PhD THESIS DECLARATION

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Cognitive Side of Consumer Behavior: Essays on the Impact of Scents and Rounded Totals

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ABSTRACT

This dissertation explores two areas in consumer behavior: scents in marketing with a focus on olfactory imagery (i.e. imagined scents) and processing fluency from rounded prices. The dissertation begins with a review on scent marketing, followed by an empirical essay on olfactory imagery and another on fluency associated with rounded prices. The first essay systematically reviews the research in scent marketing, with ambient scents, scents in advertising, and product scents as the broad areas of enquiry. For these areas, the gaps in the literature and future directions are identified. The review shows that the research focus in scent marketing is predominantly on ambient scents. The research can benefit from shifting attention to the other two areas, especially on the topics of interaction of various senses and olfactory imagery. The second essay focuses on an understudied area -- olfactory imagery -- and demonstrates a novel phenomenon that can create positive effects of scents in ads and product labels, critically without real scents. Using six studies (and multiple replications), this essay shows that pictures of scented objects can generate olfactory imagery of the associated scent, and, interestingly without any instructions to imagine the smell. Consequently, this olfactory imagery increases product evaluations. This effect is moderated by the pleasantness of the scent, the relevance of scents to a product, and the utilitarian or hedonic nature of the offering. The third essay investigates the processing fluency associated with rounded prices, which can nudge people to donate to a charity. Six studies on donations demonstrate that, after a purchase, when customers are asked to choose between different amounts of donations, they prefer a donation that makes the total amount (i.e. purchase plus donation) rounded. This preference is driven by the fluency associated with processing a rounded number. Furthermore, this effect is present even when customers mentally calculate the sum. In addition to the theoretical contributions, these effects have clear implications for commercial firms and charities.

Cognitive Side of Consumer Behavior: Essays on the Impact of Scents and Rounded Totals

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I dedicate my thesis to my parents!

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CHAPTER 1: INTRODUCTION

Consumer behavior is an interdisciplinary field, which blends the fields like marketing, psychology, economics, and sociology. One of the prominent fields that has a strong impact on consumer behavior is cognitive psychology. The cognitive side of consumer behavior has explored many different routes or areas of cognitive processes like perception, memory, attention, language and metacognition. This dissertation is focused on two such routes in consumer research. The first route is related to perception, specifically scents in sensory marketing. The second route is related to metacognition in which fluency of rounded prices is explored.

Sensory marketing is a relatively new and evolving field in marketing. It focuses on engaging the senses of consumers, which in turn can affect their perceptions and behaviors (Krishna, 2012). In the last few decades, there has been a surge in consumer research on all the individual senses. The sense of smell is one of these senses, which is phylogenetically the oldest sense. It directly impacts many different areas of the human brain, including parts of the brain associated with memories and emotions (Herz, 2010; Zald & Pardo, 1997). Marketing researchers have explored many ways in which olfaction affects consumers' evaluations and memory of products (Krishna, 2012).

The first essay reviews the scent marketing field, identifying many excellent papers that show the impact that scents have on consumers. Unlike most of the past reviews, the articles were selected for this review using a predefined set of keywords, i.e. keywords for scents (e.g., olfact*, scent, odo*r) and for marketing-relevant dependent variables (e.g. memor*, evaluat*, rememb*). The articles from the above search then went through a manual selection for relevant articles by removing articles that do not match our defined criteria. The

final number of articles considered for the review was 58. These articles were divided based on application areas of scents: ambient scents, scents in ads, and product scents. In general, the review shows a positive effect of pleasant scents on consumers, in terms of memory and evaluations.

The review also highlights variables that moderate this relationship. The variable of congruence is shown by previous research to be an important moderator of this effect (Krishna, Elder, & Caldara, 2010; Mattila & Wirtz, 2001; Spangenberg, Grohmann, & Sprott, 2005). The literature shows various kinds of congruence that affect the impact of scents, e.g. congruence with other senses and congruence with the product category. In addition to congruence, moderators like retail density and simplicity of scents are also explored in the review article.

The review also found that the research on scents is very unevenly divided between ambient scents, product scents, and scents in ads. Forty-two articles (about 3 out of every 4 articles) are focused on ambient scents, while the other one fourth is almost equally divided among the other two areas. It is evident that the research in scent marketing is highly concentrated in certain areas, while others are still quite unexplored. There are many critical topics that are under-investigated, creating multiple gaps in each of these three areas in terms of very relevant questions such as the impact on memory of stores due to the presence of an ambient scent in the environment. These gaps are discussed in the review, along with other potential future directions for the field. Research on understudied topics like olfactory imagery, interaction of other senses with olfaction, interaction of environment with scents, and research on food or restaurants can be immensely fruitful.

From the above article, it was clear that product scents and scents in ads have been far less researched than ambient scents. From an industry point of view, while it is difficult to

implement scents in ads, its implications can be immense. While the industry has tried ideas like using scratch-n-sniff ads (i.e. scented ads where you scratch a certain part of the ad to release the scent), it is neither shown to be very effective nor popular with marketers (GfK MRI, 2011). Similarly, for packaged goods, it is difficult for a consumer to experience the product's scent before trying the product, which makes scents of products difficult to market. Therefore, research in these areas is not only theoretically important, but it is also managerially relevant, as it could provide effective tools to overcome this marketing problem.

The second essay focuses on a solution to this problem. This article explores the topic of olfactory imagery (i.e., imagined scent), specifically its generation and impact on consumers' evaluation of products. The target of investigation is non-food products that have limited gustatory, haptic, and auditory senses, e.g. no food or cosmetic products have been used in the research. These restrictions make sure that results from this investigation are not impacted by other senses and their imageries. One example of such an impact from other senses would be pictures of high sugar/high carbohydrate food items that cause cravings (Kemps, Tiggemann, Woods, & Soekov, 2004), hence increasing the evaluation of the associated product.

The article shows that certain pictures can help in creating olfactory imagery, importantly without any instructions to imagine a scent. Since olfactory imagery has been shown to be similar to real scents (Bensafi, Sobel, & Khan, 2007), it is possible that olfactory imagery can produce potential positive effects similar to scents. If this is the case, it would make any ease of generation of olfactory imagery a strong step forward for scent marketing. The article shows that pictures, due to the creation of olfactory imagery, can help in improving product evaluations. We refer to this as a *visual olfactory effect*.

The article also investigates three moderators of this effect: pleasantness of the scent of the object in the picture, relevance of scents to the product, and the utilitarian or hedonic nature of the offering. For many scented products, removal of a bad smell is an essential function. Therefore, for a marketer, conveying this function, it might be more effective to use a picture. However, we show that these pictures can actually harm the evaluations of the product, as these pictures are of an unpleasantly scented object. Because of visual olfactory effect, the olfactory imagery that is generated through these pictures is of an unpleasant scent and therefore decreases product evaluations.

The second moderator of the effect is relevance of scents to the product, such that the positive effects of the picture of scented objects are applicable only when scents are relevant to the product (e.g. air freshener, cleaning product). If the products are highly scent irrelevant (e.g. lint roller, umbrella), these pictures can also harm the product evaluations. The third moderator of the effect is the utilitarian or hedonic nature of the offering. Previous research has shown that the addition of a hedonic attribute helps the evaluations of a utilitarian product more than a hedonic product (Gill, 2008; Klein & Melnyk, 2014). In addition, for hedonic products, sensorial or emotional attributes are more salient. This renders the addition of a picture of a scented object useless for these products. On the other hand, utilitarian products mostly possess functional features, adding a picture would help in generation of olfactory imagery (one of the sensory imageries) and improve evaluations.

This effect is explored in both ads as well as product labels, thereby contributing to the research in both these areas. Additionally, for a marketer, this article demonstrates an easy way to generate olfactory imagery and positive effects of scents. Therefore, positive effects of scents in product labels and ads can be incorporated in a simple and cost-effective way using the findings from this article.

The third essay focuses on the second route of metacognition, in the specific context of processing fluency related to rounded prices. The article investigates this in the area of charitable donations. Charitable donations positively impact many areas of life where less for-profit money is directed. However, the numbers associated with charity donation are not encouraging; the percentage of American charity donors is decreasing and the amount of donation as a percentage of their income has been stagnant for the last four decades (Giving USA, 2017).

One problem that a potential donor faces is that deciding to donate for a particular charity or not is a difficult decision for many potential donors. In addition, the decision of how much to donate further complicates this decision. This essay puts forward a nudge that makes one option more fluent than the others, which should make it more attractive and easier to choose. This nudge is based on the total amount that a customer pays at the point of sale. This article shows that fluency associated with a total amount can be used to nudge people toward choosing the associated donation amount.

Specifically, the article shows that, when at the point of sale a customer is asked whether (s)he would like to donate, the donation option would be preferred more if it makes the total amount that the customer is paying, i.e. purchase amount plus donation amount, rounded. Intuitively, customers might say yes to such an appeal as they are averse to receiving coins (Vandoros, 2013). However, the article shows that this effect is driven at least partially by fluency associated with a rounded total amount. Additionally, since this effect is due to fluency of rounded total amounts, it can be employed for electronic transactions too. More importantly, it is possible to increase donation amounts by giving customers options with rounded totals beyond the next dollar value.

This article then explores whether this effect is dependent on the customer seeing the rounded total amount, or whether the effect would still hold if they have to mentally calculate the total amount. Finally, the article also extends this effect to contexts other than charitable donations by showing that this nudge also works for the context of tipping in a restaurant. This article has immense relevance to charities, as this simple nudge can increase both donation amounts and the number of donors.

We sum up the thesis with a concluding chapter, which highlights the main points and contributions of the three essays.

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CHAPTER 2: SCENTING THE WAY: A REVIEW OF THE IMPACT OF SCENTS IN MARKETING

ABSTRACT

Scents are ubiquitous in the marketplace. In addition to the ever-increasing use of scents inside retail stores, many traditionally unscented product categories and product ads are now incorporating scents. In the field of sensory marketing, the olfactory sense and scents in particular have been investigated for more than two decades. The current review systematically identifies the articles that deal with the most important marketing implications of scents, i.e. their influence on evaluations and memory. This review categorizes these articles into the three application areas of (i) ambient scents, (ii) scents in ads, and (iii) product scents. The various effects of scents are identified to form an overall understanding of the impact of scents within each of these categories. Lastly, for each section, gaps in the literature and the areas where contributions are awaited are identified. The review finds that the application area of ambient scents has received the lion's share of attention from research in marketing as compared to application areas of scents in ads and product scents. Overall, the interaction of other senses with olfaction, cues to olfaction or olfactory imagery, and the interaction of ambient scents with product or advertisement smells constitute some of the research areas that would immensely benefit from further research.

Keywords: olfaction, ambient scents, scents in ads, product scents, literature review, sensory marketing

"Nothing is more memorable than a smell. One scent can be unexpected, momentary and fleeting, yet conjure up a childhood summer beside a lake in the mountains; another, a moonlit beach; a third, a family dinner of pot roast and sweet potatoes during a myrtle-mad August in a Midwestern town." (Ackerman, 1990)

As the above quote suggests, the sense of smell has a powerful link to memory. But it is much more than a cue to memories.

The marketplace is becoming increasingly complex, which makes reaching consumers and communicating effectively a difficult and multifaceted effort for marketers. For example, in advertising, the task of keeping the consumer's attention, convincing him or her to consider a product, helping them remember the product (or the brand), and maintaining a positive brand association are just a few considerations for the marketer. In addition, the consumer's experience at the company's store (or other touch points with the company) and the consumer's interaction with the product should also be positive.

Marketers, with this complex task at hand, can benefit by getting down to the very basics of sensing and perception in order to create an overall positive customer experience for consumers (Puccinelli et al., 2009). Sensory marketing, i.e. "marketing that engages the consumers' senses and affects their perception, judgment and behavior" (Krishna, 2012) has emerged as a field that can help in developing these strategies. Historically, a great deal of attention has been given to vision and hearing, making them the backbone of all communications with consumers. However, this focus is shifting to other senses in the recent years.

Phylogenetically, the sense of smell is the oldest sense. It also directly affects many areas of the human brain, including those associated with memories and emotions (Herz, 2010). For example, the sense of smell has strong associations with the amygdala, a part of

the brain that participates in hedonic or emotional processing (Zald and Pardo, 1997). Olfaction also strongly evokes emotional memories (Herz, 1998; Herz, Eliassen, Beland, & Souza, 2004). Interestingly, consolidation of these memories is also modulated by the amygdala (McGaugh, 2004). The link of olfaction with the amygdala and hippocampus is further strengthened by the fact that there is direct synapsing from the brain area associated with olfaction to the amygdala–hippocampal complex (Savic, Gulyàs, Larsson, & Roland, 2000; Willander & Larsson, 2007). Due to olfaction's direct association with emotions and memory, it is one of the most impactful senses for marketing. In the last three decades, research in marketing has uncovered many important effects of olfaction, along with many boundary conditions and mechanisms. It is timely that the research in this field is consolidated in a review and research areas that need more attention are identified.

Recently, some review articles have consolidated research in the overall field of sensory marketing (Krishna, 2012; Krishna, Cian, & Sokolova, 2016; Spence, Puccinelli, Grewal, & Roggeveen, 2014). Review of olfaction is a small part of these articles. Unfortunately, other than these articles, scent marketing has been either reviewed within a specific context, e.g. scents in services (Goldkuhl & Styven, 2007), or a review was conducted far in the past, and hence needs updating (Bone & Ellen, 1999). The current review article is aimed at bridging this gap.

The rest of the paper is organized as follows: we explain in detail our methodological approach in selecting the articles for the review. We then review the scent literature primarily focusing on these articles. We have divided this review into three important application areas of scents: atmospheric odors (ambient scents), scents in advertising, and product scents. This distinction is not only about the market application of scents, but also about the purpose and functionality of scents in the aforementioned application areas. For each application area, we

examine the impact of scents on evaluations and memory. The review starts with ambient scent, investigating the impact of ambient scents on both products and stores. After ambient scents, scents in ads and product scents are examined. Review of each application area ends with some suggestions for future research. Finally, we conclude by summarizing some of the main points in the review.

METHODOLOGY

In order to make the literature search comprehensive and objective, we selected articles for this review from two databases, Scopus and Web of Science. Articles that are available on these databases until 18th Sep 2018 are included in the review. The relevance of the articles for the review depends on two factors: firstly, they should be related to scents, and secondly, they should have investigated some dependent variables that are relevant to marketing. Therefore, we decided to perform a search on these databases with two keywords that are grouped together, one keyword for scents and another for picking up marketing-relevant articles. This search was conducted on the title, keywords, and abstract of the articles.

Table 1. Keyword pairs for article selection

Keywords	**smell**	**olfact***	**scent**	**odo*r**
consumer	smell AND consumer	olfact* AND consumer	scent AND consumer	odo*r AND consumer
consumption	smell AND consumption	olfact* AND consumption	scent AND consumption	odo*r AND consumption
evaluat*	smell AND evaluat*	olfact* AND evaluat*	scent AND evaluat*	odo*r AND evaluat*
attitude*	smell AND attitude*	olfact* AND attitude*	scent AND attitude*	odo*r AND attitude*
product	smell AND product	olfact* AND product	scent AND product	odo*r AND product
rememb*	smell AND rememb*	olfact* AND rememb*	scent AND rememb*	odo*r AND rememb*
recall	smell AND recall	olfact* AND recall	scent AND recall	odo*r AND recall
memor*	smell AND memor*	olfact* AND memor*	scent AND memor*	odo*r AND memor*

Based on four synonyms used for scents in research articles (i.e. scent, odor, smell and olfaction), and adjusting for some variability in the exact word or spelling, we finalized four keywords for the first factor. These keywords are: smell, olfact*, scent and odo*r. For the second factor, we have considered eight words, which can be used to select articles relevant to marketing (with specific focus on evaluations and memory). These words are consumer, consumption, evaluat*, attitude*, product, rememb*, recall, and memor*. In this way, we created 32 keywords for searching these databases. These two factors are used together in the search, making a keyword pair for the search. All these pairs are indicated in Table 1.

After the above selection, many articles in the list were still not relevant to marketing. Therefore, another step toward refining the list of articles using a set of criteria was undertaken. In this step, database-specific refining options were used to exclude irrelevant articles. Since each database provides different options for refining the search, slightly different criteria were applied to the individual databases. The full list of criteria for each database is provided in Table 2.

After using the above refining, we were left with 154 articles from Scopus and 101 articles from Web of Science. We combined the two lists and removed the duplicate articles between the two databases. The final resultant list from this step contained 197 unique articles. Out of these, 60 articles were present in both databases, 96 in only Scopus, and 41 in only Web of Science. The high number of unique articles in each database highlights the benefit of using multiple databases.

Table 2. List of criteria for refining article list using tools provided by the databases

No.	Refining criteria	Scopus	Web of Science
1	Only articles in the subject area of business are included.	Yes	Yes
2	Only journal articles are included.	Yes	Yes
3	Only articles that are in English are included.	Yes	No such refining needed
4	Exclude articles that are related to engineering.	Yes	No such refining needed
5	Exclude articles that are related to material science.	Yes	No such refining needed
6	Exclude articles that are related to agriculture.	Yes	No such refining needed
7	Exclude articles that are related to medicine.	Yes	No such refining needed

In the list of 197 articles, many were still not relevant for the review. Therefore, we performed a manual selection of articles based on defined criteria. These criteria are indicated in the Table 3. After refining articles using these criteria, we had 58 final articles (the list of articles is in the Appendix).

These articles were divided into the three application areas: ambient scents, scents in ads, and product scents. In each application area, we first examine articles focused on evaluations and then move on to articles focused on memory. Some of these articles belonged to multiple application areas, for example to scents in ads and to product scents. We have used the insights from these articles separately for each section. We start the review with the application area of ambient scents.

Table 3. List of criteria used to refine the list of articles manually

No.	Manual Refining criteria
1	The article is not about scents, but just mentions this keyword.
2	The article is not in English.
3	The article is not related to business or marketing.
4	The article reviews the literature.
5	The article is in a conference proceeding and not in a peer reviewed journal.
6	The article is a market research article for a specific brand.
7	The article is a market research article for a specific store.
8	The article is a market research article for a specific product from a company.
9	The basic research question is about a specific city or country.
10	The dependent variable of the article does not come in the scope of memory or evaluations.
11	The article is about atmospherics (or is about multisensory stimuli) and has no focus on scents.

AMBIENT SCENTS

Ambient scent is a term used to specify atmospheric odors that are achieved through infusing scents inside different environments like a store, an airline or a restaurant. Since the predominant focus here has been stores, this review would use the word "store" as a general term for all these different environments. They have received the lion's share of attention regarding scents in marketing. More than three quarters of the articles related to scent marketing are about ambient scents. The high feasibility of their use (compared to scented ads) and early positive indications from marketing and psychology research about their effectiveness could be some of the reasons why its use is so prevalent in the marketplace. It is also the only area in scent marketing where multiple articles have investigated similar research questions (e.g. the impact of ambient scent on product evaluations), allowing us to compare results. In the current section, the impact of ambient scent will be reviewed, with a predominant focus on evaluations and memory. With ambient scents, possible evaluations from consumers could be applicable to both products and stores. Therefore, for both evaluations and memory, we have reviewed products and stores in different subsections. At the end of these sections, we have also indicated some directions for future research.

Ambient scents: Evaluations

The impact of ambient scents on evaluations is the most well-studied area in olfaction in the marketing literature. Close to seventy percent of the total number of articles on scents focused on this question. In order to observe various effects in this area, we split this section based on the target object for evaluation, creating two subareas: product evaluation and store evaluation. For both sections, we have incorporated into the review constructs like attitudes, purchase intentions, sales, choice, evaluations, and behaviors.

Figure 1. Two examples of dominant use of ambient scents: Lush and Abercrombie & Fitch Stores

Product evaluation. In general, the literature in marketing shows that pleasant ambient scents can increase product evaluations. However, these positive effects are contingent upon some factors, like the appropriateness of the ambient scent. Scents can carry semantic associations, which are formed by repeated exposure of scents over time (e.g., the smell of freshly baked bread is associated with food and a bakery). These associations might be more accessible when a person smells a particular scent. A match or mismatch of scents and these associations with an environment or a product could give rise to different results of the scent on evaluations. Much research ascertaining the impact of ambient scents on evaluations investigates this aspect of scents (i.e. congruence of scents). Therefore, in this section, we first introduce the articles that have investigated the effect of ambient scent on

product evaluations from a point of view of congruence. Congruence refers to the degree of match or fit of one stimulus to a concept, to another stimulus, or to another sense (such as the auditory sense).

In a comprehensive paper on ambient scents, Bosmans (2006) examined the conditions that indicate when an ambient scent positively affects product evaluations and when it does not. The author identified three variables that are important when considering positive or negative effects of ambient scents on product evaluations: the congruence of the scent with the product, the salience of the scent, and consumer's motivation to correct for extraneous influences (i.e. correcting the biasing effect of scents). If the scent is congruent with the product, scents affect product evaluations irrespective of the values of the salience of the scent and the consumer's motivation to correct. However, this effect washes out when the scent is incongruent with the product and either the scent itself is salient or the consumer has high motivation to correct for extraneous influences.

In line with the above theory, in one of the early papers on ambient scents, Mitchell, Kahn, and Knasko (1995) found that the presence of a scent does not affect the consumer's behavior in terms of time spent in processing information about products and choice share of different products selected by the consumer. However, these results change if association of scent with the product is considered. Scents that are congruent with the product make people choose all available products in similar proportions, whereas scents that are incongruent with the product skew the choice towards a popular preference. However, here the congruence is the actual matches of the ambient scent with the product scent (e.g. chocolate ambient scent for chocolates) and is not merely an association, which reduces the generality of the results.

Another investigation of ambient scent found that appropriately-scented environments (i.e. environments with scents that thematically match the product) increase purchase

intention and attitude towards the product (Fiore, Yah, & Yoh, 2000). They also increase a consumer's willingness to pay for the product. Parsons (2009) also found a similar positive impact of a pleasant scent on actual sales if the scent is congruent with the product category. Similarly, the ambient scent of lavender increases the number of customers and amounts spent by them in a flower store (Jacob, Stefan, and Guéguen, 2014), and the ambient scent of chocolate increases sales in a chocolate store (Kivioja, 2017). Kivioja (2017) also found that, for final sales, product category congruence with this scent is more important than specific product congruence with the scent, e.g. an ambient chocolate scent is more appropriate than an ambient strawberry scent for the sales of strawberry-flavored chocolate in a chocolate store.

In the context of congruence, another area of inquiry could be the congruence with the actual environmental cues inside a store. An ambient scent that is congruent with the other sensory inputs in a store has been shown to increase time spent in a store, and thereby the number of items purchased (Helmefalk & Hultén, 2017). Another paper that investigated the congruence between senses of smell and sound indicated positive effects of thematic congruence of these senses on the evaluation of the merchandise of the store (Spangenberg, Grohmann, & Sprott, 2005). They showed that if a Christmas-themed scent is paired with Christmas-themed music inside a store, there is a positive impact on evaluations of the merchandise. On the other hand, a mismatch of these two was shown to lower the evaluations of the merchandise.

