool = 15.77%). The results indicate a reversal in consumption volume for food vs. beverage due to the temperature dimension of scent.

The results of four studies showed that a warm (vs. cool) ambient scent leads to a reduced amount of food consumption both in field settings as well as in laboratory environments. The findings of this research contribute to our understanding of cross-modal influences involving olfactory cues, haptic perceptions, and gustatory outcomes. Specifically, while ambient scent is an olfactory cue, perceived warmness/coolness is a haptic perception, and food consumption is related to gustatory factors. This is possibly the first research to link olfactory cues to haptic perceptions and with outcomes for gustatory factors. Hence, the findings of this research contribute to the growing literature in the domain of sensory marketing (Krisha 2012).

Our findings have important conceptual and practical implications, especially given widespread concerns about obesity and the related focus on food overconsumption. Moreover, given the ease with which different types of ambient scents can be administered, consumers and marketers can potentially use the findings of this research to nudge healthful consumption.

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