Lastly, congruence can also be interesting to investigate from a demographical point of view. Demographics affect store specificity, store communication, and the environment inside a store. Gender is often an important dimension of retail stores. Many stores have segregated sections for different genders. Due to the associations that a scent carries, many

scents are associated more strongly with a specific gender. Gender-congruent scents (based on a pretest, vanilla was used as a feminine scent and rose maroc as a masculine scent in the study) were shown to positively affect the consumer's evaluation of the merchandise in the store (Spangenberg, Sprott, Grohmann, & Tracy, 2006). Specifically, gender-congruent scents were shown to positively affect evaluations in terms of the perception of quality, style, and store selection. While this paper shows that gender-congruency with scents positively affects evaluations, another study on the same question has indicated that it is the other way around, i.e. gender-incongruent scents help the perception of product quality (Douce, Janssens, Leroi-Werelds, & Streukens, 2016). However, the second paper provided weaker support for this claim; i.e., the results from their experiment were only marginally significant.

In addition to the above literature on congruence, many studies have shown the positive effects of ambient scents on evaluations with different moderating variables. Spangenberg, Crowley, and Henderson (1996) showed that ambient scents increased product evaluations only for the products for which evaluations were low in unscented condition. On a slightly different outcome variable, Morrin and Ratneshwar (2000) showed that pleasant scents increased brand evaluations, an effect that is also shown for a brand's ads (Lwin and Morrin, 2012). This effect was strong for brands that are unfamiliar to consumers.

Herrmann, Zidansek, Sprott, and Spangenberg (2013) showed that simple scents (e.g. lemon) positively affect consumer spending, while complex scents (e.g. a mixed scent) do not have such an effect. This effect was driven by processing fluency associated with simple scents. Since many stores use complex scents as a differentiating factor (like signature scents for a brand), this finding might have strong implications for the use of ambient scents in the marketplace.

Scents also have differential effects in different environments based on the density of people inside a store. Research on environments showed that pleasant scents positively affect perceptions of a mall's environment, which in turn has a positive effect on product quality perception (Michon, Chebat, & Turley, 2005). However, this positive effect exists only for medium levels of retail density (i.e. moderate human density inside the mall). In related research, Madzharov, Block, and Morrin (2015) showed that scents actually affect the perception of social denseness in an environment. Scents that were perceived as warm (e.g. cinnamon) increase the perception of social density inside a store. The opposite was true for scents that were perceived as cold (e.g. peppermint). Higher perceived social density makes people experience a higher need for power. This in turn leads these consumers to buy more luxury products/brands.

In a different application, ambient scents have been shown to mitigate gender stereotype threats (i.e. people's anticipation of being stereotyped) in an environment (Lee, Kim, & Vohs, 2011). These threats can cause anxiety in the individual (who fears being stereotyped). This anxiety can push the individual to avoid any transaction in an environment where this stereotype is salient. The introduction of ambient scents in these environments was shown to increase intentions of these individuals to go ahead with the transaction.

One under-researched area in this field is the relationship of ambient scents with food items inside a store or restaurant. Since food items have their own smells and flavors, the effect of ambient scents in this case is not clear. Guéguen and Petr (2006) demonstrated that some scents are more apt to increase purchases in a restaurant. They found that the scent of lavender had a positive effect on purchases and time spent in a restaurant when compared to the scent of lemon, attributing this effect to the relaxing effects of lavender. Another paper in the area focused its attention on food aromas instead (Moore, 2014). The author found that

food aromas affected taste anticipation of the consumer in a restaurant. This taste anticipation in turn affects taste enjoyment, thereby increasing purchase intentions.

Most of the research on the impact of ambient scent on product evaluations showed a positive effect, especially with a pleasant ambient scent. However, in some other cases, researchers did not find any positive effect of scents. For example, Teller and Dennis (2012) did not find any positive effects of ambient scents. They conducted a field study in a small mall. They did a comparison of the shopping behavior of consumers in a scented condition versus an unscented condition, controlling for their general shopping behavior. Another study showed that in some contexts neutral scents could positively affect product evaluations more than pleasant scents. In the context of artwork, Cirrincione, Estes, and Carù (2014) found a positive effect of neutral scents compared to pleasant scents on evaluations. This is surprising, as most of the research in ambient scents considered pleasantness as a prerequisite for the positive effects of scents.

We now move to the subsection of store evaluations.

Store evaluation. In addition to product evaluations, store evaluations can also be affected by ambient scents. This area of research has a strong impact on the marketplace; in order to buy all offline products, potential consumers have to select the store they would like to visit. This means that any store that they do not like affects the sales of the products in the store itself. For many branded stores, this means that their whole product line could be affected, and thus focus on store evaluations is pivotal. From the literature in this area, it is evident that this decision is not as simple as whether or not to have a scent inside a store. Ambient scents can have potential negative effects on store evaluations if an incorrect scent is diffused inside a store.

In an early paper, Spangenberg, Crowley, and Henderson (1996) investigated the impact of ambient scents on store evaluation, both in terms of attitude towards the store and evaluation of the store environment. They found that scents in general increase store evaluations and intentions to revisit the store. While they manipulated the pleasantness of scent and intensity of scent, they did not find any interactive effects of these variables. They also found that, while the time spent by participants in the scented store and the unscented store was the same, participants in the scented environment felt that they spent less time in the store when compared to those in the unscented environment.

Similar to product evaluations, store evaluations are also impacted by congruence. When a scent is congruent with the gender (e.g. rose maroc for men's clothing, and vanilla for women's clothing) a store targets (compared to a scent that is incongruent), there is a positive impact on the overall evaluation of the store (Spangenberg, Sprott, Grohmann, & Tracy, 2006). In another study, a match or congruence between ambient scent and brand image was investigated (Errajaa, Legoherel, & Dauce, 2018). A pretest helped in determining a match of different odors with a brand AntiCafé (business providing co-working environments). This pretest indicated that smell of honey was congruent with the brand while smell of wood was not. These two smells did not differ in factors like familiarity, pleasantness and complexity. The congruence between the ambient scent and brand image improved the evaluation of the store environment.

In the research related to multisensory congruence, Spangenberg, Grohmann, and Sprott (2005) showed that thematic congruence of music with smell increases evaluations of the store and its environment. They indicated two reasons for this positive effect. First, congruent music will help the identification of the scent and hence increase its familiarity. This familiarity along with the pleasantness of the scent would increase the positive affect and

approach behavior. Second, congruent cues from two senses are more likely to be treated as diagnostic of the store environment. Therefore, any positive effects of an ambient scent would be transferred to the store. Lunardo and Mbengue (2013) showed that scents that are incongruent with the environment (e.g. ambient smell of fresh bread without an oven or a baker in a bakery) could worsen attitudes towards the atmosphere and the retailer. This incongruent scent would be very apparent to the consumer. Hence, the negative evaluation by the consumer is due to a perception of manipulative intent (IMI) on the part of the retailer.

An important outlier in this area of research is a paper by Mattila and Wirtz (2001). They investigated congruence in terms of arousing qualities of both music (e.g. high-tempo music as high arousal and low-tempo music as low arousal) and smells (e.g. smell of grapefruit as high arousal and lavender as low arousal). They demonstrated that if arousing qualities of music and scent matched each other, consumers rated the store environment more positively and showed more approach behavior than when these qualities did not match. While the other papers on congruence have focused more on thematic or semantic associations, this paper taps into a different dimension. Since arousing music can increase physiological arousal of the consumers, future research can investigate whether this may be a more physiological phenomenon.

In an investigation into the perception of space and retail density, Michon, Chebat, and Turley (2005) showed that ambient scents improved perceptions of a mall only if the retail density (i.e. human density inside the mall) is moderate. Research on restaurants or food-related retail stores in general is scant. In the only research in this area, it was shown that food aromas affected diners' perception of a restaurant (Ouyang, Behnke, Almanza, & Ghiselli, 2018). Diners rated the restaurant higher in terms of food quality perception, restaurant

quality perception, and overall perception of the restaurant if a pleasant food aroma is present inside a restaurant.

Lastly, a few papers investigated whether mood mediated the effect of presence of a pleasant ambient scent on store evaluation. In an inquiry into how scents change shoppers' spending, Chebat and Michon (2003) found evidence that the scents first affected shoppers' perception of the environment, which in turn affected their mood. However, since all these variables were measured rather than manipulated, the causality inferences might be problematic. There is some evidence of both variables affecting store environment and evaluations. Scented environments are shown to affect overall store perceptions (Ward, Davies, & Kooijman, 2007), mainly for qualities like quietness, friendliness, brightness, and some support for factors like being inviting and stimulating. On the other hand, evidence of mood mediating effects of scents on store evaluations were seen when high-intensity scents were compared with no scents in a store (Leenders, Smidts, & Haji, 2016). The apparent difference between the comparisons is that the third paper has used high intensity of scent (versus no scent) as a manipulation, but other papers have used either a light scent or a scent with average intensity. When the scent intensity is high, the attention of the consumers might be focused on the scent inside the store, and hence consumers' moods could be strongly affected by it. This aspect becomes even more apparent as almost all the other studies that have used mood as a control did not find any effect of ambient scent on mood. Future research in this area can shed more light on this aspect.

Future research: ambient scents on evaluation. The effect of ambient scents on product and store evaluations has been researched extensively over the last two decades. However, there are some areas where more attention is needed. The focus on congruence in ambient scent literature is mainly on thematic or semantic aspects of congruence. One paper

by Mattila and Wirtz (2001) has highlighted another potential new area for congruence research in marketing. A future investigation into the impact of the match of different sensory inputs on a person's emotions can determine whether there is a physiological aspect of congruence.

Another area for research can involve the interactive effects of ambient scents on products that have scents. In an eye-tracking study on ads, Lwin, Morrin, Chong, and Goh (2016) found that, after smelling a scent, eyes focus on targets that match the smell. This finding could also indicate potential biasing effects of ambient scents for different products. Future research can explore this area of research in terms of selection of products, evaluations of products, and the general interactions of different scents (or cues to olfaction). Related to this inquiry, effects of ambient scents on food items and effects of ambient scents in restaurants in general can be an interesting avenue for future research.

Cues to olfaction and olfactory imagery can also be fruitful areas of research. Since scents and olfactory imagery have been shown to be similar in many aspects such as similar activation of brain areas associated with olfaction, it would be interesting to see if they can have positive effects on evaluations similar to actual scents.

Research in scents should strive to explore other aspects of scents, in addition to its associations and hedonic properties. Investigating the impact of scents from a different aspect, like food versus non-food smells, could provide newer valuable insights. Another interesting aspect can be how experiences from one sense can help compensate for a need in another sense. In a recent paper, Biswas and Szocs (2019) showed that prolonged exposure to an indulgent food ambient scent makes people buy less unhealthy food when compared with non-indulgent food ambient scent. They suggested that this effect is driven by cross–modal sensory compensation.

Ambient scents: Memory

Scents are intricately linked to memory and are able to evoke strong feelings and bring back older associations, when compared to memories evoked by pictures (Willander & Larsson, 2006). These evoked memories are more emotional (Herz, Eliassen, Beland, & Souza, 2004) and autobiographical (Chu & Downes, 2002). Can this advantage of olfaction with memories help consumers to remember products, brands, and ads in a certain scented environment?

An early study in marketing investigated the impact of ambient scents on memory of brands (Morrin & Ratneshwar, 2000). This research found a positive effect on brand memory. However, this effect was only present for those brands that are unfamiliar to consumers. Those authors attributed this effect to the time spent on each brand, which was found to be greater if a pleasant ambient scent was present. Since the recall task in this paper was done immediately after exposure to the brands, these results are only applicable for short-term recall of brands.

The same authors investigated this question again with more variables and a higher time delay (i.e. twenty-four hours) for the recall task (Morrin & Ratneshwar, 2003). Congruence of a scent with the product category was also used as a variable in the study. Surprisingly, with an increased time delay for the recall task, they found that the recall is better with ambient scents both for familiar and unfamiliar brands. A new insight from this research was that scents affected the recall for familiar brands only when the time delay for the recall task is elongated. In addition, they also found that this effect was present irrespective of whether the scent was congruent to the product category or not. Similar to the previous paper, they found that the amount of time spent on the brand explains this effect, i.e. ambient scents increase the time consumers spent with the brand name, hence enhancing their

memory of the brand name. These two papers provided strong support to the prediction that ambient scents can enhance memory of brands.

Extending the above discussion, Lwin and Morrin (2012) investigated ambient scents' effects on recall of advertised product attributes. They also compared this recall for short (five minutes) versus long (two weeks) delays, and aided versus unaided recall (i.e. whether a cue for remembering the attributes is present). They found that ambient scents affect recall for both short and long delays as well as for aided and unaided recall of product attributes. Since pictures were also manipulated in this research in addition to ambient scents, they were also able to compare the effects of scents versus the effect of pictures on memory of product attributes. Ambient scents increase the recall of product attributes when compared to recall due to pictures. They also found that, in the long delay condition, pictures and scents together have an even stronger effect on recall than what would have been expected from just simple additive effects of both the scent and the picture on memory.

While all the above papers indicate a positive effect of ambient scent on memory, a recent paper found an interesting moderator to this effect (Yuan, 2017). This paper showed that the positive effect of ambient scent on recall of brand names (after twenty-four hours) is present only if the consumers were not habituated to scents in the environment. On the other hand, perceived novelty of an environment also increases with less exposure to that environment (i.e. habituation). This could be worrisome, as the novelty of using ambient scents is decreasing with the increasing adoption of ambient scents in stores.

Cirrincione, Estes, and Carù (2014) showed that the positive effect of ambient scents on memory is not always applicable. In the context of artwork, they showed that pleasant ambient scents actually decreased remembrance of the artwork. Additionally, the scents that were incongruent with the artwork helped in remembering artwork more than the scents that

were congruent with the artwork. This paper calls for further investigation of conditions where the ambient scents are able to enhance memory and where they can be a hindrance to recall.

Overall, the literature indicates positive effects of pleasant ambient scents on memory. However, ambient scents and their effects on memory have received limited attention compared to the research on ambient scents affecting evaluations. In addition, the mechanism of why ambient scents affect memory seems to be under-investigated. While initial research in this area showed that this effect is because of consumers spending more time with the brands, the question of novelty and habituation calls for further exploration of the mechanism for this effect. In addition, the paper by Cirrincione, Estes, and Carù (2014) introduced interesting boundary conditions to this effect.

Future research: ambient scents on memory. As indicated before, it would be interesting to revisit the question of the mechanism of ambient scents increasing memory of the brands and product attributes in order to rule out any novelty or habituation effects. Since ambient scents are associated with both the products/brands and the store itself, it is surprising that the memory effects are not explored in the context of memory of stores. It would be interesting to discover whether ambient scents can help induce stronger memories of stores when an ambient scent is present. If this is the case, many interesting questions can be examined. When a consumer is deciding on where to shop, does this strong memory help in increasing the accessibility of the store in the consumer's mind? If it does, then perhaps ambient scents can affect the number of times the consumer visits the store. In addition, stronger memories of stores can also affect the recommendations given by a consumer to other people, i.e. when a consumer is considering which store to suggest out of two similarly-evaluated stores. Secondly, if the memory of the store is stronger in the mind of the consumer,

does it affect the perceived closeness of the store and the comfort felt in thinking about shopping at that store?

Since there are many scented products in a store, it would also be interesting to investigate the memory effects of an ambient scent based on its congruence with product scents. Another associated area to explore can involve the congruence of ambient scents with products that sport labels with cues to other senses. For example, does a warm ambient scent increase memory for and attention towards products that are associated with warmth, like tea or soup?

As indicated in the future research section of ambient scents affecting evaluations, another potential area of research could be the effects on memory of products or stores when cues to olfaction are present inside the store. These cues can exist in the form of verbal statements or pictures, and can help in generation of olfactory imagery. Can olfactory imagery have effects that are similar to actual ambient scents?

SCENTS IN ADVERTISING

Advertising in the marketplace has evolved from text-based ads focused on information transfer to picture-based ads that influence emotions or facilitate visual imagery. Lately, multisensory ads have been shown to increase positive sensory thoughts (Elder & Krishna, 2010). These ads can positively influence the behavior of consumers. Due to its proximity to the hippocampus and the amygdala (indicating influence on memory and emotions), olfaction can be immensely important for ads. In addition, with the huge number of scented products on the market, communication of scents becomes pivotal. But can scented ads improve product evaluations and memory? When do they have these positive effects?

The use of scented ads started even before research in marketing began to investigate its impact. Ellen and Bone (1998) investigated this new trend at that time, i.e. the use of scratch-&-sniff ads. These ads contain an area that can be scratched to release a scent. While from all the literature on scents it seemed that scented ads would positively affect the product and the ad evaluation, the article (Ellen & Bone, 1998) did not find support for this. Their study highlighted the complexity involved with the effects of scents and the role of congruence of scents in ads. On top of this, they found a negative effect on attitudes towards the ad and brand if the scent is not congruent with the ad. However, since their study involved a travel destination ad, the link of the scent with the product in the ad was weak. In addition, while being done professionally, there is always a realistic possibility of scent intensity being inappropriate for a pleasant experience. Additionally, as the finding was based on a single study with a relatively smaller sample, the results might be less reliable.

Recent research on a scent-related product (liquid detergent) with a bigger sample size has demonstrated the opposite effects to the above paper (Gvili, Levy, & Zwilling, 2018). They showed that scented ads actually increased attitude toward the ad, brand attitude, and purchase intention. Consistent with the previous research, they also found negative effects of scents that are not congruent with the product, and found that this effect is due to the scent's impact on emotions.

For scented ads, the visual sense is also important. Substantial literature in psychology indicates a strong overlap among the visual and olfactory senses. For example, stimulation of the visual cortex is shown to positively affect a participant's ability to distinguish between different qualities of scents (Jadauji, Djordjevic, Lundström, & Pack, 2012). In the last decade, some research in marketing has also investigated this overlap between visual and olfactory senses (Lwin, Morrin, & Krishna, 2010). Colors are one such visual cue. Gvili,

Levy, and Zwilling (2018) showed that color and scent congruence (e.g. lavender is congruent with blue color and chocolate with brown) affects the emotional response from scents and purchase intention of the product.

This area of visual and scent congruence was also investigated by Lwin, Morrin, Chong, and Goh (2016). Using eye-tracking technology, they found that scents help the participant focus on semantically-related parts of an ad, both in terms of total gaze duration and fixation frequency. This attention helps to increase the participant's purchase intentions of the product if there is a semantically-congruent target in the ad. The fixation frequency (i.e. the number of times the gaze is fixed on the target object for more than 200-300 milliseconds) explains why scents that are congruent with a target in the ad increase purchase intentions.

Figure 2. Examples of scratch-&-sniff ads

In addition to the discussion about evaluations, scented ads have also been investigated for their impact on memory. In the above paper, Lwin, Morrin, Chong, and Goh (2016) showed positive impact of scents that are congruent with visual content in ads on memory; i.e., if scents are semantically associated with a target in the ad, there is higher recall of the content of the ad. In another paper, Lwin, Morrin, and Krishna (2010) showed that recall of verbal information in an ad was increased if scents were used. Interestingly, because of the synergy between vision and olfaction, scents increased the effectiveness of pictures in recall, i.e., while pictures are helpful in recalling verbal content in an ad, scents increase this recall even further.

Unlike the research regarding ambient scents, in the area of scented ads there is some research on olfactory imagery. Krishna, Morrin, and Sayin (2014) showed that when consumers are asked to imagine the smell of a food item while viewing an ad for the same food product, the desire to consume and the actual consumption of food increased. They found that this effect of olfactory imagery on consumption is moderated by the participant's ability to vividly imagine the food visually. In another paper, olfactory imagery is shown to have negative effects for ad and product evaluation for people sensitive to smell (Lin, Cross, Laczniak, & Childers, 2018). They suggest sniffing cues in ads to remove these potential negative effects on evaluations.

Future research: scents in advertising. The dominant way of olfactory advertising is scratch-&-sniff ads, where people can scratch the ad to release a scent. Most of the work in this area has focused on these ads. However, the concept of olfactory advertising is evolving. In recent years, examples of scented ads have become intertwined with ambient scents. A scent is released in the environment only when an ad of the product is present. Examples of

this application can be campaigns by Unilever and Beefeater Pink Gin, which released scents from their ads placed in Singapore and London underground stations. Similarly, small devices installed by Dunkin Donuts in buses of Seoul released coffee scent in buses when an ad of Dunkin Donuts was played inside the bus. These ads were played when the buses were approaching stops that have a Dunkin Donut shop close by. While a few researchers have started to look into similar phenomenon (Lwin & Morrin, 2012), more focus is required in the scent marketing research on this overlap of scent advertising and ambient scents.

In general, the research focus on scents in advertising is comparatively much more scant than research of ambient scents. While many more insights are awaited from this research area, the practicality of the use of scented ads might pose a limitation. Cues to olfaction and olfactory imagery could help in overcoming these limitations, allowing this area of research to expand. Future research should investigate different cues to olfaction (e.g. name of scent, picture of scented object) and their effectiveness in generating olfactory imagery. However, with imagery, it is important to disentangle effects of olfactory imagery from other imageries like gustatory and haptic imageries.

There is a lack of research in terms of multisensory congruence in scented ads. One interesting investigation could be the multisensory congruence of olfactory imagery and other senses. In addition to the congruence between scents and other senses, this investigation could also explore the effect of other senses on facilitation in generation or disruption of generated olfactory imagery. Interactions of the scents with other aspects of the ad, as well as interactions with the ad's surroundings, may also be an interesting inquiry. For example, what happens when ads with cues to olfactory imagery are placed in a place with high arousal music versus low arousal music?

Another area of research that is absent from research on scented ads is the impact of unpleasant smells. While unpleasant smells are not appropriate for ambient scents, for product smells and scented ads this may be an interesting research area. Unpleasant scents could have different impacts on memory of and attention toward a brand and product information than pleasant scents. In addition, can there be cases where unpleasant scents increase evaluations?

PRODUCT SCENTS

There has been a substantial increase in the number of scented products in the market in the last few decades. An indication of this comes from the fragrance ingredient industry, which supplies raw material for all scented products. The market demand for fragrance ingredients is high, and is projected to increase even further (marketsandmarkets, 2014), which highlights the increase in scented products in the market. Do scents provide any distinctive advantages to the product and the brand?

An early paper in marketing investigated the link between the use of scents in products and product evaluations by consumers (Bone & Jantrania, 1992). Two products for which the use of scent is appropriate were selected with either matching or mismatching scents. For example, lemon scent matches with a cleaning product but not with a sunscreen, whereas, coconut scent matches with a sunscreen but not with a cleaning product. They found positive effects of scents on product evaluations when a matching scent was used. This was an initial demonstration of the positive effects of product scents, which suggested that congruence also plays a role with product scents.

This focus on products was nearly absent from the marketing literature for about two decades. Returning to this area of research, multisensory semantic congruence of smell and touch is shown to have a positive impact on haptic perception and product evaluations

(Krishna, Elder, & Caldara, 2010). Authors show this effect with two haptic properties, i.e. temperature and texture, which were matched with warmth and gender perception of a scent. This paper highlighted the role of semantic congruence in enhancing the perceptions of one sense due to scent qualities.

Figure 3. Examples of scented products in market

In terms of the impact of product scents on memory, Krishna, Lwin, and Morrin (2010) showed that scenting a product increased the memory for the product's other attributes. They also found that only the product scent, and not the ambient scents, had a positive effect on memory. In a follow-up paper, they found that scents aid remembering product-associated information, and are somewhat immune to retroactive interference, i.e. the

reduction in memory of scent-associated information after being exposed to more scent-associated information (Morrin, Krishna, & Lwin, 2011). They found that even after information about a competing brand was exposed to the participants, they could still remember some information about the original product if scents were used with the product in the encoding and retrieval phase. They showed that this is because, with scents, the new information affected accessibility of the information of the first product and scent as a retrieval cue. These two papers put forward the effects of product scents in enhancing memory for associated information of the product. While the above research provided evidence for positive effects of product scents on memory, surprisingly, the direct link between product scent and product evaluation is still under-investigated in marketing literature.

Another important aspect of product scents is how visual images affect evaluations of a product with scents. Visual communication of scents can be based on puffery or exaggerations, which shaped the view consumers had about the scent of the product (Toncar & Fetscherin, 2012). Often this puffery increases consumer expectations about the product. For example, because of the visuals in an ad of a perfume a consumer might expect the smell to be intense, masculine and sensual. However, these expectations might not be met when the actual perfume has a faint fruity smell. While this is good for increasing purchase, this could also have drastically negative effects on the actual product trial. This is because this puffery can lead to higher expectations from the scent that would not match with the actual product scent. Interestingly, even without exaggerations, scent preference differs according to whether people saw the corresponding scent (picture of plant or flower) or smell (Yang & Chen, 2015). However, since product scents are often hard to communicate before using the product, it becomes both theoretically and managerially important to find solutions to this problem.

Therefore, more work is required in this area, for example from the point of view of smell imagery.

Lastly, with such a large variety of scented products, the sampling order of the product could affect its evaluation. This is especially true as sensory habituation helps the first product in the line, with the consumer being less sensitive to the sensory cues, which causes him or her to like the next product less (Epstein, Temple, Roemmich, & Bouton, 2009; Morewedge, Huh, & Vosgerau, 2010). This could reduce the chances of selection of sensory products that are sampled later. On the other hand, the recency effect would make consumers remember the last sampled product better in terms of sensory inputs (Biswas, Grewal, & Roggeveen, 2010), and they might prefer the most recent product (Stecker & Hafter, 2009). Biswas, Labrecque, Lehmann, and Markos (2014) found that both these explanations could be true, as the consumers prefer the first sampled product when the sensory cues (like smell) from the products are similar, but they prefer the last sampled product when these cues are dissimilar.

Future research: product scents. The focus on the product scent seems to be limited in the research on scents in marketing. While there has been some focus on memory, the research that provides support to positive effects of product scents on evaluations is scant. This could be due to limitations in terms of actually smelling product scents before purchase. An important missing link in this research is the focus on other ways to communicate scents, like olfactory cues and olfactory imagery. Olfactory imagery can potentially remove the problems associated with communicating scents of a product.

Another area for further research is related to the scents and flavors associated with food products, specifically their impact on memory and evaluations, when critically examining olfaction and taste as separate sensory modalities. For food products, disentangling the pure effects of olfaction could bring forth some important theoretical insights. This could

also bring more clarity into the differentiation (if any) between food flavors and non-food product scents, when only olfactory sense is considered.

DISCUSSION

In this systematic review of scent marketing, we have explored the literature in marketing that studied the effects of scents on the consumers' evaluations and memory. The review systematically identified articles that investigate these effects. Two databases, i.e. Scopus and Web of Science, were parsed with thirty-two keywords to select articles. This list was then refined in two phases (one automated and one manual phase) using defined criteria, leaving fifty-eight relevant articles. The review consolidated this research into three broad application areas: ambient scents, scents in ads, and product scents. This division is important both from an academic point of view and from a practitioner point of view. It highlights the differences in application, functionality, and purpose of scents for that particular application area.

Overall, the area of ambient scent has received most of the attention in marketing, while the other two areas of product scent and scent in ads require more focus. While there are practical reasons, like the difficulty of using scents in ads and differences in actual adoption of scents in ads that could drive the literature in this direction, many valuable theoretical insights from these understudied areas are still awaited. Regarding outcome variables, evaluations are more widely studied when compared to memory. For instance, in the ambient scent literature, while the area of store evaluations received a lot of attention, research on store memory is non-existent.

All three application areas (i.e., ambient scents, scents in ads, and product scents) show evidence of the positive effects of scents. This effect is strongly established in ambient

scent research. However, within the product scents application area, this link is only weakly supported because of scant research and contrasting findings. One overarching variable in these three areas is congruence. It has been effective in explaining why scents show a positive effect in some instances but not in the others. The dominant theme in congruence papers has been thematic or semantic associations. These associations have been studied for both individual senses and between two different senses. While the prior research in olfaction has focused more on single sense congruence, recent research has also looked at multisensory congruence. For example, thematic match of the scent and the product (Fiore, Yah, & Yoh, 2000; Parsons, 2009) and scent and gender (Spangenberg et al., 2006) are examples of congruence involving a single sense, whereas scent and sound (Spangenberg, Grohmann, & Sprott, 2005) and scent and touch (Krishna, Elder, & Caldara, 2010) are examples of a multisensory congruence. However, the focus in these articles has been predominantly on thematic or semantic congruence. There are other possible reasons for congruency between senses, for example, match of arousal from two stimuli (Mattila & Wirtz, 2001), which can further expand our understanding. There is a need for future research in this specific area.

Research in scents has also highlighted the significance of cues to senses or olfaction in particular. These cues can lead to the generation of imageries of the respective senses. As scents are difficult to incorporate in ads and difficult to communicate for scented products (before consumption), imagery could be a powerful tool for marketers. The research in the area of olfactory imagery is very limited (Krishna et al., 2014). It would be immensely fruitful for research in marketing to focus on factors facilitating the generation of such imagery and ascertaining its impact on consumers.

Lastly, this review highlights many other gaps in the literature. For example, research on food flavors, disentangling the senses of taste and smell to see their impacts on consumers,

and the interaction of ambient scents with product scents are some of the potentially rich research areas in scents. Also, some areas are surprisingly absent from the literature, like ambient scent's impact on memory of a store. These areas could aid in our overall understanding of the impact of scents, and would be meaningful contributions to the scent literature.

Limitations

In the current article, we systematically reviewed the literature on scents in marketing with a focus on its impact on evaluations and memory. The article also shows the gaps in the literature and future directions that could further our understanding of scents in marketing and expand the scope of the current research. However, there are limitations to our research, stemming from the scope of the article and how it is operationalized.

First, the article uses a systemic approach to identifying articles for the review. This approach helps in making sure that there is no bias in selection. However, this systematic approach still has potential problems. The articles were selected from two databases, which helps in reducing any omitted articles. On the other hand, these databases still would not cover all the articles in the whole field. There may be some journals that are not included in these databases, which could limit the scope of selection. However, this aspect of the selection of articles is probably not a big setback, as these databases cover the most impactful journal in marketing and business in general.

Second, after the initial search from the databases, we have used defined criteria for automated and manual selection of articles. While this helps in standardizing the selection and reducing biases, this could also lead to the omission of some relevant articles because of database inconsistencies. A simple example of such an omission involves articles that are relevant to marketing being listed as psychology papers. Considering that the overall search of

articles in the databases without any exclusion criteria numbers in the tens of thousands, this is a difficult problem to resolve. Any addition of such articles could influence the review and the future directions suggested in each section.

Third, the purpose of the article is to review the literature on scents affecting consumers in the areas of evaluations and memory. Given its scope, it leaves out some articles and details in the articles that are not relevant to this review, e.g. articles with dependent variables that are not marketing related. On the other hand, these omissions could affect the overall understanding of the effects of scents and the gaps identified in the review. Some of these limitations can be resolved in future articles using a more specific and different inquiry into a focused area of scents in marketing.

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APPENDIX

List of articles in the review:

No.	Title of the article	Year
1	Olfaction As a Cue for Product Quality	1992
2	Theres Something in the Air - Effects of Congruent or Incongruent Ambient Odor on Consumer Decision-making	1995
3	Effects of Ambient Odors on Slot-machine Usage in a Las Vegas Casino	1995
4	Right Under Our Noses: Ambient Scent and Consumer Responses	1995
5	Improving the Store Environment: Do Olfactory Cues Affect Evaluations and Behaviors?	1996
6	Does It Matter If It Smells? Olfactory Stimuli As Advertising Executional Cues	1998
7	Scents in the Marketplace: Explaining a Fraction of Olfaction	1999
8	Effects of a Product Display and Environmental Fragrancing on Approach Responses and Pleasurable Experiences	2000
9	The Impact of Ambient Scent on Evaluation; Attention; And Memory for Familiar and Unfamiliar Brands	2000
10	Congruency of Scent and Music As a Driver of In-store Evaluations and Behavior	2001
11	Impact of Ambient Odors on Mall Shoppers' Emotions; Cognition; And Spending: A Test of Competitive Causal Theories	2003
12	Does It Make Sense to Use Scents to Enhance Brand Memory?	2003
13	Mall Atmospherics: The Interaction Effects of the Mall Environment on Shopping Behavior	2005
14	It's Beginning to Smell (and Sound) a Lot Like Christmas: The Interactive Effects of Ambient Scent and Music in a Retail Setting	2005
15	Person-place Congruency: The Interactive Effects of Shopper Style and Atmospherics on Consumer Expenditures	2005

16	Odors and Consumer Behavior in a Restaurant	2006
17	Scents and Sensibility: When Do (in)Congruent Ambient Scents Influence Product Evaluations?	2006
18	Gender-congruent Ambient Scent Influences on Approach and Avoidance Behaviors in a Retail Store	2006
19	Music; Scent and Time Preferences for Waiting Lines	2007
20	Olfaction and the Retail Environment: Examining the Influence of Ambient Scent	2007
21	The Influence of Nostalgic Memories on Consumer Exploratory Tendencies: Echoes From Scents Past	2008
22	Use of Scent in a Naturally Odourless Store	2009
23	Feminine to Smell but Masculine to Touch? Multisensory Congruence and Its Effect on the Aesthetic Experience	2010
24	Exploring the Superadditive Effects of Scent and Pictures on Verbal Recall: An Extension of Dual Coding Theory	2010
25	Product Scent and Memory	2010
26	Stereotype Threat in the Marketplace: Consumer Anxiety and Purchase Intentions	2011
27	The Effects of Cognitive Thinking Style and Ambient Scent on Online Consumer Approach Behavior; Experience Approach Behavior; And Search Motivation	2011
28	Is Scent-enhanced Memory Immune to Retroactive Interference?	2011
29	Negative Effects of Ambient Scents on Consumers' Skepticism About Retailer's Motives	2012
30	A Study of Visual Puffery in Fragrance Advertising: Is the Message Sent Stronger Than the Actual Scent?	2012
31	The Effect of Ambient Scent on Consumers' Perception; Emotions and Behaviour: A Critical Review	2012
32	Scenting Movie Theatre Commercials: The Impact of Scent and Pictures on Brand Evaluations and Ad Recall	2012

33	The Influences of Verbal Smell References in Radio Advertisements	2013
34	Interrupted Anticipation After a Service Failure: The Role of Olfactory Sensation on Expected Pleasure; Taste Enjoyment; Consumption; And Repatronage Intentions	2013
35	The Power of Simplicity: Processing Fluency and the Effects of Olfactory Cues on Retail Sales	2013
36	When Atmospherics Lead to Inferences of Manipulative Intent: Its Effects on Trust and Attitude	2013
37	Smellizing Cookies and Salivating: A Focus on Olfactory Imagery	2014
38	Making Choices While Smelling; Tasting; And Listening: The Role of Sensory (Dis)Similarity When Sequentially Sampling Products	2014
39	Ambient Scent and Consumer Behavior: A Field Study in a Florist's Retail Shop	2014
40	Is Anticipation Delicious? Visceral Factors As Mediators of the Effect of Olfactory Cues on Purchase Intentions	2014
41	The Effect of Ambient Scent on the Experience of Art: Not As Good As It Smells	2014
42	The Effects of Sensory Stimuli on Motorsports Spectators	2015
43	Invisible and Intangible, but Undeniable: Role of Ambient Conditions in Building Hotel Guests' Loyalty	2015
44	The Cool Scent of Power: Effects of Ambient Scent on Consumer Preferences and Choice Behavior	2015
45	Cosmetic Scents by Visual and Olfactory Senses Versus Purchase Intention	2015
46	Odor Semantics and Visual Cues: What We Smell Impacts Where We Look; What We Remember; And What We Want to Buy	2016
47	Ambient Scent As a Mood Inducer in Supermarkets: The Role of Scent Intensity and Time-pressure of Shoppers	2016
48	What to Diffuse in a Gender-specific Store? The Effect of Male and Female Perfumes on Customer Value and Behaviour	2016

49	Impact of Point-of-purchase Olfactory Cues on Purchase Behavior	2017
50	Multi-sensory Congruent Cues in Designing Retail Store Atmosphere: Effects on Shoppers' Emotions and Purchase Behavior	2017
51	Subject or Object: A Product's Scent Congruent Perspectives	2017
52	Extrinsic and Intrinsic Food Product Attributes in Consumer and Sensory Research: Literature Review and Quantification of the Findings	2018
53	The Sweet Smell of Advertising: The Essence of Matching Scents With Other Ad Cues	2018
54	The Sniffing Effect: Olfactory Sensitivity and Olfactory Imagery in Advertising	2018
55	The Influence of Food Aromas on Restaurant Consumer Emotions, Perceptions, and Purchases	2018
56	Immersion and Emotional Reactions to the Ambiance of a Multiservice Space: The Role of Perceived Congruence Between Odor and Brand Image	2018
57	Consumer Evaluation of Ambient Scent: The Impact of Pre-information; Environment; And Persuasion Knowledge	2018
58	An Investigation of the Influence of Cinema Environment on Advertising Effectiveness	2018

CHAPTER 3: STOP AND SEE THE ROSES: PICTURES CAN INDUCE OLFACTORY IMAGERY AND AFFECT PRODUCT EVALUATIONS

ABSTRACT

Scents are known to affect product evaluations. We show that, due to the multisensory nature of product representations in consumers' minds, pictures can induce imagined scents, which affect evaluations even when no scent is physically present. Six studies demonstrate that pictures of pleasant-scented objects (e.g., a rose) in ads or on packages evoke olfactory imagery of that scent, thereby improving product and service evaluations. Pictures of unpleasant-scented objects (e.g., fish), in contrast, harm product evaluations by inducing negative imagined smells. This visual-olfactory effect is eliminated when scent is irrelevant to the product (e.g., a lint roller), as consumers may adjust their evaluations to counteract the biasing effect of the irrelevant scent. Moreover, pictures greatly improve evaluations of utilitarian offerings by enhancing their olfactory aspect, but pictures have little or no effect on hedonic offerings because they are already sensorial. By revealing that pictures can create scent perceptions, which affect product evaluations even without the physical presence of a scent, these results demonstrate that scent has far more pervasive and powerful effects than previously thought.

Keywords: advertising and packaging, imagery, olfaction, scent, sensory marketing

Surprisingly many products these days are scented, including not only traditional fragrance products such as perfumes, candles, and air fresheners, but also products for which scent is not traditional, like colored markers, water bottles, and greeting cards. With this large market comes a growing demand to advertise and package these scented products effectively, but therein lies a fundamental problem: Although scent is known to improve product evaluations (Morrin, 2010), incorporating scent in advertising and packaging is expensive, impractical (e.g., in online advertising) and only minimally effective (e.g., only 11% of consumers engage with scented magazine ads, GfK MRI, 2011). So then, how can marketers effectively convey product scents?

We demonstrate a simple but effective method for creating smells in ads and on packages, critically, without the use of actual scents. Based on recent multisensory theories of object representation (Barsalou, 2008) and product evaluation (e.g., Elder & Krishna, 2010), we hypothesize that a mere picture of a scented object can evoke olfactory imagery (i.e., imagined scent) in consumers' minds, which in turn can improve product evaluations. For example, a picture of a rose on a product package evokes the smell of a rose, and that imagined smell can improve perceptions of the product. Not all is rosy, however, as we also show various types of scents and products for which scent-inducing pictures fail to improve or even harm product evaluations.

This research provides several theoretical contributions. Olfaction is the phylogenetically oldest sense, affecting a variety of consumer behaviors including emotions, memories, and motivations (Herz, 2010). However, few prior studies have focused on olfaction in advertising or packaging (Ellen & Bone, 1998), fewer have examined how pictures affect other sensory perceptions (Elder & Krishna, 2010), and even fewer have examined how olfactory imagery affects consumer behavior (Krishna, Morrin, and Sayin,

2014). Moreover, because the limited prior research on how olfactory imagery affects consumer behavior was in the context of food (Krishna et al., 2014), it is unclear to what extent those prior results may be attributable to gustatory imagery and/or cravings (Kemps et al., 2004). Indeed, some scholars have recently called for further research on olfaction and olfactory imagery in marketing (Krishna, 2012; Peck & Childers, 2008). Thus, in heeding these calls, our research is the first to examine how the visual appearance of an ad or package can evoke olfactory imagery, and it is also among the first to demonstrate that such olfactory imagery can affect product evaluations.

Figure 4. Examples of scented products without pictures of the scented object on their package labels.

This research also offers clear practical contributions. To begin with, some scented products are packaged and advertised without a picture of the scent-inducing object (for examples see Figure 1 on the next page). For instance, floral-scented Clorox kitchen cleaner shows no flowers on its package. Could adding scent-inducing pictures improve evaluations of such brands, or is merely printing "floral scent" sufficient? Of course, many scented products do include a scent-inducing picture on the ad or package, but this does not imply that marketers are aware of the power of pictures to evoke smells: Presumably, marketers often include pictures simply because they render the ad or package more visually attractive or informative. Unless marketers fully understand *why* such pictures are effective, they may make costly mistakes. For instance, the present research demonstrates that both the type of scent and the type of product moderate this effect of pictures on product evaluation. By identifying conditions under which pictures do or do not improve product evaluations, we thus provide practical guidance for effective marketing.

SEEING IS SMELLING

Decades of research has investigated differences between pictures and textual information (Bagozzi, 2008; Childers & Houston, 1984; Childers, Houston, & Heckler, 1985; Edell and Staelin 1983; Meyvis, Goldsmith, & Dhar, 2012; Holbrook & Moore, 1981; Unnava & Burnkrant, 1991). Relative to purely textual information, pictures improve brand attitudes, memory, and implicit attitudes (e.g., Lutz & Lutz, 1977; Mitchell, 1986; Trendel, Mazodier, & Vohs, 2018). This is unsurprising, given that pictures attract more attention, are more distinctive, are understood faster, and tend to be more visually appealing than words (Pieters & Wedel, 2004; Townsend & Kahn, 2013). However, pictures also affect attitudes in

subtler ways. For example, advertisements with pictures are capable of evoking visual imagery that affects attitudes more than purely textual ads do (Babin & Burns, 1997; Rossiter & Percy, 1980).

Thus, effects of pictures on brand and product evaluations are well established. But crucially, that prior research has not addressed the multisensory nature of object representations (Barsalou, 2008) and product evaluations (Elder & Krishna, 2010). Essentially, imagery is a sensory process, invoking highly similar neural and physiological processes as actual perception. Moreover, imagery is multisensory (MacInnis & Price, 1987). For instance, Murray, Foxe, and Wylie (2005) showed that experience of an object creates multisensory memory representations, and that subsequent activation of a visual representation can also activate representations in other sensory modalities. That is, from one's experience with lemons, one's mental representation of a lemon includes not only its appearance, but also its smell, taste, and graspability. And importantly, merely seeing a lemon can also activate those other sensory features (Streicher & Estes, 2016).

Although imagery is known to be multisensory (Barsalou, 2008; Elder & Krishna, 2010; MacInnis and Price, 1987; Unnava, Agarwal, and Haugtvedt, 1996), the overwhelming majority of prior research has examined visual imagery (e.g., Lutz & Lutz, 1977; Mitchell, 1986; Rossiter & Percy, 1980). Notably, multisensory imagery has even greater potential to improve product evaluations. Given the rapidly growing interest in scented products, we instead examine *olfactory imagery*, which is an experience of the sensation of smell despite the absence of an actual scent (Stevenson & Chase, 2005). Olfactory imagery entails activation of sensory networks in the brain (i.e., smells), not merely semantic networks (i.e., thoughts; Sugiyama, Ayabe-Kanamura, & Kikuchi, 2006). However, olfactory imagery is low in vividness and difficult to generate (Tomiczek & Stevenson, 2009), suggesting that it may

not occur automatically. Marketing scholars have revealed many fundamental insights about the impact of actual scents on product or store evaluations and sales (Bosmans, 2006; Cirrincione, Estes, & Caru, 2014; Herrmann et al., 2013; Krishna, Elder, & Caldara, 2010; Madzharov, Block, & Morrin, 2015; Morrin & Ratneshwar, 2000; Spangenberg, Crowley, & Henderson, 1996; Spangenberg, Grohmann, & Sprott, 2005; Spangenberg et al., 2006), but very little is known of olfactory imagery in product evaluation.

A large literature investigating olfactory sense and vision shows that these senses have strong cross-modal correspondence i.e. nonarbitrary associations that exist in different sensory modalities between different basic features or physical attributes (Spence, 2011). Literature shows a nonrandom correspondence between colors and scents (Demattè, Sanabria, & Spence, 2006; Gilbert, Martin, & Kemp, 1996; Kemp & Gilbert, 1997), and shapes and scents (Hanson-Vaux, Crisinel, & Spence, 2012; Seo et al., 2010). Specifically focusing on the directionality of this cross-modal correspondence, vision strongly affects olfaction. For instance, electrically stimulating the visual cortex improves scent discrimination, indicating that visual representations affect olfactory perception (Jadauji et al., 2012). Marketing researchers have also shown that vision and olfaction are interdependent (Krishna et al., 2014; Lwin, Morrin, & Krishna, 2010). For example, when red coloring was added to white wine, experts perceived it to smell more like red wine (Morrot, Brochet, & Dubourdieu, 2001). Moreover, the congruence of pictures and scents facilitates olfactory perception of even very faint scents, suggesting visual-olfactory integration (Gottfried & Dolan, 2003). Thus, because pictures affect olfaction, we predicted that a mere picture of a scented object (e.g., a flower) can evoke olfactory imagery of that object (e.g., the smell of a flower) in the consumer's mind.

OLFACTORY IMAGERY AFFECTS PRODUCT EVALUATION

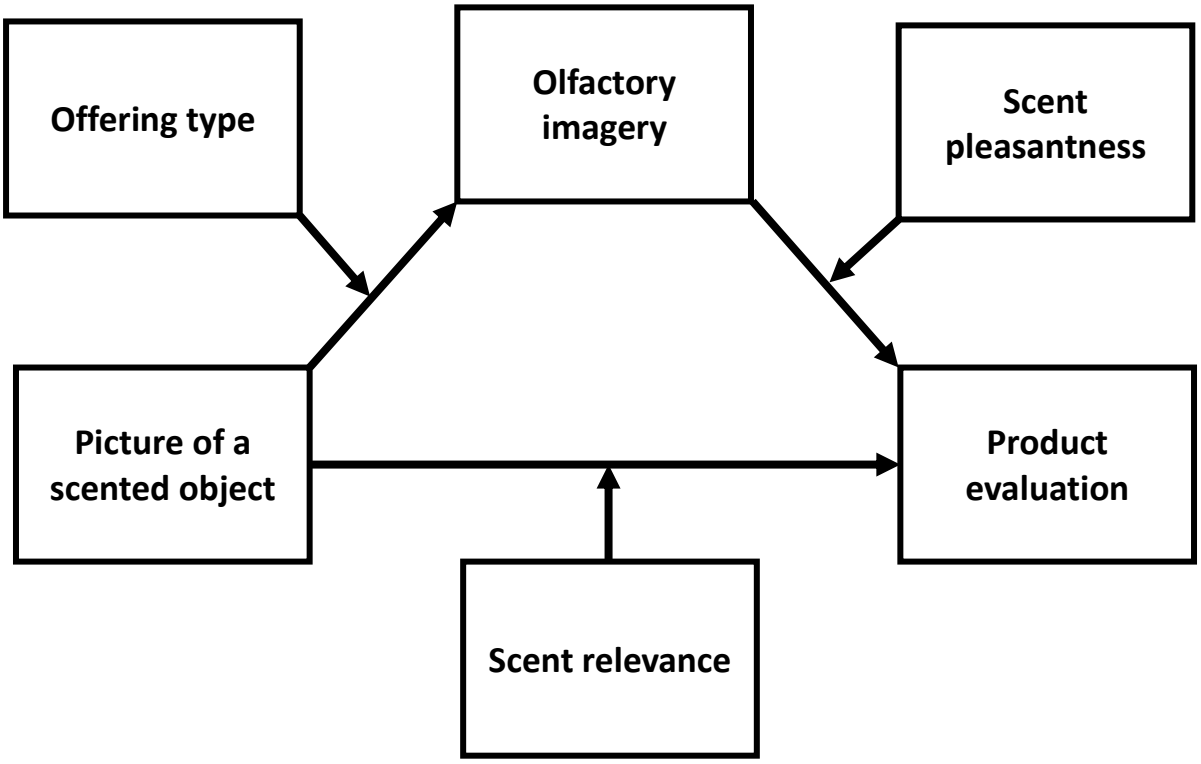
Two independent lines of evidence indicate that olfactory imagery can affect product evaluation. The first line of evidence is inferential: (i) Actual scents and imagined scents evoke highly similar neural and behavioral responses (Bensafi, Sobel, and Khan, 2007; Djordjevic et al., 2005). (ii) Actual scents are well known to affect product and brand evaluation (e.g., Bone & Jantrania, 1992; Bosmans, 2006; Morrin & Ratneshwar, 2000). Therefore, (iii) imagined scents probably also affect product evaluations. On the other hand, given that olfactory imagery is less vivid and more effortful than actual olfaction (Tomiczek & Stevenson, 2009), it is not obvious whether olfactory imagery would *necessarily* affect product evaluations. Indeed, there may well be conditions under which olfactory imagery does *not* affect evaluations; we consider some of these potentially moderating conditions in the next section. The second line of evidence is more direct, but with less overall evidence. In the only prior study of olfactory imagery in marketing, Krishna et al. (2014) showed that imagining the smell of food can increase the desire to eat, the amount of salivation, and actual food consumption.

The literature described above forms the basis of our conceptual model, shown in Figure 2. A picture of a scented object (e.g., a lemon) may evoke olfactory imagery (i.e., imagined lemon scent), which in turn may improve product evaluations. Together these yield our predicted main effect, which for simplicity we will call the *visual-olfactory effect*, and its hypothesized cognitive process.

H_1: A picture of a pleasant-scented object on a package or advertisement (in the absence of an actual scent) improves evaluation of that product (*visual-olfactory effect*).

H_2: The visual-olfactory effect is mediated by the generation of olfactory imagery.

Figure 5. Conceptual framework.



The impact of pictures on the generation of olfactory imagery (A-path, Figure 2) has not been investigated before. Additionally, we are aware of only a single paper providing some indication of support for the hypothesized B-path (Krishna et al., 2014), albeit with a different measure of consumer behavior (i.e., food consumption rather than product evaluation). Moreover, no prior study has synthesized those two effects. Thus, if empirically supported, our studies would be the first to demonstrate an overall effect of pictures on product evaluations via olfactory imagery.

The prevalence of pictures of scented objects (e.g., a lemon) on packages and in ads of scented products (e.g., an air freshener) implies that **H_1** is common managerial wisdom. However, several alternative assumptions may underlie this presumed effect. For instance, a

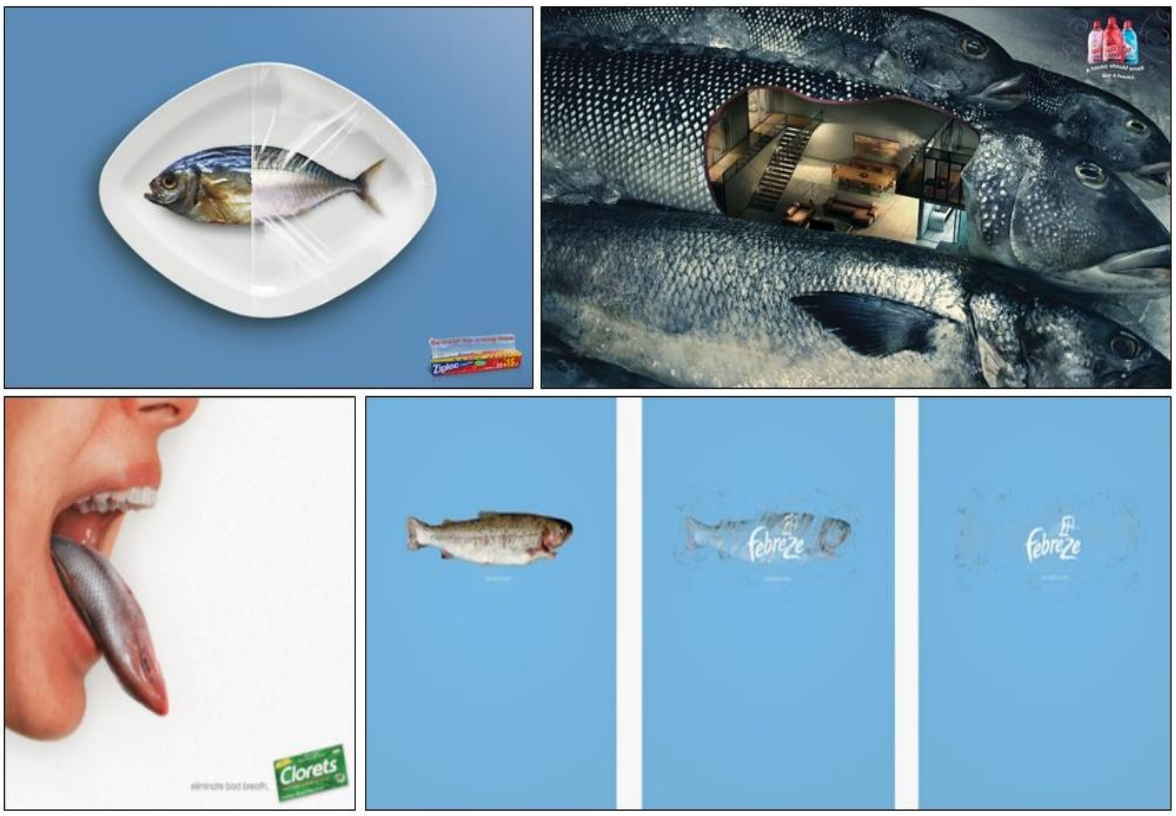
picture could improve product evaluations because it enhances the visual attractiveness and/or informativeness of the pack or ad. We instead hypothesized that olfactory imagery underlies the presumed effect. As explained below, our studies were designed to discriminate among these alternative explanations of the effect, by demonstrating several moderating conditions. Thus, our research documents the effect ($\mathbf{H_1}$) and its mediating process ($\mathbf{H_2}$), and then contributes further by identifying critical moderators that can eliminate or even reverse the effect, as described next.

PLEASANTNESS AND RELEVANCE OF SCENT

The prior research on ambient scent has, quite understandably, focused almost exclusively on pleasant scents (e.g., Ellen & Bone, 1998). Some research has suggested that a less pleasant ambient scent can actually improve evaluations of target objects (Cirrincione et al., 2014; Spangenberg et al., 1996), but retailers are unlikely to intentionally diffuse unpleasant scents into their shops. Scented products, in contrast, often do involve unpleasant scents: Products such as air fresheners, deodorants, candles, and cleaning products are often used to mask or remove unpleasant odors. In fact, given their goal of removing unpleasant scents, some product packages and ads even include images of bad-smelling objects that they purport to counteract. For example, many bathroom and kitchen cleaning products include pictures of mold or mildew, and some brands like Febreze and Ziploc use ads to demonstrate their ability to contain smelly items like dead fish (see Figure 3). These examples highlight a likely moderator of the visual-olfactory effect. Given that a picture of an unpleasant-scented object (e.g., a dead fish) should evoke unpleasant olfactory imagery, it should also harm product evaluations.

H_3: A picture of an unpleasant-scented object on a package or advertisement (in the absence of an actual scent) decreases evaluation of that product.

Figure 6. Examples of advertisements (brands clockwise from top left: Ziploc, Ajax, Febreze, Clorets) showing bad-smelling objects.



The importance of this previously-untested hypothesis is not limited to its practical relevance for brands like those shown in Figure 3. Rather, this hypothesis also provides an important theoretical test. Brands that do use pictures of unpleasant-scented objects presumably do so because they intend to convey information more clearly or convincingly. The picture is presumably intended to illustrate the product's functionality at removing or containing unpleasant scents. If pictures generally improve product evaluations by increasing the informativeness of the package or ad, then a picture of an unpleasant-scented object

should improve product evaluations just as pictures of pleasant-scented objects do. Thus, **H_3** pits olfactory imagery against informativeness as potential explanations of the effect.

Should all brands use pictures of pleasant-scented objects in their ads or on their packages? We suspected not. In particular, products for which scent is not a relevant attribute may not benefit from using pictures of scent-inducing objects on their packages or in their ads.

For scented products, scents are a relevant functional feature. Features of a product were traditionally considered to be functional attributes that engage consumers to reason out and decide their purchase (Shafir, Simonson, and Tversky 1993). However, features can also be experienced in a more fluent and less effortful manner by creating an experience for a consumer. A sensory feature or cue can be one of the triggers for such an experience (Brakus, Schmitt, and Zhang 2014). In comparison to the name of a scent, pictures being strongly linked with olfaction (Jadauji et al. 2012), can help to create an experience by facilitating the formation of olfactory imagery of a scent. Therefore, for products for which scents are a relevant feature, introduction of a picture can make the functional attribute of product scent a more sensorial one.

On the other hand, for products where scents are not a relevant functional feature, introduction of a cue to a scent on the ad or product label can create an inconsistency, which leads to disfluency (Winkielman, Huber, Kavanagh, and Schwarz 2012). In presence of a picture of a scented object, this inconsistency would become even more salient. This would make the consumer reason out this feature in order to resolve this inconsistency, disrupting any additional imagery generation and hence any positive effects on the product evaluation of the product. In cases where there is some reason why this feature could still be relevant to the product, there would be no negative effects of this picture as the consumer would be able to

resolve this inconsistency. However, if the feature does not even make sense for the product and the inconsistency is not resolved, the evaluations could even reduce.

In the context of actual scents (product scents and scents in ads), literature did not explicitly test for effect of scent on evaluations for scent-irrelevant categories. For real scents, Bosmans (2006) argued that ambient scent is an extraneous source of bias when evaluating a target product. Critically, if that extraneous source of bias is salient, so that consumers become consciously aware of the scent, then consumers may correct for this bias by intentionally decreasing their evaluations. We similarly expected that a picture of a scented object on a product for which scent is not actually relevant would lead participants to decrease their evaluations in attempt to "correct for" that potentially biasing imagined scent.

H_4: The visual-olfactory effect is moderated by the scent-relevance of the product, such that pictures of pleasant-scented objects improve evaluations of products for which scent is relevant, but not of scent-irrelevant products.

In addition to its practical relevance, this previously-untested hypothesis also provides an important theoretical test. If pictures generally improve product evaluations by increasing the visual attractiveness of the package or ad, then a given picture should improve product evaluations regardless of the relevance of its imagined scent. Thus, **H_4** pits olfactory imagery against attractiveness as potential explanations of the effect.

HEDONIC ASPECTS OF SCENTS AND OFFERINGS

Scent is a hedonic attribute of a product. Scent is inherently sensorial, and it is strongly linked to affect. Given that actual scents and imagined scents activate largely overlapping neural circuits (Bensafi et al., 2007), imagined scents also appear to be hedonic.

In addition to investigating the differing hedonic aspects of scent (i.e., pleasant versus unpleasant), we also investigated potentially differing hedonic aspects of the offering itself (i.e., hedonic versus utilitarian). Utilitarian offerings such as cleaning products and banking services primarily offer functional benefits, whereas hedonic offerings such as perfumes and holiday tours primarily offer sensorial and/or emotional pleasure (Chaudhuri & Holbrook, 2001; Hirschman & Holbrook, 1982; Okada, 2005).

One might intuitively expect that (imagined) scent, as a hedonic attribute, would be especially effective for hedonic offerings. However, prior research suggests the opposite: Hedonic attributes tend to improve evaluations more for utilitarian offerings than for hedonic offerings (Gill, 2008; Klein & Melnyk, 2014). Because hedonic offerings already possess salient sensorial and emotional attributes, the addition of a picture should have a relatively small positive influence on evaluations. On the other hand, because utilitarian offerings have mostly functional features, adding a picture of a scent-inducing object should improve evaluations relatively more.

H_5: The visual-olfactory effect is moderated by the nature of the offering, such that pictures of pleasant-scented objects improve evaluations more for utilitarian offerings than for hedonic offerings.

OVERVIEW OF STUDIES

We report six studies that test the five hypotheses of our conceptual model (Figure 2). In each study, we compare evaluations of scented products or services that either do or do not include a picture of a scented object on either the package or an ad. Studies 1a and 1b provide a simple initial demonstration of the visual-olfactory effect (**H_1**), and Study 2 demonstrates

that the effect is mediated by olfactory imagery ($\mathbf{H_2}$). Study 3 tests whether pictures of unpleasantly scented objects reduce product evaluations ($\mathbf{H_3}$). Studies 4 and 5 respectively test for moderation by the relevance of scent for the product category ($\mathbf{H_4}$) and the hedonic or utilitarian nature of the offering ($\mathbf{H_5}$). Our studies were also designed to test alternative explanations of the presumed effect, based on the visual attractiveness or the informativeness of the packs and ads.

We aimed to test the generality, reliability, and robustness of the visual-olfactory effect in a number of ways. For generality we used different scents (i.e., lemon, rose, lavender), different offerings (i.e., cleaning products, air fresheners, laundry services), and different marketing implementations (i.e., packages, advertisements) across the various studies. For reliability we tested the effect six times and the mediating process three times across studies. We used different control conditions across studies to ensure that the effect does not only arise in comparison to certain controls. We also used relatively subtle methods: Whereas the only prior study of olfactory imagery in marketing (Krishna et al., 2014) explicitly instructed participants to imagine the smell of the product, we did not instruct or ask participants to imagine the scent. Also, our packages and advertisements did not carry any direct cues for smelling except for the name of the scent.

We have also used both within (Study 1A and 1B) and between designs (Study 2, 3, 4 and 5). With within designs, we tried to rule out other possible explanations of the effect using very subtle manipulations. Since the within studies have choice as the dependent variable, any within design mediation analysis was not possible. Between designs are used to reduce any demand effects and carry over effects i.e. since participants have already indicated their choice, the replies for mediator questions might be positively influenced in the direction of this choice. This makes the mediation more credible in a between design.

In testing the effect of visual stimuli on olfactory imagery, we also sought to minimize or control influences of the other sensory modalities. First, as our target stimuli we chose products with negligible gustatory, haptic and auditory uses or properties (e.g., air freshener, cleaning product), which reduces the risk of any differences in these senses affecting evaluations. Second, as our scent-inducing objects we chose either non-foods (i.e., rose, lavender) or foods low in fat, sugar, and carbohydrates (i.e., lemon). This was important because foods high in fat, sugar, and/or carbohydrates activate gustatory networks in the brain (Frank et al., 2010; Simmons, Martin, & Barsalou, 2005) and also induce cravings (Kemps et al., 2004), either of which could affect our presumed effects. Indeed, given that Krishna et al. (2014) used cookies and cakes as their olfactory stimuli, their effects likely operate also via cravings. Since cravings are related more to gustatory imagery than to olfactory imagery (Tiggemann & Kemps, 2005), their presence would weaken any argument for effects of olfactory imagery. We instead sought to avoid cravings in order to examine purely visual and olfactory processes.

STUDY 1A: VISUAL OLFACTORY EFFECT IN CHOICE STUDY

Study 1A tested for a visual-olfactory effect ($\mathbf{H_1}$). We also sought to exclude visual attractiveness of the scent-inducing picture as a potential explanation of the presumed effect. We created two ads for a floral-scented air freshener, one with a picture of a rose and the other with a picture of a sunflower (see Figure 4A). Critically, roses are more fragrant than sunflowers, but the pictures were equally visually attractive. Participants viewed both ads, and indicated which air freshener they would be more likely to buy. They also rated the extent to

which each ad evoked a scent in their minds. We predicted that the rose ad would elicit greater olfactory imagery and would be preferred over the sunflower ad.

Methods

Pretest. 40 US-based respondents from an online pool (Paolacci and Chandler, 2014) rated the visual attractiveness ("The flower is visually attractive") of five pictures of a rose and five pictures of a sunflower (order randomized) on a scale from 1 ("strongly disagree") to 7 ("strongly agree"). All roses were yellow, so they would be visually similar to a sunflower. For use in the main study we selected the rose picture (M = 5.70, SD = 1.09) and the sunflower picture (M = 5.65, SD = 1.29) that were most closely matched for visual attractiveness (p = .81), while also being relatively high in attractiveness. The lack of difference between the two selected pictures was not due to a lack of statistical power, as several other picture pairs did differ significantly in attractiveness.

Main study. In all studies reported herein, we sampled approximately 100 participants per condition. In Study 1A, 100 US-based respondents (M = 36 years, SD = 11; 47 male) from an online pool participated. Unless otherwise stated, in all studies we also used the same *introductory block* in which participants first provided informed consent, indicated their sex and age, completed an attention check, and read some general instructions before advancing to the main study. In Study 1A, after this introductory block, participants were shown the two ads (see Figure 4A) and were asked "Which of these would you be more likely to buy?" The two ads appeared side by side, and were randomly assigned to the left or right position. After indicating their choice, they advanced to the next page, where they rated the olfactory imagery ("This ad evokes a scent in my mind") generated from each ad separately on a scale from 1 ("strongly disagree") to 5 ("strongly agree"). The two ads (rose, sunflower) were presented on separate pages, in random order. Finally, participants completed a *concluding*

block that was the same in all studies reported herein, unless otherwise stated. This block consisted of control measures in which participants indicated their liking of the scent ("I like the fragrance of flowers", 1-5 scale) and their involvement with the product category (2 items: "For me, choosing the right air freshener is", 1 = not important, 5 = very important; "Choosing the right air freshener", 1 = does not matter to me, 5 = matters a lot to me). The two involvement items were correlated highly significantly in all studies reported herein (all $r > .85$, $p < .001$), so in all studies they were averaged to create an involvement index.

Results and Discussion

One participant failed the attention check and was excluded. None of the control measures (sex, age, liking of the scent, involvement with the product) significantly predicted choice, all $p > .32$. Most importantly, a significant majority of participants (62%) preferred the ad with a rose, $\chi^2(1) = 5.34$, $p = .02$.[1] Olfactory imagery was also significantly higher from the rose ad ($M = 4.09$, $SD = .74$) than from the sunflower ad ($M = 3.10$, $SD = 1.11$), $t(98) = 7.46$, $p < .001$, Cohen's $d = .77$. To test whether olfactory imagery predicted ad preference, we subtracted ratings of the sunflower ad from ratings of the rose ad (positive scores indicate greater imagery of the rose). A binary logistic regression confirmed that olfactory imagery significantly predicted ad preference, Wald $\chi^2 = 21.73$, $B = 1.32$, $p < .001$. In sum, the ad with a picture of a scented object (rose) induced greater olfactory imagery and elicited more positive evaluations than the ad with an equally attractive but non-scented object (sunflower). Moreover, that greater olfactory imagery predicted the significant preference for the ad with the scented object (rose). These results thus support $\mathbf{H_1}$, and also reveal that $\mathbf{H_2}$ is plausible.

[1] In an earlier version of this study ($N = 100$), participants viewed these same ads, but instead were asked "Which of these is more likely to persuade you to buy Fresca air freshener?" A significant majority of participants (69%) again preferred the ad with a rose, $\chi^2(1) = 13.50$, $p < .001$.

Figure 7. Stimuli, Studies 1A (Panel A) and 1B (Panel B).

A.

B.

STUDY 1B: MANIPULATING PERCEIVED ACCESSIBILITY OF SCENT

Study 1B tested the generality of the effect (**H_1**) demonstrated in Study 1A. We used a different medium (package instead of ad), a different product (dish soap instead of air freshener), and a different scent (lemon instead of floral). We also matched the pictures semantically, by comparing cut lemons (scent-inducing) to whole lemons (control). See Figure 4B. Because cut lemons are more fragrant than whole lemons, we predicted that the label with a picture of cut lemons would evoke greater olfactory imagery and would be preferred over the label with whole lemons.

Methods

Pretest. 40 US-based respondents from Mechanical Turk rated the visual attractiveness ("The lemons are visually attractive") of four pictures of a cut and four pictures of a whole lemon (order randomized) on a scale from 1 ("strongly disagree") to 5 ("strongly agree"). All pictures carried three lemons. For cut lemon pictures, two of these lemons were cut, whereas for the whole lemon pictures, all lemons were uncut. For use in the main study we selected the cut lemon picture (M = 4.20, SD = 0.85) and the whole lemon picture (M = 4.13, SD = .76) that were most closely matched for visual attractiveness (p = .60), while also being highest in attractiveness. The lack of difference between the two selected pictures was not due to a lack of statistical power, as several other picture pairs did differ significantly in attractiveness.

Main study. 101 US-based respondents (M = 34 years, SD = 9; 48 male) from an online pool participated. None had participated in Study 1A. Stimuli are shown in Figure 4B. Procedures were identical to Study 1A, except that the measurement items were adapted to reflect the different medium (label), product (dish soap), and scent (lemon).

Results and Discussion

Three participants failed the attention check and were excluded. None of the control measures (sex, age, liking of the scent, involvement with the product) significantly predicted choice, all $p > .91$. Critically, a significant majority of participants (71%) preferred the label with cut lemons, $\chi^2(1) = 18.00$, $p < .001$.[2] Olfactory imagery was also significantly higher from the cut-lemons label ($M = 4.20$, $SD = .94$) than from the whole-lemons label ($M = 3.64$, $SD = .98$), $t(97) = 4.99$, $p < .001$, $d = .50$. Moreover, olfactory imagery ($M_{cut} - M_{whole}$) significantly predicted label preference, $\chi^2 = 18.22$, $B = 2.19$, $p < .001$. These results thus provide further support for $\mathbf{H_1}$ and the plausibility of $\mathbf{H_2}$, while also controlling semantic (non-olfactory) aspects of the stimuli.

STUDY 2: MEDIATION BY OLFACTORY IMAGERY

Study 2 provided a between-participants test of the visual-olfactory effect ($\mathbf{H_1}$), and a traditional test of its mediation by olfactory imagery ($\mathbf{H_2}$). We created two packages for a multi-purpose cleaning spray, one with a picture of cut lemons (*lemon* condition) and one with no picture (*control* condition; see Figure 5). Participants viewed one of the packages, rated the olfactory imagery of lemon, and evaluated the product.

Methods

200 UK-based respondents ($M = 35$, $SD = 12$; 96 males) from an online pool were randomly assigned to one of two conditions (picture: lemon, control) in a between-participants design. Stimuli are shown in Figure 5. Participants first completed the introductory block (see Study 1A for details). Then they viewed one of the products for five

[2] In an earlier version of this study ($N = 98$), participants viewed these same packages, but instead were asked "Which of these labels do you prefer?" A significant majority of participants (77%) again preferred the label with cut lemons, $\chi^2(1) = 27.38$, $p < .001$.

seconds, during which time they were prevented from advancing to the next page. After five seconds, the product remained onscreen while three olfactory imagery items ("This product evokes a scent in my mind", "I can imagine a fragrance by seeing the product", "While looking at the product, I imagined the smell of lemon") and three product attitude items ("I think that I would like this product", "I would be interested in buying the product", "I would look for this product, next time I go to buy a cleaning spray") appeared below it.[3] We also included a second attention check among these items. The items were presented in an intermixed order, and all items were rated on a scale from 1 (strongly disagree) to 5 (strongly agree). Finally, on a separate page, participants completed the concluding block (see Study 1A for details).

[3] An additional item ("I think that the cleaning spray will have a pleasant fragrance") included elements of both olfaction ("fragrance") and attitude ("pleasant"), and so was conceptually ambiguous between the mediator and dependent variable. We therefore exclude that item from analyses. (Principal components analysis revealed that this item loaded more strongly on product attitude than on olfactory imagery. The pattern of significant results was exactly the same with or without this conceptually ambiguous item included in the analyses.)

Figure 8. Stimuli, Study 2.

Results and Discussion

Seven participants who failed one of the two attention checks were excluded. None of the control measures (sex, age, liking of the scent, involvement with the product) differed significantly between conditions, all $p > .28$. Principal components analysis confirmed two

latent factors among the six items, one consisting of the three olfactory imagery items (Cronbach α = .90), and one consisting of the three product attitude items (α = .89). We therefore averaged the three items within each measure. Independent samples *t*-tests revealed significantly greater olfactory imagery from the lemon label (*M* = 4.00, *SD* = .90) than from the control label (*M* = 3.52, *SD* = 1.04), *t*(191) = 3.41, *p* = .001, *d* = .47, and significantly more positive attitudes toward the lemon label (*M* = 3.59, *SD* = .88) than the control label (*M* = 3.32, *SD* = .93), *t*(191) = 2.09, *p* < .05, *d* = .30.

The correlation between olfactory imagery and product attitude (*r* = .55, *p* < .001) was only moderately strong, suggesting discriminant validity and potentially meaningful mediation. With a sweetspot analysis (see Pieters, 2017), this correlation passes the lenient criteria and is close to the upper end for the strict criteria for meaningful mediation. Indeed, a bootstrap mediation analysis (Hayes, 2013, model 4, 10K samples; control = 0, lemon = 1) revealed that the lemon picture increased olfactory imagery (A-path; *B* = .48, *t* = 3.41, *p* < .001), which in turn improved product evaluation (B-path; *B* = .50, *t* = 8.82, *p* < .001), thus producing a significant indirect (mediation) effect, *B* = .24, *CI* =.10 to .40. The direct effect was nonsignificant, *CI* = -.19 to .26. Thus, a package with a picture of cut lemons improved product evaluations by increasing olfactory imagery of lemons.[4] These results support **H_1** and **H_2**.

STUDY 3: MODERATION BY PLEASANTNESS OF SCENT

[4] In a lab version of this study (*N* = 170) with slightly modified stimuli, participants again indicated significantly greater olfactory imagery from the lemon label (*M* = 3.66, *SD* = 1.08) than from the control label (*M* = 2.72, *SD* = 1.12), *t*(168) = 5.57, *p* < .001, *d* = .79, and significantly more positive attitudes toward the lemon label (*M* = 2.98, *SD* = .80) than the control label (*M* = 2.71, *SD* = .82), *t*(168) = 2.18, *p* < .05, *d* = .33. The indirect (mediation) effect was again significant, *B* = .27, *CI* = .15 to .43, and the direct effect was nonsignificant, *CI* = -.24 to .25.

Study 3 tested whether pictures of unpleasant-scented objects (for examples see Figure 3) harm product evaluations (**H_3**). We created two packages with equally attractive pictures, but critically, one of the pictured objects has an unpleasant scent (*fish*) and the other has no scent (*oven*). Both packages stated that the product was "lemon scented" and "neutralizes fishy smell" (see Figure 6). Participants viewed one of the two packages, rated the olfactory imagery of lemon and of fish, and evaluated the product.

Methods

Pretest. 40 US-based respondents from an online pool rated the visual attractiveness ("The picture is visually attractive") of five pictures of a fish and five pictures of an oven (order randomized) on a scale from 1 ("strongly disagree") to 7 ("strongly agree"). For use in the main study we selected the fish picture (M = 4.29, SD = 1.38) and the oven picture (M = 4.32, SD = 1.35) that were most closely matched for visual attractiveness (p = .94), while also being relatively high in attractiveness. The lack of difference between the two selected pictures was not due to a lack of statistical power, as several other picture pairs did differ significantly in attractiveness.

Main study. 201 US-based respondents (M = 39 years, SD = 11; 94 male) from an online pool were randomly assigned to one of the two conditions (Picture: fish, control). Stimuli are shown in Figure 6. In this study, the introductory block (see Study 1A) additionally included measures of participants' liking of lemon and fish scents and their involvement with the product (i.e., the concluding block was merged into the introductory block, to ensure that the manipulation did not affect the controls). Participants then viewed one of the packages for five seconds, at which point two olfactory imagery items ("While looking at this label, I imagine the scent of [lemon/fish]") and three product attitude items

(see Study 2; all items were rated on a 1-5 scale) appeared below it. The olfactory imagery items preceded the attitude items, separated by a second attention check.

Figure 9. Stimuli, Study 3.

Results and Discussion

Six participants who failed one of the two attention checks were excluded. None of the control measures (sex, age, liking of the lemon scent, liking of fish scent, involvement with

the product) differed significantly between conditions, all $p > .37$. As in Study 2, the three attitude items ($\alpha = .94$) were averaged. Lemon olfactory imagery ratings were subtracted from fish olfactory imagery ratings to form a single measure of olfactory imagery ($r = -.36$, $p < .001$), whereby positive scores indicate stronger olfactory imagery of fish, and negative scores indicate stronger olfactory imagery of lemon. As predicted, the fish picture ($M = 1.93$, $SD = 1.91$) elicited stronger fish olfactory imagery than the control picture ($M = -.14$, $SD = 1.62$), $t(193) = 8.16$, $p < .001$, $d = 1.01$, and the fish picture also elicited less positive product evaluations ($M = 2.41$, $SD = 1.08$) than the control picture ($M = 3.20$, $SD = .92$), $t(193) = 5.56$, $p < .001$, $d = .73$.

The correlation between olfactory imagery and product evaluation ratings ($r = -.56$, $p < .001$) was not overly strong, suggesting sufficient discriminant validity. With a sweetspot analysis (Pieters, 2017), this correlation passes the lenient criteria and is close to the upper end for the strict criteria for meaningful mediation. A mediation analysis (Hayes, 2013, model 4, 10K samples; control = 0, fish = 1) revealed that the fish picture increased olfactory imagery (A-path; $B = 2.07$, $t = 8.16$, $p < .001$), which in turn reduced product evaluation (B-path; $B = -.26$, $t = 7.26$, $p < .001$), thus producing a significant negative indirect (mediation) effect, $B = -.54$, $CI = -.74$ to $-.37$. The direct effect was not significant, $B = -.25$, $CI = -.54$ to $.04$. Thus, a package with a picture of fish harms product evaluations by increasing olfactory imagery of fish.[5] These results support $\mathbf{H_3}$.

STUDY 4: MODERATION BY SCENT RELEVANCE

[5] In an earlier version of this study ($N = 195$), without controlling for visual attractiveness, participants again indicated significantly greater fish olfactory imagery from the fish label ($M = 2.51$, $SD = 1.70$) than from the control label ($M = -.47$, $SD = 1.83$), $t(193) = 11.77$, $p < .001$, $d = 1.29$, and significantly more negative attitudes toward the fish label ($M = 2.27$, $SD = .94$) than the control label ($M = 3.34$, $SD = .78$), $t(193) = 8.61$, $p < .001$, $d = 1.05$. The indirect (mediation) effect was again negative and significant, $B = -.54$, $CI = -.79$ to $-.33$, and the direct effect was also significant, $CI = -.81$ to $-.22$.

This study tested whether a picture of a pleasant scent-inducing object improves evaluations of a product for which scent is relevant, but not for products for which scent is irrelevant (**H_4**). When consumers consciously identify an ambient scent, they may realize its potentially biasing effect, and consequently they may adjust their evaluations downward in order to counteract the biasing scent (Bosmans, 2006). Similarly, adding a scent to a product for which scent is not relevant may trigger participants to counteract that potential source of bias by decreasing their evaluations accordingly. To manipulate scent-relevance, we compared a multipurpose cleaner (relevant) to a lint roller (irrelevant). Lint rollers and multipurpose cleaners are both cleaning products, but scent is more relevant for a cleaning spray than for a lint roller. Thus, in a 2 × 2 between-participants design, participants evaluated either a lemon-scented multipurpose cleaner (*scent-relevant*) or a lemon-scented lint roller (*scent-irrelevant*) that either included a picture of cut lemons on the package (*picture*) or not (*control*). Stimuli are shown in Figure 7.

This study also provided a critical test of whether the effect of pictures on product evaluation might be due to informativeness rather than olfactory imagery. In Studies 1A and 1B, for instance, one could argue that a rose and a cut lemon – by virtue of being more fragrant than a sunflower and a whole lemon, respectively – are more *informative* in the sense that they more accurately convey a key attribute of the product (i.e., scent). Similarly, in Study 2 the label with a lemon picture more saliently informs consumers of the product scent than the label with no picture, and in Study 3 the label with a fish picture informs consumers of the scent that the product is intended to neutralize. Study 4 tested this informativeness explanation in two ways. First, if the visual-olfactory effect is simply due to the pictures conveying the product scent more clearly or saliently, then a picture should improve evaluations not only for the cleaning spray, but also for the lint roller. Second, we measured how likely participants

were to notice the scent with or without a picture, and we analyzed the data only of those participants who correctly identified the scent.

Figure 10. Stimuli, Study 4.

Methods

402 US-based respondents (M = 36 years, SD = 12; 185 males) from an online pool were randomly assigned to one condition of a 2 (scent: relevant, irrelevant) × 2 (picture: present, absent) between-participants design. Stimuli are shown in Figure 7. After completing the introductory block (see Study 1A), participants rated their product attitudes via the same three items as in Study 3. Olfactory imagery was not measured here, because we had no clear prediction for the scent-irrelevant conditions. In the concluding block, participants rated their product involvement (as in all prior studies), and as an awareness check, participants were asked to identify the product scent from four alternatives (lavender, lemon, mint, no scent). We did not measure participants' liking of lemon scent, because it could have interfered with the awareness check. Finally, as a manipulation check, participants rated the scent-relevance of the given product ("How relevant is the presence of a scent to a [multipurpose cleaner/lint roller]?") on a scale from 1 (not relevant) to 5 (very relevant).

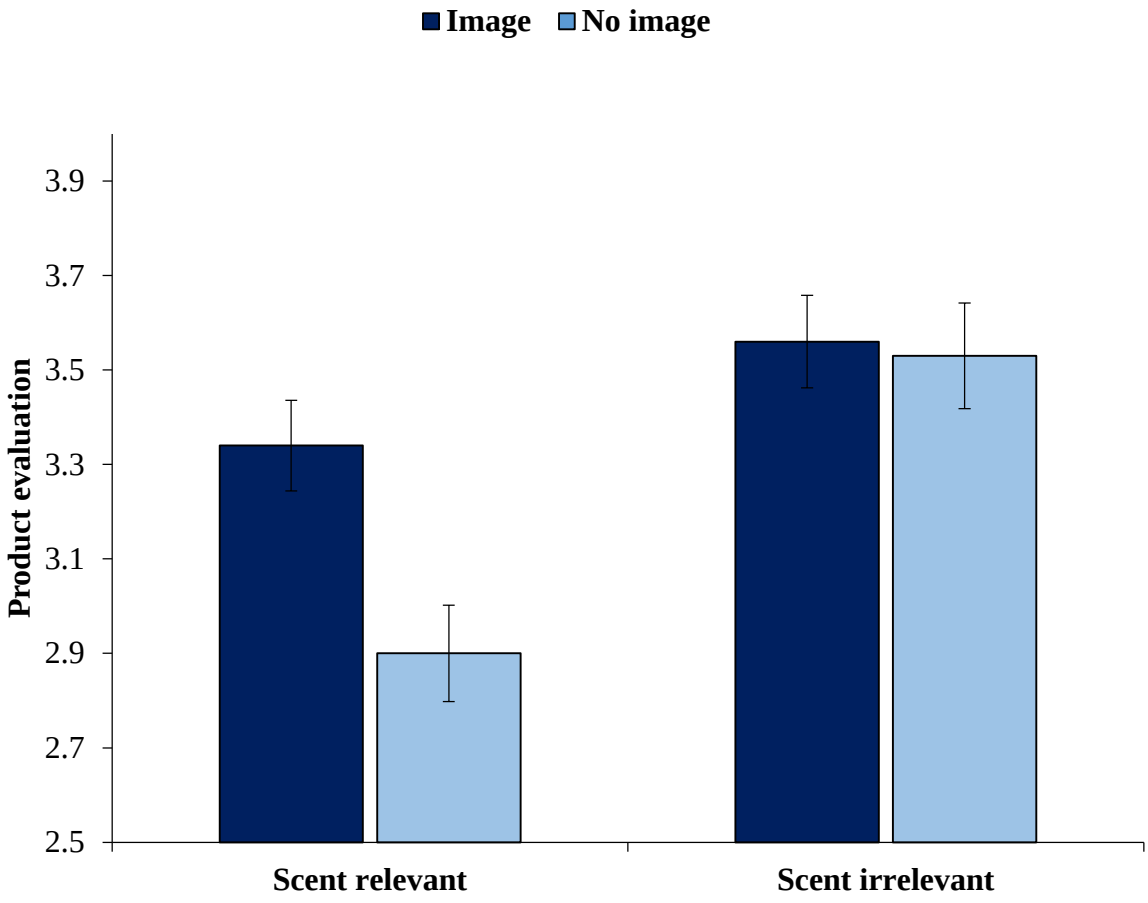
Results and Discussion

Five participants who failed the attention check were excluded. The scent-relevance manipulation was successful: The multipurpose cleaner was rated to be scent-relevant (M = 3.50), whereas the lint roller was rated scent-irrelevant (M = 2.57), $t(395) = 7.14$, $p < .001$. Separate 2 (scent relevance) × 2 (picture) ANOVAs on the control factors revealed an age difference between the picture and control conditions, $F(1, 393) = 3.82$, $p = .051$, and a significant interaction on product involvement, $F(1, 393) = 7.57$, $p < .01$. Therefore, they were both included as covariates in the subsequent analysis. Sex did not differ between conditions ($p > .39$).

Overall, 91.20% of participants correctly identified lemon as the scent of the product. However, the picture of lemons significantly increased participants' awareness, $\chi^2 = 17.22$, p

< .001. Specifically, 97.01% of participants correctly identified the lemon scent in the picture conditions, whereas only 85.20% in the control conditions identified the lemon scent. Thus, one advantage of including a picture of the scented object is that it increases awareness of the scent. Nevertheless, to examine the effect of pictures on product attitudes – independent of this awareness benefit – we excluded those 8.80% of participants who failed to correctly identify the lemon scent. Thus, 362 participants were included in the following analyses.

Figure 11. Results, Study 4. Error bars represent ±1 SE.



The three attitude items (α = .94) were again averaged. A 2 (scent: relevant, irrelevant) × 2 (picture: present, absent) ANCOVA revealed significant main effects of scent-relevance, $F(1, 356) = 16.21$, $p < .001$, and picture, $F(1, 356) = 5.37$, $p < .05$, and the predicted interaction was significant, $F(1, 356) = 4.34$, $p < .05$. As shown in Figure 8, a picture of a scented object (lemon) improved evaluations of a scent-relevant product (multipurpose cleaner), $t(188) = 3.50$, $p = .001$, $d = .50$, but had no effect on a scent-irrelevant product (lint roller), $p = .38$.

These results support **H_4**. Evidently, when scent is not relevant to a given product, consumers mentally "correct" or adjust for the presumed biasing effect of a scent-inducing object (cf. Bosmans, 2006), thereby nullifying the visual-olfactory effect[6]. Whereas Study 3 showed that including a picture of a negative-scented object on a package can harm evaluations of that product, the present result shows that a picture of a *positive*-scented object does not always improve evaluations of that product either.

STUDY 5: MODERATION BY NATURE OF OFFERING

The preceding studies demonstrated the visual-olfactory effect with functional products, such as air freshener, dish soap, and cleaning sprays. Indeed, prior research suggests that hedonic attributes (e.g., sensorial features) may counterintuitively influence such utilitarian offerings more strongly than they influence hedonic offerings (Gill 2008; Klein & Melnyk 2014). Study 5 therefore tested whether the visual-olfactory effect is diminished among more hedonic offerings (**H_5**). We created alternative versions of an ad for a laundry service, one in which the service was presented as *utilitarian*, and another in which it was

[6] In an earlier version of this study ($N = 199$) with an even less scent-relevant product – an umbrella – attitudes toward the umbrella were significantly worse with a lemon picture ($M = 2.93$, $SD = .96$) than without a picture ($M = 3.31$, $SD = 1.06$), $t(197) = 2.64$, $p < .01$, $d = .37$.

presented as *hedonic* (see Figure 9). The laundry service was advertised to use a lavender fragrance, and the ads either included a picture of lavender (*picture*) or not (*control*). Thus, in a 2 × 2 between-participants design, participants rated their olfactory imagery of lavender and evaluated the laundry service.

Methods

402 UK-based respondents (M = 33 years, SD = 10; 149 males) from an online pool were randomly assigned to one condition of a 2 (Service type: utilitarian, hedonic) × 2 (Picture: present, absent) between-participants design. Stimuli are shown in Figure 9. A hedonic service ad was created by using a pleasure-centric headline ("More time for pleasures with our pampering laundry service"), a luxury-related brand qualifier ("Luxury laundry service"), and a luxurious typeface (i.e., Empire Script; see Childers and Jass 2002). A utilitarian ad was created by using a function-centric headline ("Cheap and efficient laundry service"), an economy-related brand qualifier ("Economical laundry service"), and a simple typeface (i.e., Broadway). In all conditions the laundry service was described as using lavender scent, and the ad either included a picture of lavender or not. After the introductory block, participants viewed one of the four ads, then rated their olfactory imagery (3 items) and service evaluation (3 items, see Study 2)[7], separated by a second attention check. On the next page, as a manipulation check, participants rated the extent to which the ad was more hedonic (1) or utilitarian (7). This check was followed by the concluding block.

[7] As in Study 2, one of the items ("I think that the clothes from the above laundry service will have a pleasant fragrance") was conceptually ambiguous between the mediator and dependent variable. We therefore exclude that item from analyses, though the pattern of significant results was the same with or without this item.

Figure 12. Stimuli, Study 5.

Utilitarian

Image

No image

Hedonic

Image

No image

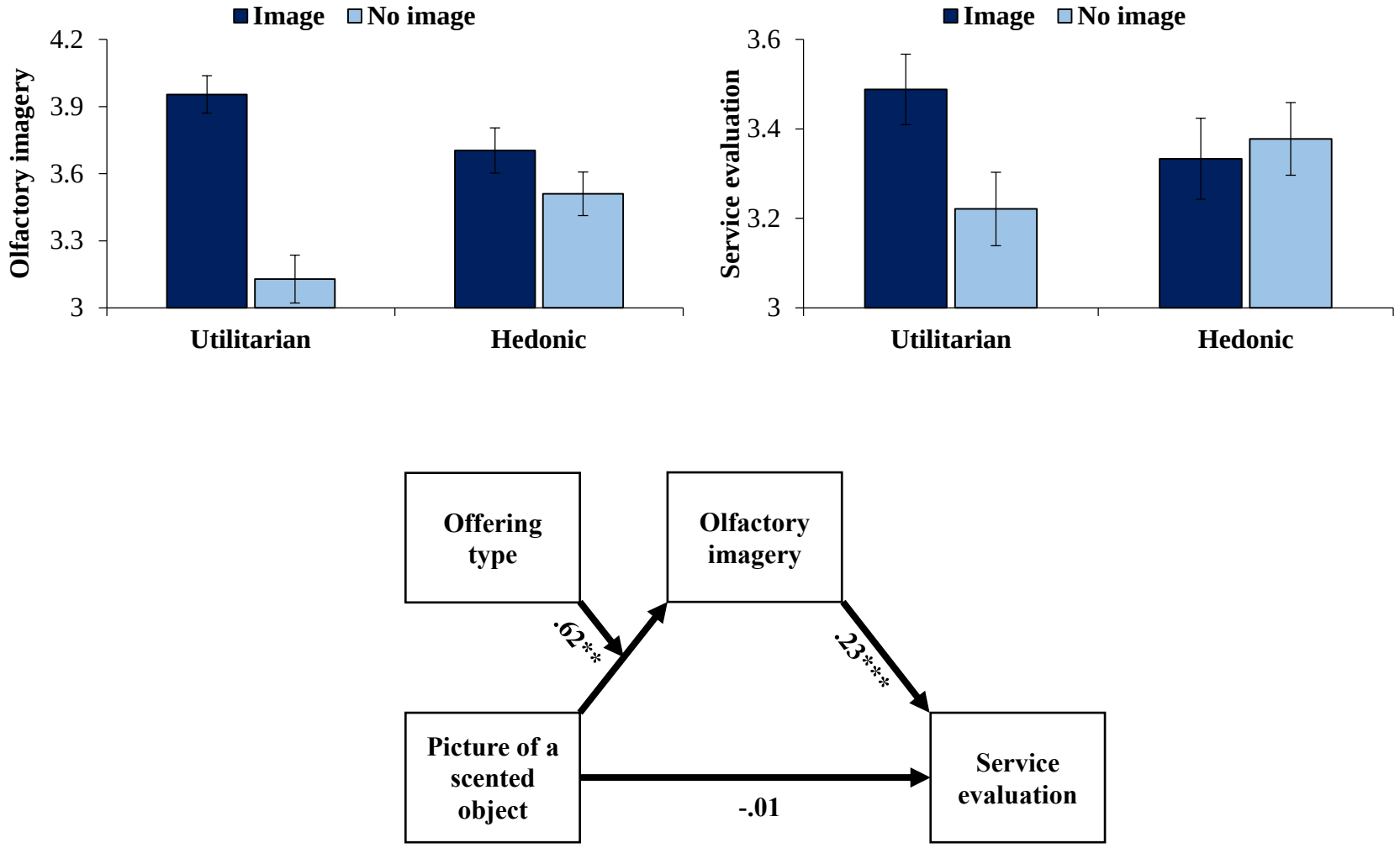
Results and Discussion

Three participants failed one of the two attention checks and were excluded. The manipulation was successful: The hedonic ad was rated to be hedonic (M = 3.52), whereas the utilitarian ad was rated to be utilitarian (M = 4.98), $t(397) = 8.38$, $p < .001$. Involvement differed between the hedonic and utilitarian conditions ($F(1, 395) = 4.52$, $p < .05$) and was therefore included as a covariate in the subsequent analysis. Other controls (age, sex, liking of lavender scent) did not differ between conditions (all $p > .24$). The olfactory imagery ($\alpha = .88$) and service evaluation index ($r = .74$, $p < .001$) were reliable.

Results are illustrated in Figure 10. A 2 (service type: utilitarian, hedonic) × 2 (picture: present, absent) between-participants ANCOVA on olfactory imagery indicated a main effect of picture, $F(1, 394) = 28.35$, $p < .001$, but no main effect of service type ($p > .24$). More importantly, the predicted interaction was significant, $F(1, 394) = 10.57$, $p = .001$. The lavender picture increased olfactory imagery in the utilitarian ad, $t(200) = 6.08$, $p < .001$, $d = .78$, but not in the hedonic ad, $p = .16$. A similar ANCOVA on service evaluation indicated no main effects (both $p > .15$), but a marginally significant interaction, $F(1, 394) = 2.94$, $p = .074$. As predicted, the lavender picture significantly improved evaluation of the utilitarian service, $t(200) = 2.18$, $p < .05$, $d = .31$, but not of the hedonic service, $p = .76$.

The correlation between olfactory imagery and service evaluation ($r = .36$, $p < .001$) indicated good discriminant validity. With a sweetspot analysis (Pieters, 2017), this correlation passes the lenient and strict criteria for meaningful mediation. We ran a moderated mediation analysis (Hayes, 2013, model 7, 10K samples), with presence of a picture as independent variable (no picture = 0, picture = 1), olfactory imagery as mediator, service type as a moderator (hedonic = 0, utilitarian = 1) on the A-path, service evaluation as dependent variable, and involvement with the product as a covariate. The index of moderated mediation

Figure 13. Results, Study 5. Error bars represent ±1 SE.



was significant, B = .16, CI = .06 to .29. For the utilitarian ad, the indirect (mediated) effect of the picture on service evaluation via olfactory imagery was significant, B = .21, CI = .12 to .32. For the hedonic ad, however, this indirect effect was nonsignificant, CI = -.01 to .13. The direct effect was nonsignificant, CI = -.17 to .15.

Thus, the visual-olfactory effect was moderated by the type of offering: The effect was present for a utilitarian offering, but a picture of a scented object did not affect evaluations of a hedonic offering. Evidently, because hedonic offerings are already high in sensorial attributes (Voss, Spangenberg, & Grohmann 2003), the addition of another sensorial attribute (olfactory imagery) provides little or no additional benefit to evaluations (cf. Gill 2008; Klein & Melnyk 2014). These results support $\mathbf{H_5}$.

DISCUSSION

Prior research has established that ambient scents, scented advertisements, and scented products can elicit positive effects on a broad range of consumer behaviors such as approach behaviors, memory, and product evaluations (for a review see Krishna, 2012). The present research demonstrates that positive effects of scent can also be attained, critically, without the use of actual scents. Specifically, we show that merely endowing an ad or package with a picture of a pleasantly scented object can improve product evaluations by evoking olfactory imagery (imagined scent) in consumers' minds (i.e., the *visual-olfactory effect*). Six studies demonstrate this visual-olfactory effect, its psychological mechanism, and several boundary conditions. Studies 1a, 1b, and 2 demonstrate the effect and the mediating role of olfactory imagery. Study 3 shows that, despite their frequent appearance in ads and on packages, pictures of bad-smelling objects (e.g., fish) can harm product evaluations by evoking

unpleasant olfactory imagery. Study 4 shows that the visual-olfactory effect only occurs for scent-relevant products (e.g. air fresheners, cleaning products, etc.), not for scent-irrelevant products, and Study 5 further shows that the effect occurs only for utilitarian offerings, not for hedonic ones.

For reliability and generality, we demonstrated the visual-olfactory effect in all six studies, using a variety of imagined scents (i.e., rose, lemon, lavender) and a variety of consumer responses (i.e., choice, product attitudes, and purchase intentions). We used products with negligible haptic, gustatory, or auditory uses or attributes, thereby focusing our investigation on the visual and olfactory modalities. In addition, the scent-inducing objects in the pictures were either non-food items (i.e., rose, lavender) or food items low in fat, carbohydrates, and sugar (i.e., lemon), thus ruling out food cravings and activation of gustatory networks as possible explanations of the effect. We also used a variety of control conditions and study designs to test and exclude other alternative explanations, including visual attractiveness (Studies 1a and 3), semantic associations (Studies 1b, 4, and 5), and informativeness (Studies 4 and 5).

Theoretical Contributions

We believe that our research provides novel theoretical contributions to both marketing and psychology. Marketing researchers have revealed many important processes and consequences of the individual senses of vision (Krishna, 2012; Raghubir, 2010) and scent (e.g., Bone & Jantrania, 1992; Krishna, Lwin, & Morrin, 2010; Mattila & Wirtz, 2001; Morrin, 2010; Morrin & Ratneshwar, 2003; Spangenberg et al., 1996; Spangenberg et al., 2006). Much less is currently known about multisensory interactions in general (e.g., Elder & Krishna, 2010; Streicher & Estes, 2016), and visual-olfactory interactions in particular (Krishna et al., 2014; Lwin et al., 2016; Lwin, Morrin, & Krishna, 2010). Building from the

multisensory nature of object representations (Barsalou, 1999, 2008) and product evaluations (Elder & Krishna, 2010), this research provides the first investigation of how pictures on packages or in advertisements can induce olfactory imagery and affect product evaluations. This visual-olfactory effect on product evaluation has not previously been proposed or tested, and the three hypothesized moderators are also theoretically novel. Thus, the present research contributes new knowledge in an area of sensory marketing that has received little attention (Krishna, 2012; Krishna, Cian, & Sokolova, 2016; Krishna & Schwarz, 2014; Peck & Childers, 2008).

In marketing, the impact of pictures on brand attitudes and memory is well established (e.g., Lutz & Lutz, 1977; Mitchell, 1986; Trendel et al., 2018), but the role of olfactory imagery in that process has not previously been recognized. Also in psychology, the impact of vision on olfaction is not yet fully understood (Jadauji et al., 2012; Morrot et al., 2001). Although olfactory imagery is known to activate much of the same neural circuitry as actual scent perception (Bensafi et al., 2007), the present research is among the first to investigate conscious, subjective perceptions of imagined scent and its behavioral consequences. Notably, this olfactory imagery occurred without any instruction to imagine the scent, and it was observed in comparison to an identical scent presented verbally (e.g., “lemon scented” but without a picture of a lemon). Thus, our results suggest that pictures are strongly evocative of olfactory imagery.

Olfactory imagery, in turn, appears to have robust effects on product evaluation. Krishna et al. (2014) previously showed that instructing participants to imagine the smell of a food product (e.g., chocolate cake) increased salivation, desire to eat, and actual consumption. In fact, consistent with our results, they only found increased consumption when pictures of food were also shown to participants. However, because Krishna and colleagues used food

products, and because they measured gustatory craving (i.e., salivation) but not olfactory imagery, it is unclear whether the effects are attributable to gustatory craving and/or olfactory imagery. By using non-food imagined scents (e.g., rose) and non-food products (e.g., cleaning sprays), and by directly measuring olfactory imagery, we strengthen Krishna et al.'s conclusion that olfactory imagery can increase consumption, or product evaluations in our case.

We also show important boundary conditions of the visual-olfactory effect. First, pictures of bad-smelling objects can harm product evaluations, because consumers imagine the unpleasant scent (Study 3). Importantly, we observed decreased product evaluations despite the unpleasant-scented object (fish) being just as visually attractive as the neutral, unscented object (oven), so this detrimental effect was not attributable to the bad-smelling object simply being ugly. Second, the visual-olfactory effect occurs only for scent-relevant products and not for scent-irrelevant products (Study 4). We showed that a picture of a lemon improved evaluations of a cleaning spray, for which scent is relevant, but not for a lint roller, for which scent is less relevant. Finally, pictures of pleasantly scented objects improved product evaluations of a utilitarian offering (functional laundry service), but not of a hedonic offering (luxury laundry service). Intuitively, because sensory attributes are more central to hedonic offerings than to utilitarian offerings (Chaudhuri and Holbrook, 2001; Hirschman and Holbrook, 1982; Okada, 2005), including a picture of a scented object on the label or in the ad might seem more beneficial for hedonic offerings. Counter-intuitively, however, we found evidence for pictures of scented objects improving evaluations only for the utilitarian offering, presumably because the hedonic offering was already rich in sensory attributes (cf. Gill, 2008; Klein and Melnyk, 2014).[8]

[8] At face value, this result appears to contradict the findings of Krishna et al. (2014), who showed that olfactory imagery increases consumption of hedonic products like cakes and cookies. However, there were several

Managerial Implications

This research reveals a strikingly simple and effective means of implementing olfactory marketing – in the absence of any actual scent. We show that merely including a picture of a scented object can improve product evaluations for certain kinds of products. Our research thus provides clear practical guidance on how to design package labels and ads to optimize olfactory imagery and, ideally, increase consumers' choice of the given product or service. Although many packages and ads of scented offerings do include pictures of scented objects, many others do not (see Figure 1). The present research informs marketing managers whether, when, and why such pictures can improve consumers' evaluations. Given the limited reach and high cost of scented ads, this alternative method of inducing imagined scent via pictures offers broader reach at lower cost.

Companies marketing hedonic offerings tend to emphasize sensory attributes on labels or in ads. A surprising finding from our research is that for these offerings, pictures of the scented object do not improve product evaluations. On the other hand, utilitarian offerings typically emphasize functional rather than sensory attributes. However, we found that pictures of scented objects can strongly improve evaluations of these offerings, presumably because the picture and resultant olfactory imagery enrich perceptions of the offering to be more than just functional. Thus, our results indicate that marketing managers should consider the nature of their offering when deciding whether to include a picture of a scented object, because counter-intuitively this strategy may only be effective for utilitarian offerings.

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important methodological differences between studies: (1) They used food scents, whereas we used non-food scents. (2) They used gustatory products and pictures of food (introducing cravings as an alternate explanation), whereas we used non-gustatory products. (3) They instructed participants to imagine the smell of the product, we did not. (4) They imposed a 2-minute period of olfactory imagery, whereas our participants evaluated the products at their own pace. (5) They measured salivation, desire to eat, and consumption, whereas we measured product evaluations. We believe that these numerous methodological differences between the studies undermine direct comparison of results.

Many products that mask or remove bad odors are marketed by illustrating the bad-smelling object that they are intended to counteract (see Figure 3). However, our results indicate that this strategy can backfire: Pictures of unpleasant-scented objects can actually harm product evaluations. Of course, such ads and packs may achieve other positive marketing outcomes, such as attracting attention and/or increasing memorability. If the goal is to optimize product evaluations, however, our research indicates that illustrating an unwanted odor may have negative consequences. Similarly, some companies include pictures of scented objects on the packaging or in the ads of products for which scent is not directly relevant, perhaps in order to increase the product's visual attractiveness or sensory richness. However, our results suggest that pictures of scented objects do not improve evaluations for these scent-irrelevant products. Marketers thus may be advised to refrain from this strategy unless scent is genuinely an important and relevant attribute of the offering.

Limitations and Future Directions

Research on olfactory imagery is in its infancy, not only in marketing, but also in psychology and neuroscience. Consequently, there are several limitation of our research, and many directions for further research. We will include here only a few that we consider most important or interesting. First, most scented products use familiar and easy-to-identify scents such as lemon and rose. We therefore used such scents in our studies. Some products, though, instead use less familiar and harder-to-identify scents such as passionflower and kumquat. Scents that are easier to identify and name are also easier to imagine (Stevenson, Case, & Mahmut, 2007). Thus, the visual-olfactory effect may be limited to simple, familiar scents. Unfamiliar, difficult-to-name scents are less likely to induce olfactory imagery, and hence the visual-olfactory effect may not arise.

Although we have provided robust evidence that pictures affect product evaluations via imagined scent, we did not endeavor to compare imagined scents to actual scents. Indeed, Krishna et al. (2014) showed that imagined food scents increased salivation but actual food scents did not. That finding implies that the visual-olfactory effect we have shown likely would not occur in the presence of actual scents. Note, however, that this was precisely the goal of our research: We sought to demonstrate olfactory effects specifically in the absence of actual scents. This is in fact why our experiments do not examine actual scents. Nonetheless, direct comparison of actual and imagined scents could be informative for marketers. Would infusing product labels with actual scents be more effective than merely including pictures of olfactory objects, and if so, would the increased effectiveness justify the increased cost of scent-infused labels?

A related limitation is that, due to our focus on scented products and services, this research did not examine the possibility of imagined ambient scent. Ambient scent is known to have powerful effects on shoppers' thoughts, feelings, and purchases (Bosmans, 2006; Herrmann et al., 2013; Madzharov et al., 2015; Mattila and Wirtz, 2001; Morrin & Ratneshwar, 2000, 2003; Spangenberg et al., 1996). Can pictures of scented objects also induce perceptions of ambient scent? That is, just as the scent of freshly-baked bread can affect shoppers' behavior in a grocery store, can pictures illustrating freshly-baked bread similarly affect consumer behaviors? We suspect that effects of olfactory imagery may require a specific target product to which the imagined scent may be attributed, and hence the effect may not generalize to ambient scent. However, this and many other interesting speculations remain to be tested in future research.

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CHAPTER 4: ROUNDING OFF: A SIMPLE NUDGE TO DONATE, AND TO DONATE MORE, WITH ROUNDED TOTALS

ABSTRACT

Much research examines charitable behavior with a view to increasing donations. In a series of experiments, we show that consumers are likely to choose a donation amount that makes the total of the purchase plus donation "round" (e.g., $30.00). This "Rounding Off" effect can nudge people to donate more than they otherwise would. The preference for rounded totals also increases the likelihood of donating at all. The effect is robust across a variety of contexts, such as donation options that are lower versus higher than the rounding off option; donations that are relatively small versus relatively large; or where the total is explicitly provided versus not, showing its immense potential for increasing donations. We believe that the Rounding Off effect is a simple and low-cost method for nudging people to donate more (and donating at all) to charities, and is driven by fluency in processing of the round total amount. Lastly, we show that this method is extendable to other contexts too, like tipping in a restaurant.

Keywords: helping/prosocial behavior; charity donation; nudge; processing fluency; round numbers.

In recent years, charitable giving has declined. For instance, the percentage of Americans who donate to charities has decreased, and their donations tend to be relatively small: on average, Americans donate only about 2% of their disposable income (Giving USA, 2017). To increase donations, some charities have partnered with retailers, who solicit donations at the point of sale. For instance, Macy's occasionally runs campaigns in which consumers are asked to donate the change from their purchase to the partner charity. In addition, there are a few companies that offer a new payment system, which automatically rounds off all payments made by the customer and sends those cents to a charity of the customer's choice, e.g. Donate Your Change. In such campaigns and companies, the purchase amount is rounded up to the nearest dollar, resulting in relatively small donations ranging from 1 to 99 cents.

Figure 14. Macy's campaign titled "make good cents": asking customers to donate the change from their purchases.

Intuitively, such campaigns may elicit donations because the amounts are small, people value loose change less and are generally averse to receiving coins (Vandoros, 2013). However, we propose that such donations are driven, at least partially, by a preference for round numbers/prices. *Round prices,* which have only zeros in the decimal places (e.g., $3.00), induce stronger feelings of fluency (Coulter & Roggeveen, 2014) and "rightness" (Wadhwa & Zhang, 2015). Round prices can also increase liking of a product (Wadhwa & Zhang, 2015) and willingness to accept an offer when bargaining (Yan & Pena-Marin, 2017). We extend the previous research by focusing on the total amounts that a consumer pays at the point of sale instead of product prices. We show that, after making a purchase, consumers prefer a donation amount that makes their total payment (i.e. purchase plus donation) a rounded total, i.e. RoundingOff effect. If this preference for rounded totals influences donation decisions, then rounded totals could be used to nudge people into donating even higher amounts beyond "the next dollar", and could even prompt purchasers to donate when there are no coins involved in the transaction (e.g., when paying via credit or debit card).

We further show that this effect is due to the fluency associated with a rounded total. Rounded totals are processed more fluently than nonrounded totals, therefore, consumers choose the donation amount associated with this rounded total. Moreover, this effect is present even when people mentally calculate the total amount. This further differentiates rounded 'totals' from rounded 'prices', as it shows that this effect is independent of seeing a final round price. This research extends the research in prosocial behavior, specifically for charitable donation (e.g. Hsee, Zhang, Lu, & Xu, 2013), and demonstrates a nudge that can increase donations and the overall number of donors. This nudge can also be extended to other contexts where, after making a purchase, consumers are asked for a smaller additional expenditure. We demonstrate this in the context of tipping in a restaurant.

ROUNDED PRICES

In daily life, people use round and non-round numbers at different times and for different purposes. In decimal number system, people prefer to report more round numbers (with 0s), halves (with 5s), quarters, and even numbers even for objective questions like age (Yule, 1927). Research shows that people use round numbers more frequently compared to their neighboring numbers, irrespective of the magnitude of the number (Dehaene & Mehler, 1992; Jansen & Pollmann, 2001). Often, round numbers convey estimates, while non-round numbers convey precise measures (Dehaene & Mehler, 1992). Round numbers indicate general figures and/or approximate values (Dehaene, 1997). For instance, when there are 18 people in a room, we tend to say that there are about 20 people, as an approximation. It is uncommon to hear non-round numbers as an approximation.

In addition, round numbers act as cognitive reference points in numerical scales (Rosch, 1975). A cognitive reference point is a standard benchmark against which other stimuli are judged. In general, people convey their benchmarks or goals in terms of round numbers (Pope & Simonsohn, 2011). For example, students orient their goals around exceeding certain round-numbered scores in exams (e.g. GMAT score passing the mark of 700) rather than around non-rounded numbered scores (e.g. GMAT score passing the mark of 723). Another example from research on stock trading data shows that people are more likely to sell a stock once it crosses a rounded price and buy it when it dips below the rounded price (Bhattacharya, Holden, & Jacobsen, 2012). These studies indicate that there is indeed a difference in how people use and perceive round numbers.

Over the last decade, marketing research has shown many other important differences between round numbers and non-round numbers. Round numbers have been shown to

activate associations of a sense of stability (Pena-Marin & Bhargave, 2016), symbolize completion (Yan & Pena-Marin, 2017), and induce a sense of feeling right (Wadhwa & Zhang, 2015). All these effects impact a consumer's final evaluation or behavior. For example, the sense of feeling right amplifies any positive evaluations of products by consumers. Collectively, there is ample support in marketing and psychology for a substantial difference between round numbers and non-round numbers.

In the current paper, we are interested in the context of rounded prices (specifically rounded total amounts). Rounded prices are derived from the concept of round numbers. In business and marketing literature, round numbers are defined as numbers that end in 0s (Pena-Marin & Bhargave 2016). The roundedness of a number increases with increasing number of trailing 0s at the end. Therefore, we use rounded prices as those prices that end with zeros in the decimal places (e.g. $20.00 is a rounded price, whereas $20.21 is not). As a characteristic of rounded prices, there is a shift in the digit to the left of zeros when moving to a rounded price (e.g. from a price of $8.99 to $9.00, the digit to the left of the zeros changed from eight to nine). Rationally, consumers should not respond to such small price differences as those between $2.99 and $3.01, as the difference is miniscule compared to the base price (Monroe, 2003). However, past marketing research shows that when prices end with 9s, they would be perceived smaller if the leftmost digit changes to a lower level, e.g. $7.00 to $6.99 (from a rounded price to a lower non-round price). Note that this difference would not be present if the price is not rounded, e.g., $7.30 to $7.29. While in both these examples prices change by 1 cent, research shows that there is a difference in the perceived smallness of the price only if the comparison includes a rounded price (Thomas & Morwitz, 2005). In some instances (like when using large numbers), people perceive precise values to be smaller than nearby rounded values (Thomas, Simon, & Kadiyali, 2010).

While the above studies show that nonrounded prices could be perceived as smaller and hence could be preferred by consumers (Stiving & Winer, 1997), there are reasons why we think consumers would, in fact, prefer rounded prices. In comparison to nonrounded amounts, rounded amounts (e.g. $3.00) have been shown to subjectively "feel right" (Wadhwa & Zhang 2015) when the context is driven by feelings and the consumer has a positive evaluation of the product. This in turn increases consumers' purchase intentions for products with rounded prices. Similarly, in negotiations, people are more likely to accept an offer that is presented as a rounded price rather than one presented as a nonrounded price (Yan & Pena-Marin 2017).

While intuitively we might not expect potential donors to change their preferences based on miniscule differences in donation amounts, by combining the above insights for donation amounts these preference changes could take place. We hypothesize that, when consumers are asked at the point of sale to donate after a purchase, they are more likely to choose to donate when this donation makes their total amount (purchase plus donation) rounded (compared to when they are nonrounded), termed the *RoundingOff effect*. For example, a consumer would be more likely to agree to donate if after a purchase of $6.25, (s)he is asked to donate $0.75 compared to when (s)he is asked to donate any other neighboring donation amount. Furthermore, in the case of multiple options for donations (with different donation amounts), consumers are more likely to choose a donation option that makes their total amount rounded as compared to a case in which there are no rounded totals present.

TOTAL AMOUNTS

The construct that we are interested in is ‘rounded totals’. Consumers often buy products in a shop and pay a total amount at the point of sale. This total amount can be the price of a single product or a sum total of multiple product prices. Since this total amount is paid after a consumer decides to buy, the total amount probably seems less relevant to the behavior of consumers when compared to product prices. Moreover, it seems that many of the effects from total amounts could be similar to those with normal product prices. Therefore, in general, there has been a limited differential focus on total amounts in marketing. Some research that comes close to the construct of total amounts relates to mental accounting (e.g. Stilley, Inman, & Wakefield, 2010a; Stilley, Inman, & Wakefield, 2010b) and to product bundling (e.g. Gaeth, Levin, Chakraborty, & Levin, 1991; Harlam, Krishna, Lehmann, & Mela, 1995; Johnson, Herrmann, & Bauer, 1999). However, in these studies, the focus is either on mental budgets or bundle prices, which are used by a consumer to make a decision to select a product. This is different from a total amount that a consumer pays after selecting products. Therefore, these focus on a different construct than the actual total amount paid at the point of sale.

In contrast to the signals from existing research, total amounts could be pertinent to consumer research for two reasons. Firstly, total amounts can still affect a consumer’s ultimate decision to pay for a product or remove/replace a product. Secondly, total amounts can impact the decisions that consumers make at the point of sale (e.g. impulse buying at the counter if the total amount seems smaller than expected). The current research focuses on the second reason, showing the impact of total prices on consumers’ decisions to donate at the point of sale.

The focus on total amounts also delves into a different line of inquiry than previous research on individual prices. Individual prices that have been researched before for their

roundedness (Wadhwa & Zhang, 2014) are concerned with the preference for the product itself. This preference cannot be applied to a decision for an unrelated additional payment, like a charitable donation. In addition, as we are investigating total amounts and not just prices, any preferences for donation should still hold if consumers have to mentally calculate these amounts. Therefore, we hypothesize that the RoundingOff effect would still be present when consumers have to mentally add the purchase amount and the donation amount.

ROUNDED TOTALS AND FLUENCY

Processing fluency is the subjective experience of ease with which people process information, which is a metacognitive experience of processing a thought (Alter and Oppenheimer, 2009). When a person is repeatedly exposed to a stimuli, s(he) will form a memory representation of this stimulus. This representation will make the stimulus more fluently processed when it is encountered again (Janiszewski & Meyvis, 2001; Lee & Labroo, 2004). Since round numbers are more frequently used than nonround numbers (Dehaene & Mehler, 1992; Jansen & Pollmann, 2001), round numbers could be more fluently processed than nonround numbers.

Marketing research shows that, in marketing promotions, rounded prices are more fluently processed (Coulter & Roggeveen, 2014). Similarly, for large numbers, nonround prices (or precise prices) are shown to be more difficult to process than rounded prices (Thomas, Simon, & Kadiyali, 2010). Therefore, we expect that seeing a rounded total could make a donation option appear more fluent than other options with nonrounded totals.

How does fluent processing of rounded totals impact people's decision to donate? Consumers like fluently processed stimuli over non-fluent ones (Reber, Schwartz, &

Winkielman, 2004). Fluency influences judgments, therefore, any variables that can increase fluency may also affect judgments. A large body of literature shows positive effects of fluent processing, e.g., fluent processing can lead to more favorable attitudes towards a brand (Lee & Labroo, 2004), higher liking of a product (Labroo, Dhar, & Schwarz, 2007), choice of a travel destination (Petrova & Cialdini, 2005), and more positive reactions to visual stimuli (Reber, Winkielman, & Schwarz, 1998; Winkielman & Cacioppo, 2001). We investigate whether fluency associated with a rounded total amount can impact people's preferences for making donations. Specifically, we expect that people would prefer a donation amount that results in a rounded total, as this total amount could be more fluently processed. We therefore hypothesize that the RoundingOff effect is mediated by fluency associated with rounded totals.

In order to investigate the fluency mechanism, we have to consider the impact of loose currency. Earlier research on rounded prices has not considered that coins or loose change could affect people's choices. People value coins and change less than a whole currency note (Vandoros, 2013), and therefore it might be easier for them to spend change. In addition, compared to a currency note, coins are a pain to carry. Therefore, it is possible that people prefer a rounded total amount to avoid carrying loose change, or that people simply do not value change. However, if the RoundingOff effect is driven by fluency, it would also exist when we consider electronic transactions (no coins). In addition, the explanation based on an aversion to coins indicates that this effect would only be present if the change is just a few coins. On the other hand, our explanation regarding fluency holds true independent of the value of the change. Therefore, we expect that the effect would still hold when we move beyond 'next dollar rounding'.

OVERVIEW OF STUDIES

We report eight studies that test the RoundingOff effect. The first six studies demonstrate the effect for charitable donations, and are followed by two studies that extend the effect to another domain (i.e. tipping in a restaurant). We show mediation by fluency in study 3. In study 4, we show that seeing a rounded total is not required for the effect, as people can mentally calculate the total. Our studies are also designed to rule out many other possible explanations of the effect. In study 1, we have used cash as the payment method (preregistered and incentive-compatible), while for the other studies we have used electronic transactions (hypothetical debit or credit card payment) as the payment method. We also investigate rounding off to the next dollar amount (study 1) and to higher dollar amounts (other studies). These two investigations (electronic payments and higher dollar rounding) rule out the idea that the RoundingOff effect is simply due to an aversion to coins.

We tested the effect using many different manipulations to increase the generality, reliability, and robustness of the effect. For generality, we have used three different scenarios to test the effect: donation for wildlife conservation (study 1), donation for arts and crafts talent development (study 2-6), and restaurant tipping (study 7-8). In addition, we use two different study designs to either nudge people into increasing their individual donation amounts or to nudge more people into donating. Out of the six studies for charitable donations, studies 1, 5, and 6 show an increase in individual donation amounts, and studies 2, 3, and 4 show an increase in the number of donors.

For reliability, we tested the effect eight times across studies. We have also used different ways to create the rounded versus control conditions in order to ensure that the effect does not arise in just one type of manipulation. We have either changed the amount of

donation in one option, i.e. the option that makes a rounded total in the rounded condition (study 1, 3, 4, 6 and 8), or varied the initial purchase amount for each condition (study 2, 5, and 7). We also changed the amounts that are varied in each study to make sure that these effects are robust. We have used different purchase amounts, donation percentages (used to calculate the donations amounts used in the studies), and differences in donation amounts between rounded conditions and control.

Lastly, all the conditions in each study have exactly the same instructions and questions to ensure that there are no effects of framing or language. For example, we did not use any term like ‘round up’ or ‘round off’, as using these terms could lead to activation of different associations from these words. These effects might not sustain when these appeals use different words. Therefore, in our studies, the only differences in various conditions are the amounts, which helps to show only the effect of whether the totals are rounded or not.

STUDY 1: ROUNDINGOFF EFFECT

Study 1 provided a preregistered (see Appendix for details), incentive-compatible test of the RoundingOff effect. Participants purchased a postcard, and then decided how much to donate to a charity, from options of no donation, small donation, or large donation. Critically, the purchase and large donation amounts either summed to a rounded total (€2.00) or not (€1.95). Except for the difference between these two donation amounts, there is no difference between these two conditions.

Methods

Design. Participants in Study 1 were randomly assigned to one of two between-participant conditions, in which the total amount of the critical donation option was either rounded or nonrounded.

Participants. Given the absence of prior knowledge of effect size, we sampled 100 participants per condition for all the donation studies. Thus, 200 students (M = 21 years, SD = 2; 102 male) at a large European university took part in the study.

Procedure. Students at a university campus were asked to participate in a study related to charity donation. At the beginning of the study, participants were awarded €2.50 for participating, and they immediately were given the amount in coins (i.e., one €2.00 coin and one €0.50 coin). They were further told that they should use this amount for any expenditure in the study. Participants were then provided a sheet of paper, on which they indicated their student ID, gender and age before reading the instructions.

Next, they were shown a collection of wildlife postcards (Figure 15). They were informed that each postcard costs €1.55, and that they were required to purchase one with the money they had been given. After making their postcard choice, they were told about a charity (i.e., *European Wildlife*) involved with nature preservation and wildlife conservation. Specifically, the instructions were, "There are some post cards in front of you. The theme of these cards is nature. The company producing the cards plants a tree after selling a set number of post cards. They thus help in creating a sustainable environment. The cost of a single card is €1.55. Please go ahead and choose a card of your choice. Take as much time as you need for the selection."

Finally, participants were asked whether they would like to donate to the charity, and they were presented three options. The options separately indicated both the charity donation amount and the total amount (i.e. postcard purchase plus charity donation). The first two

options were common across both conditions of the experiment: no donation (total amount of €1.55), or €0.20 donation (total amount of €1.75). Critically, the third and largest donation option differed between the two conditions. In the *nonrounded* condition, the final option was €0.40 donation (total amount of €1.95), whereas in the *rounded* condition, the final option was €0.45 donation (total amount of €2.00).

Figure 15. Wildlife postcards used in Study 1.

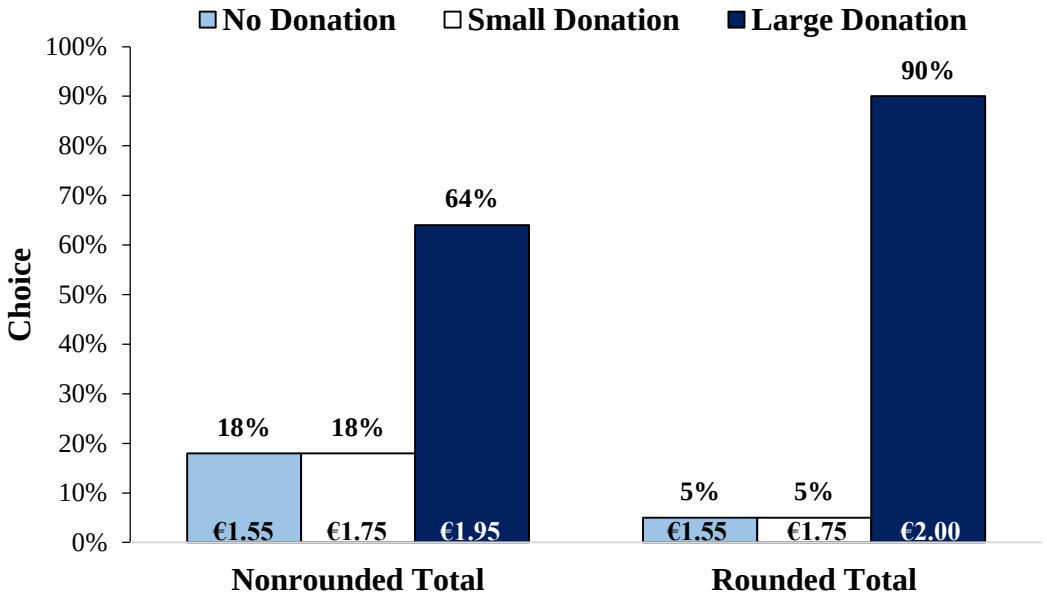
The specific instructions were, “In addition to the purchase of the card, we would like to offer you an opportunity to donate a small amount (from the initial amount of €2.50) to European Wildlife, a charity involved with nature preservation and wildlife conservation. Their key objective is to conserve biological diversity and to reduce the impact of climatic changes on nature and humankind. This donation would be in addition to your purchase of €1.55 and would be deducted from your initial amount of €2.50.”

Participants then indicated their donation choice and paid the total amount in cash with the money they had been given. They received their chosen postcard and kept the remaining amount of cash. At the conclusion of data collection, we summed the donation amounts of all participants and donated that sum to *European Wildlife* on participants’ behalf.

Results

Choice distributions (see Figure 2) differed significantly between conditions, Pearson $\chi^2(2) = 19.38$, $p < .001$. In particular, choice of the large donation amount (i.e., €1.95 vs €2.00) differed significantly between conditions, $\chi^2(1) = 4.39$, $p = .036$. In the nonrounded condition, 64% of participants chose the large donation amount (i.e., €0.40 donation, with total cost of €1.95). In the rounded condition, however, 90% of participants chose the large donation amount (i.e., €0.45 donation, with total cost of €2.00).

Figure 16. Results of Study 1. Total amounts (i.e., purchase + donation) are shown at the base of each bar, and choice %s are shown at the top.



Thus, presenting a total amount that was rounded (i.e., €2.00) successfully nudged people to donate more money. This preregistered, incentive-compatible study provides strong initial evidence of the RoundingOff effect.

STUDY 2: ROUNDING BEYOND THE NEAREST DOLLAR VIA ELECTRONIC TRANSACTION

Study 2 tested whether rounded totals can increase not only *donation amounts* (as in Study 1), but also the *number of donors*. Study 2 also tested our two novel hypotheses: We used a hypothetical scenario involving an electronic transaction (i.e., purchasing with a credit or debit card), and a donation amount that went beyond the nearest dollar (i.e., from a purchase amount of $26.08 to a total amount of $30.00). Lastly, this study also rules out that rounded totals affect donation decisions because of different perceived value from a rounded total (i.e. $30.00) and a comparable nonrounded total (i.e. $29.64) that is slightly lower than the rounded total. This difference is possible as the rounded total has a higher first digit than the lower nonrounded total (i.e. ‘3’ versus ‘2’ in $30.00 versus $29.64). This could impact the

value associated with the donation, i.e. the rounded total could be associated with higher value of donation. Study 2 introduces an additional control condition with a total amount that is slightly higher than the rounded total (i.e. $30.34) in order to show that the effect only occurs for the rounded total, ruling out any value related alternate explanations.

General Methods, Studies 2-4

We standardized several aspects of our methods. (1) For generalizability and consistency, we again aimed to sample approximately 100 participants in all conditions of all donation studies. (2) We used the same basic scenario in all studies. Only the purchase and donation amounts, and some minor aspects of the presentation, varied across studies. (3) To encourage meaningful responses, we used the same attention check in all studies, administered pre-manipulation. (4) We used the same exclusion criterion in all studies, based on participants' responses to the attention check.

In all of our online studies (i.e., Studies 2-8), we used the same *introductory block* in which participants first provided informed consent, indicated their sex and age, and then completed the following attention check: "How much attention are you willing and able to dedicate to this very brief study? If you select VERY LITTLE, then we will have to reject your work." The only response options were "Very little" and "A whole lot." All and only participants who failed this attention check were excluded from analyses.

Also in all of our online studies for donations, we used as the scenario an arts and crafts fair. Participants viewed a poster of an arts and crafts fair (see Figure 3), and we asked them to imagine that the fair came to their city, they visited it, and they purchased some products there. Specifically, they were told, ""Imagine the following: The fair shown in the above picture is held in your city. You visit and purchase some products at the fair. The price of all the products you purchase is $[purchase price varied across studies] (including taxes). You go

to the payment counter to pay the amount using a card (credit or debit).” After reading these instructions, participants advanced to the next page.

We then described a charity (i.e., American Art Revival) and asked whether they would be interested in donating to it. Participants were then asked to choose from some donation options that varied in amount and, critically, whether the total amount (purchase + donation) was rounded or not. Finally, before participants chose a donation amount, they were informed that they would be paying by a debit or credit card.

The specific instructions were, “The cashier informs you that there are two options for payment, i.e. option A and option B. In option A, you pay [purchase amount including taxes] in total, for your purchase. In option B, you pay [purchase amount including taxes + [donation amount] (donation to American Art Revival) = [total amount is visible for all studies except for total amount absent conditions in study 4]. American Art Revival is a charitable organization supported by the fair. They are involved in promoting small artists and in proliferating various arts and crafts activities in the USA. They are seeking donations to build a school of arts and crafts in order to train underprivileged talents. Your donation (a small percentage of your purchase amount) will be used for this purpose. Imagine that you are paying the amount by card (credit or debit).”

We now turn specifically to Study 2.

Figure 17. Arts and Crafts fair stimuli.

Methods, Study 2

Design. Participants were randomly assigned to one of three between-participant conditions, in which the total amount was either *nonrounded-lower* (than rounded), *rounded*, or *nonrounded-higher* (than rounded).

Participants. 303 US-based respondents (*M* = 35 years, *SD* = 11; 128 male) on Amazon's Mechanical Turk participated (Paolacci & Chandler, 2014). No participant failed the attention check, so all were included in analyses.

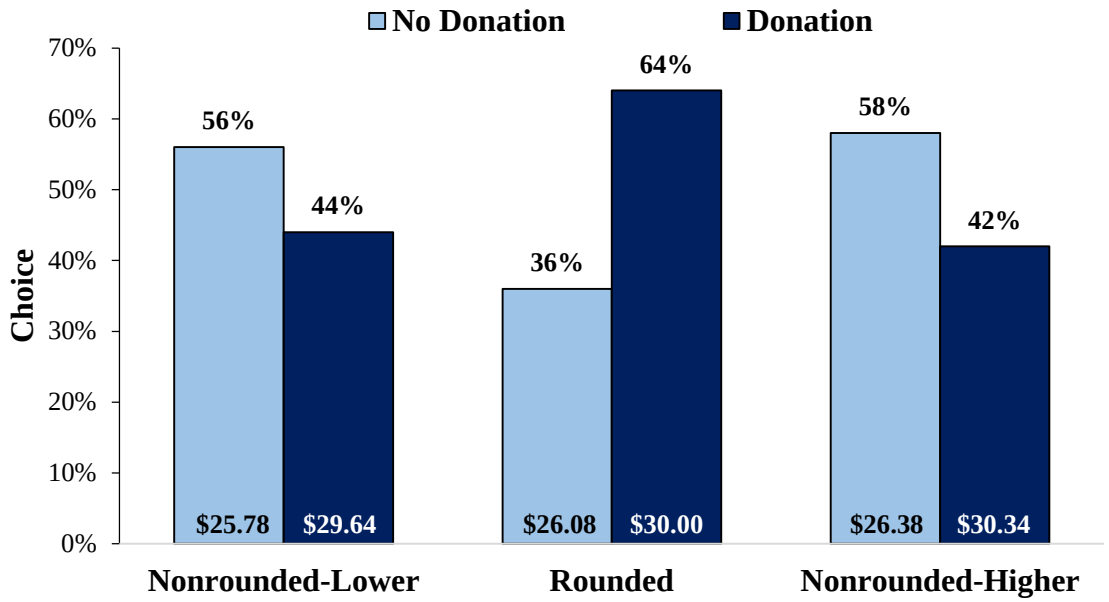
Procedure. After completing the introductory block and reading the scenario about the arts and crafts fair, participants imagined purchasing products there, and then they were given two options: to donate or not to donate to the American Art Revival charity. In the previous study we manipulated the total $ amount by holding constant the purchase $ amount and

altering the donation $ amounts. In the present study we instead altered the purchase amount and held constant the donation percentage (i.e., 15% of purchase price donated). In the *nonrounded-lower* condition, the hypothetical purchase amount was $25.78, and participants chose between no-donation (presented as "Total amount: $25.78"), and donation ("Total amount: $29.64", with the donation amount of $3.86). In the *rounded* condition, participants chose between no-donation ("Total amount: $26.08") and donation ("Total amount: $30.00" with the donation amount of $3.92). In the *nonrounded-higher* condition, similarly, participants chose between no-donation ("Total amount: $26.38") and donation ("Total amount: $30.34" with the donation amount of $3.96).

Results

Choice distributions across the three conditions, shown in Figure 4, differed significantly, $\chi^2(2) = 12.27$, $p = .002$. As predicted, participants were more likely to donate when the total amount was rounded ($30.00; 64% choice) than when it was nonrounded and either lower ($29.64; 44% choice, $\chi^2(1) = 8.39$, $p = .004$) or higher ($30.34; 42% choice, $\chi^2(1) = 10.04$, $p = .002$). Thus, in addition to increasing donation amounts, the RoundingOff effect can also increase the number of donors. Critically, this RoundingOff effect occurred even though the rounded total was beyond the nearest whole unit (i.e., from $26.08 to $30.00; rounding to tens of dollars), and even though the transaction was electronic and therefore involved no change.

Figure 18. Results of Study 2. Total amounts (i.e., purchase + donation) are shown at the base of each bar, and choice %s are shown at the top.



STUDY 3: MEDIATION BY PROCESSING FLUENCY

Round numbers are processed more fluently than nonround numbers (Coulter & Roggeveen, 2014). Study 3 therefore tested whether processing fluency underlies the RoundingOff effect. The procedure was similar to the preceding study, but here we additionally measured the simplicity and ease of processing the total amount.

Methods

Design. Participants were randomly assigned to one of two between-participant conditions in which the total amount of the donation option was either rounded or nonrounded.

Participants. 201 US-based respondents (*M* = 36 years, *SD* = 11; 77 male) on Mechanical Turk participated. Three participants who failed the attention check were excluded from analyses (1%), leaving 198 valid participants.

Procedure. Participants completed the introductory block and read about the arts and crafts fair (see General Methods above). The hypothetical purchase amount ($27.64) was held constant across all options in both conditions. In the rounded condition, the options were presented as "Total amount: $27.64, Donation: no donation" and "Total amount: $30.00, Donation: $2.36". In the nonrounded condition, the options were "Total amount: $27.64, Donation: no donation" and "Total amount: $29.82, Donation: $2.18".

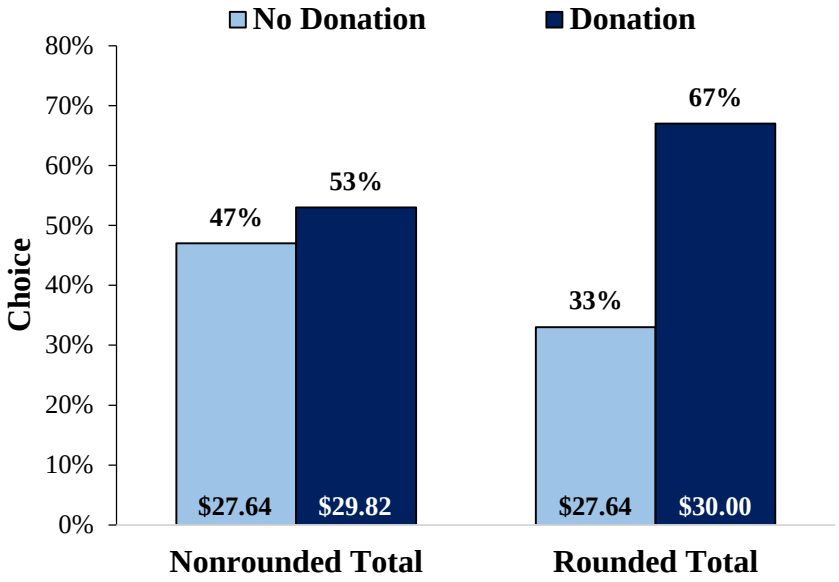
After making their choice to donate or not, participants advanced to a subsequent page of the online questionnaire, and they were prevented from going back to the choice page. Regardless of whether they had chosen to donate or not, they were reminded of the total amount for the donation option, which was $30.00 in the rounded condition or $29.82 in the nonrounded condition. Participants then rated their level of agreement, on a scale from 1 ("strongly disagree") to 7 ("strongly agree"), with four statements measuring processing fluency: "This amount is simple," "This amount is not complex," "I can easily process this amount," and "I can easily understand this amount." The order of these statements was randomized. Note that all participants rated the total amount of the donation option that they saw (i.e., $30.00 or $29.82), regardless of whether they had chosen that option; we tested whether their ratings of processing fluency predicted whether they chose that donation option or not.

Results

As shown in Figure 5, participants again were more likely to donate when the total amount was rounded ($30.00; 67% choice) than when it was nonrounded ($29.82; 53% choice), $\chi^2(1) = 3.80$, $p = .051$. The four processing fluency items exhibited good reliability (Cronbach $\alpha = .92$), so they were averaged to create a single measure of fluency. Bootstrap mediation analysis (Hayes 2015, model 4, 10K samples) revealed a significant indirect effect,

B = .32, *SE* = .12, 95% *CI* [.12, .61]. More specifically, the rounded total increased fluency (*B* = .65, *p* < .001), which in turn increased the likelihood of donating (*B* = .49, *p* = .001). The direct effect was nonsignificant (*p* = .37). These results indicate that rounded totals increase donations because they are easier to process than nonrounded totals.

Figure 19. Results of Study 3. Total amounts (i.e., purchase + donation) are shown at the base of each bar, and choice %s are shown at the top. the top.



STUDY 4: MENTAL ROUNDING

Study 4 tested whether the RoundingOff effect also occurs when the rounded total is not explicitly provided, but merely implied ($27.60 purchase + $2.40 donation). For the RoundingOff effect to occur here, participants must mentally sum the purchase and donation amounts themselves. Mental arithmetic is effortful, hence it could reduce the fluency associated with the task (Alter & Oppenheimer, 2009). However, since the effort is required

for both the nonrounded total and the rounded total, we predicted that rounded totals would still be preferred over nonrounded totals.

Methods

Design. Participants were assigned randomly to one condition of the 2 (total amount: rounded, nonrounded) × 2 (Presence of Total: present, absent) between-participants design.

Participants. 401 US-based respondents (M = 34 years, SD = 12; 214 male) recruited from Prolific participated in the study. Four participants who failed the attention check were excluded from analyses (1%), leaving 397 valid participants.

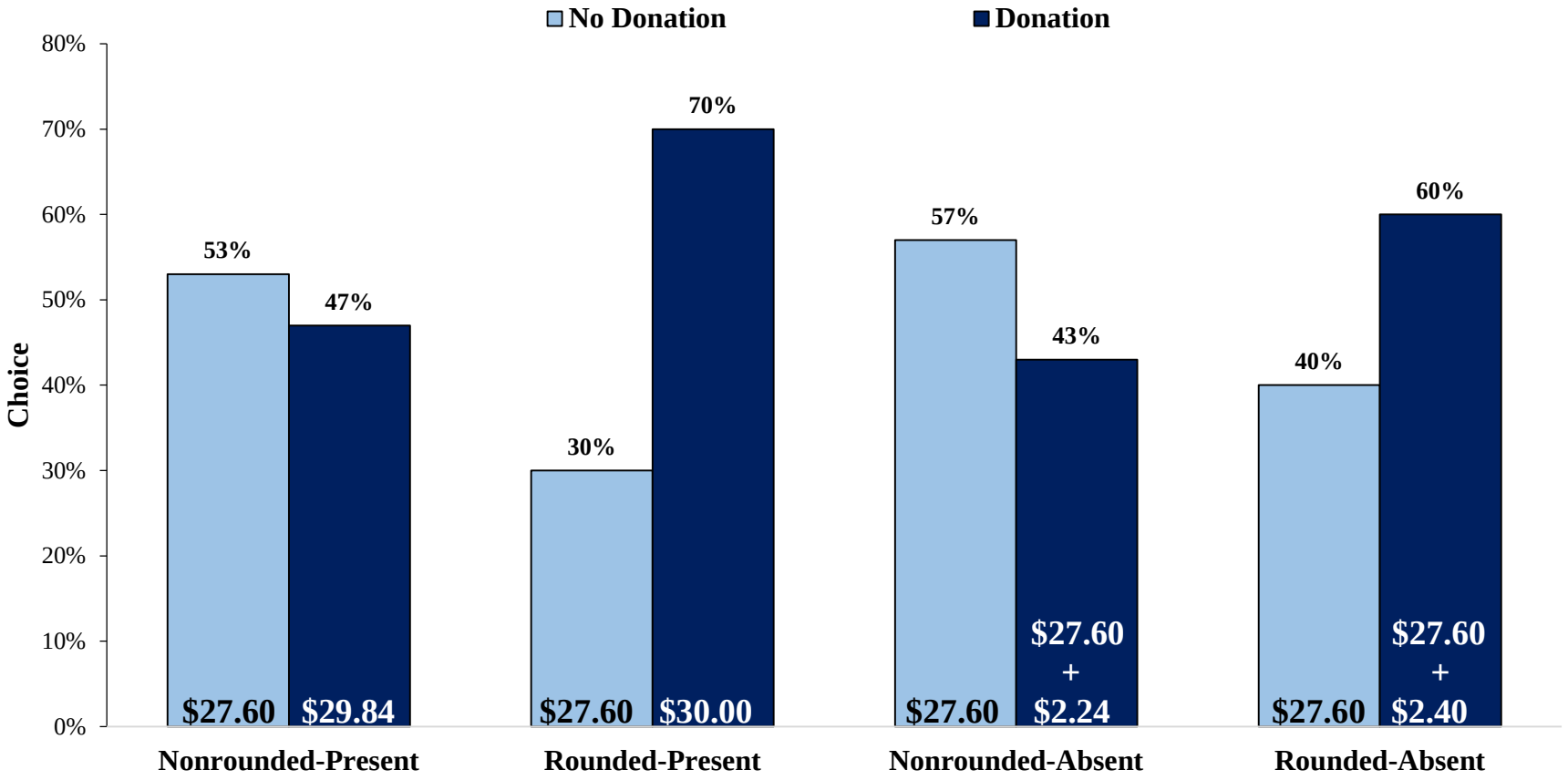
Procedure. Participants completed the introductory block and read about the arts and crafts fair. The hypothetical purchase amount was $27.60 in all conditions. In all conditions, participants were told the purchase amount and optional donation amount before making a choice to donate or not, and the no-donation option was presented as "Total amount: $27.60". In the rounded conditions, the donation amount was $2.40. Thus, in the *Rounded-Present* condition, the donation option was presented as "Total amount: $30.00". However, in the *Rounded-Absent* condition, the summed total was omitted: Here the donation option was presented as "Total amount: $27.60 + $2.40". The nonrounded conditions were analogous, but with a donation amount of $2.24. In the *Nonrounded-Present* condition, the donation option was presented as "Total amount: $29.84". In the *Nonrounded-Absent* condition, it was presented as "Total amount: $27.60 + $2.24".

Results

As illustrated in Figure 6, choice distributions differed significantly across the four conditions, $\chi^2(3) = 18.66$, $p < .001$. Overall, only 45% of participants chose to hypothetically donate when the total amount was nonrounded ($29.84), whereas 65% chose to donate when the total was rounded ($30.00). This difference was significant, $\chi^2(1) = 15.93$, $p < .001$,

demonstrating the RoundingOff effect overall. The RoundingOff effect was significant not only when the total was present, $\chi^2(1) = 11.54$, $p = .001$, but also when the total was absent, $\chi^2(1) = 5.18$, $p = .023$. To test whether the effect size differed significantly between the *Present* and *Absent* conditions, we conducted a binary logistic regression with choice (0 = no donation, 1 = donation) regressed on total amount (0 = nonrounded, 1 = rounded), total presence (0 = absent, 1 = present), and their interaction. The nonsignificant interaction, $p = .401$, indicated no significant difference in effect size across conditions. Thus, rounded totals increased the number of donors even when the total was left implicit ($27.60 purchase + $2.40 donation), and in fact that RoundingOff effect was of comparable size to when the total amount was explicitly stated ($30.00).

Figure 20. Results of Study 4. Total amounts (i.e., purchase + donation) are shown at the base of each bar, and choice %s are shown at the top.



STUDY 5: INCREASING DONATION AMOUNTS WITH ELECTRONIC PAYMENT

Study 5 used a hypothetical scenario to test whether rounded totals can increase donation amounts if participants are instructed to pay via an electronic transaction (i.e., purchasing with a credit or debit card). Therefore, this study replicates the results from study 1, removing any effects of pain of carrying coins. Similar to the previous three studies, the scenario used in this study is an arts and crafts fair, however, the context is of increasing individual donation amounts (similar to study 1) and not increasing number of donors (study 2, study 3 and study 4).

General Methods, Studies 5-6

Studies 5 and 6 are very similar to studies 2-4 in terms of procedure. We have used the same introductory block as before, where participants first provided informed consent, indicated their sex and age, and then completed an attention check. Then we gave them the scenario for an arts and crafts fair. Just like in previous studies, the first page of instructions indicated that an arts and crafts fair visited their city and they made some purchase there. Specifically, "Imagine the following: The fair shown in the above picture is held in your city. You visit and purchase some products at the fair. The price of all the products you purchase is $[purchase price varied across studies] (including taxes). You go to the payment counter to pay the amount using a card (credit or debit)." Then they advanced to the next page.

On this page, there were some differences in the specific instructions. Since compared to the previous studies, study 5 and study 6 provided multiple donation options to the participant, we gave an overview of the charity to the participant but did not specify the options in the instructions. The specific instructions were, "The cashier at the payment counter informs you that the fair also runs a charitable organization. They would really

appreciate small donations to build a school of arts and crafts in order to train underprivileged talents. Normally, visitors at the fair choose to donate small percent of their total purchase. Imagine that you are paying the amount by card (credit or debit).” After reading this, participants saw all the options below these instructions.

Design. Participants were randomly assigned to one of three between-participant conditions, in which the total amount was either *nonrounded-lower* (than rounded), *rounded*, or *nonrounded-higher* (than rounded).

Participants. Participants were 300 US-based respondents (M = 36 years, SD = 12; 131 male) recruited on Amazon’s Mechanical Turk. Five participants who failed the attention check were excluded from analyses (2%), leaving 295 valid participants.

Procedure. Participants read the scenario about the arts and crafts fair (see Appendix). Similar to Study 2, we manipulated the initial purchase amount to create three conditions, in which the highest donation amount makes either a rounded total (in rounded condition) or a total slightly lower (nonrounded-lower condition) or higher (nonrounded-higher condition) than the rounded amount. The initial purchase amounts in the three conditions were $27.10 in the nonrounded-lower condition, $27.30 in the rounded condition, and $27.50 in the nonrounded-higher condition.

In all conditions, participants saw four options to choose from: no donation, 5% of purchase amount as donation, 7.5% of purchase amount as donation and 10% of purchase amount as donation. Specifically, in the *nonrounded-lower* condition, participants chose between no-donation (presented as “Total amount: $27.10”), 5% donation (“Total amount: $28.46”, with the donation amount of $1.36), 7.5% donation (“Total amount: $29.13”, with the donation amount of $2.03) and 10% donation (“Total amount: $29.81”, with the donation amount of $2.71). In the *rounded* condition, participants chose between no-donation (“Total

amount: $27.30"), 5% donation ("Total amount: $28.68", with the donation amount of $1.38), 7.5% donation ("Total amount: $29.34", with the donation amount of $2.04) and 10% donation ("Total amount: $30.00", with the donation amount of $2.70). In the *nonrounded-higher* condition, similarly, participants chose between no-donation ("Total amount: $27.50"), 5% donation ("Total amount: $28.87", with the donation amount of $1.37), 7.5% donation ("Total amount: $29.56", with the donation amount of $2.06) and 10% donation ("Total amount: $30.36", with the donation amount of $2.86). The total amounts and the corresponding donation amounts are indicated in Figure 21.

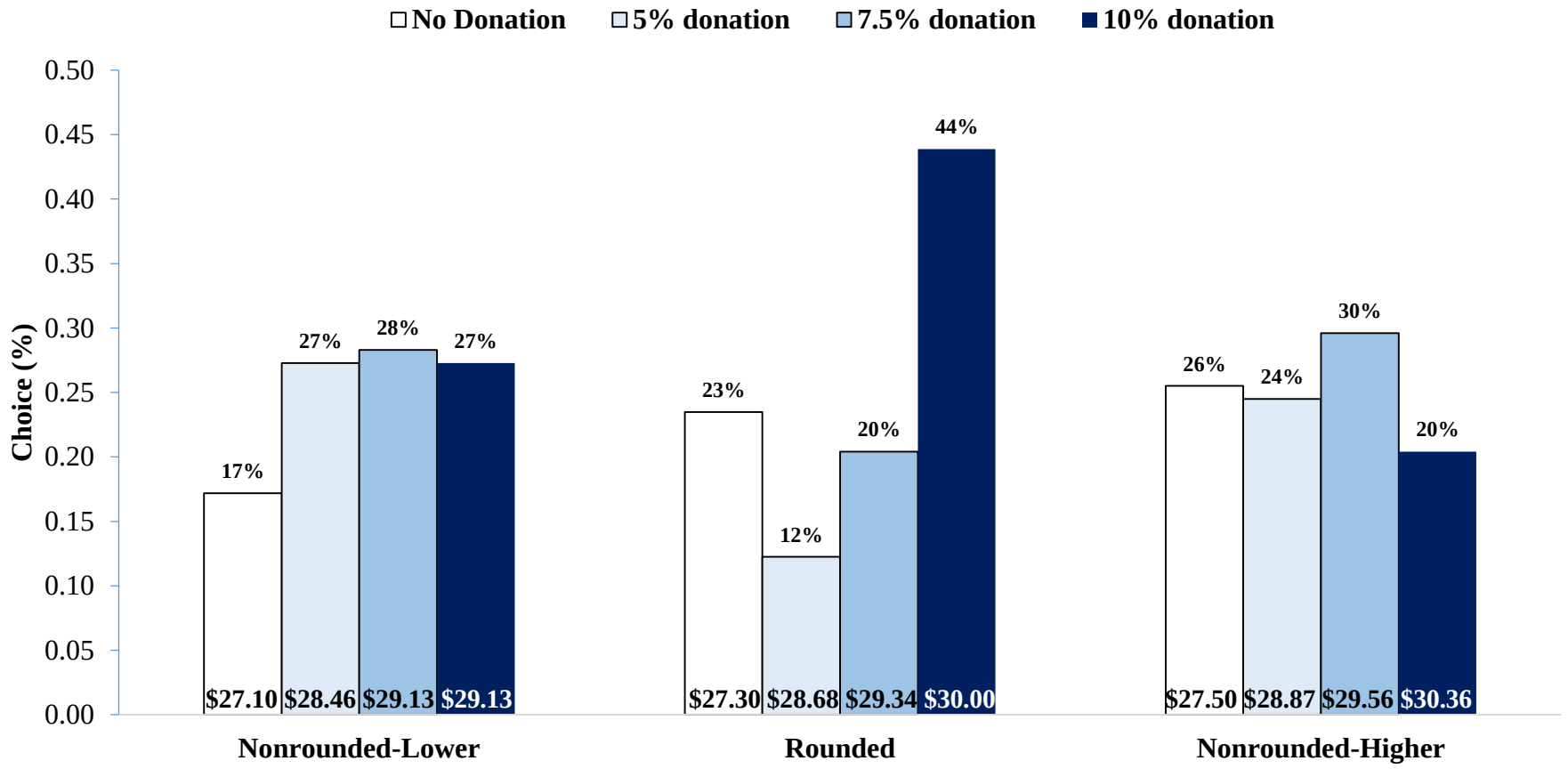
Figure 21. Overview of experimental conditions in Study 5.

		Total Amount	
Option/Condition	**Nonrounded-lower**	**Rounded**	**Nonrounded-higher**
No donation	$27.10, no donation	$27.30, no donation	$27.50, no donation
5% donation	$28.46, $1.36 donation	$28.68, $1.38 donation	$28.87, $1.37 donation
7.5% donation	$29.13, $2.03	$29.34, $2.04 donation	$29.56, $2.06
10% donation	**$29.81, $2.71 donation**	**$30.00, $2.70 donation**	**$30.36, $2.86 donation**

Results

Choice distributions across the three conditions, shown in Figure 21, differed significantly, $\chi^2(6) = 18.79$, $p = .005$. As predicted, participants were more likely to donate when the total amount was rounded ($30.00; 44% choice) than when it was nonrounded and either lower ($29.81; 27% choice, $\chi^2(1) = 4.07$, $p = .044$) or higher ($30.36; 20% choice, $\chi^2(1) = 9.00$, $p = .003$). Thus, people chose the higher donation option if it makes the total rounded. Therefore the current study shows that rounded totals can increase individual donation amounts, replicating the findings from study 1. More importantly, this effect was present even when the rounded total was beyond the nearest whole unit (i.e., from $27.30 to $30.00) and the transaction was electronic and therefore involved no coins.

Figure 22. Results of Study 5. Total amounts (i.e., purchase + donation) are shown at the base of each bar, and choice %s are shown at the top.



STUDY 6: ROUNDING OFF CAN INCREASE OR DECREASE DONATIONS

All the previous studies have shown the effect of rounded totals in increasing the number of donors and the individual donation amounts. The current study tested whether rounded totals can nudge donation amounts not only upwards (i.e. increase donation amounts), but also downwards. This study aims to remove any differential effects of rounded totals at certain positions in the option set and show general attractiveness of the rounded totals, providing further support to fluency as a mediator for the effect.

Methods

Design. Participants were randomly assigned to one condition of a 2 (total amount: rounded, nonrounded) × 2 (relative amount: higher, lower) between-participants design.

Participants. Participants were 405 US-based respondents (*M* = 34 years, *SD* = 12; 154 male) recruited on Amazon's Mechanical Turk. Seven participants who failed the attention check were excluded from analyses (2%), leaving 398 valid participants.

Figure 23. Overview of experimental conditions in Study 6.

Relative Amount	Total Amount	
	Nonrounded	Rounded
Higher	\$27.30, no donation \$28.70, \$1.40 donation **\$29.90, \$2.60 donation**	\$27.30, no donation \$28.70, \$1.40 donation **\$30.00, \$2.70 donation**
Lower	\$27.30, no donation **\$29.90, \$2.60 donation** \$31.40, \$4.10 donation	\$27.30, no donation **\$30.00, \$2.70 donation** \$31.40, \$4.10 donation

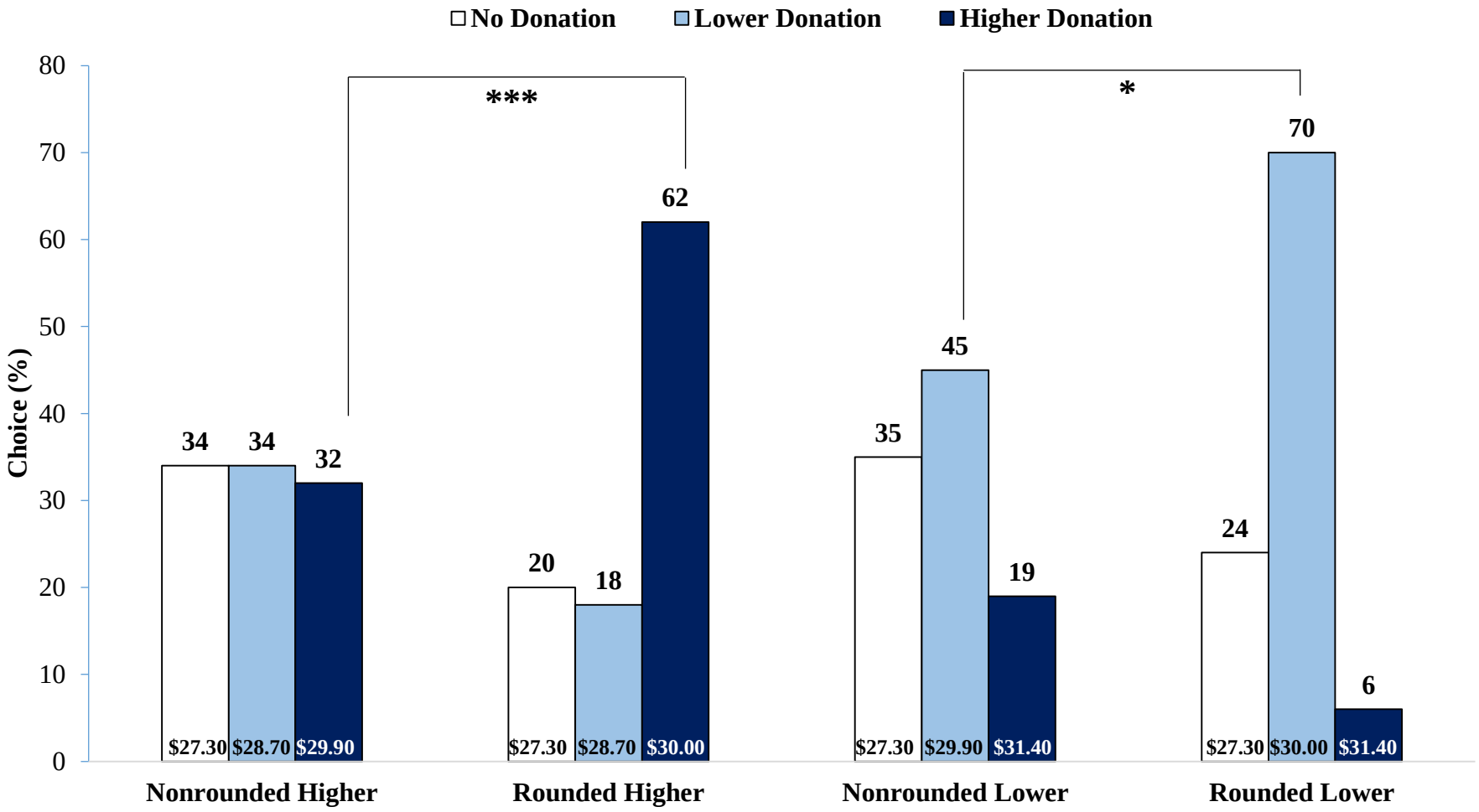
Procedure. After reading the scenario about the arts and crafts fair (see Appendix), participants imagined purchasing products worth $27.30 (including taxes) at the fair, and they chose how much they would donate at the point of sale. All participants were given three options, one of which was for no donation ("Total amount: $27.30, Donation: No donation"). Our manipulations were embedded in the other two options given to participants. The four option sets, corresponding to the four conditions of the design, are shown in the Figure 9.

Participants in the *rounded* conditions were given an option with a total amount of $30.00 ("Total amount: $30.00, Donation: $2.70"), whereas participants in the *nonrounded* conditions were given a comparable option with a total amount of $29.90 ("Total amount: $29.90, Donation: $2.60"). The RoundingOff effect would again be observed as a higher choice percentage for the rounded option than for this comparable nonrounded option. Moreover, the amount of that critical rounded or nonrounded option was either higher or lower than the other option given to participants. In the *higher* conditions, the critical option ($30.00 or $29.90) was higher than the other option ("Total amount: $28.70, Donation: $1.40"), whereas in the *lower* conditions, the critical option ($30.00 or $29.90) was lower than the other option ("Total amount: $31.40, Donation: $4.10"). These higher and lower conditions allowed us to observe whether the rounded total could shift participants' donations both upward and downward.

Results

The choice distributions across the four conditions, shown in Figure 10, differed significantly, $\chi^2(6) = 43.37$, $p < .001$. Overall, in the nonrounded conditions, 39% of the participants chose the nonrounded total option ($29.90). In the rounded conditions, however, 66% of the participants chose the comparable rounded total option ($30.00). This difference was significant, $\chi^2(2) = 31.39$, $p < .001$, demonstrating the RoundingOff effect overall.

Figure 24. Results of Study 6. Total amounts (i.e., purchase + donation) are shown at the base of each bar, and choice %s are shown at the top.



The choice distributions also differed significantly within the higher conditions only, $\chi^2(2) = 18.42$, $p < .001$, and within the lower conditions only, $\chi^2(2) = 14.62$, $p = .001$. More specifically, choice of the rounded option ($30.00) was significantly greater than choice of the comparable nonrounded option ($29.90) within both the higher conditions, $\chi^2(1) = 10.84$, $p = .001$, and the lower conditions, $\chi^2(1) = 5.82$, $p = .016$. Notably, this created a shift in participants' choices within the option sets, such that they were more likely to choose the higher or lower donation option depending on which was rounded. This study provides more support to fluency as a mediator of the effect as the rounded totals are shown to be attractive irrespective of whether they are increasing or decreasing the donation amounts.

STUDY 7: ROUNDING OFF IN TIPPING

Tipping refers to the extra money given to thank someone who has provided you with a service (e.g. tipping your waiter in a restaurant). Since fluency drives the RoundingOff effect, rounded totals can potentially impact other similar contexts too. In the next two studies, we show support for the RoundingOff effect in the context of tipping, hence extending the scope of the effect beyond the context of donations.

Methods

Design. Participants were randomly assigned to one of the two between participant conditions (total amount: rounded, nonrounded).

Participants. For the tipping studies (study 7 and study 8), we have kept a sample size of 150 participants per condition. The increase in sample size is done to take care of potential drop in the effect size of the effect. We expected this drop as unlike donations people have stronger preferences for certain tipping percentages, which could make them choose these

irrespective of whether that option makes a rounded total bill or not. Participants were 303 US-based respondents (M = 35 years, SD = 11; 127 male) recruited on Amazon's Mechanical Turk. Five participants who failed the attention check were excluded from analysis, leaving a sample of 298 valid participants.

Procedure. For all the tipping studies, the procedure is the same. Participants completed the same *introductory block* as the other studies. Participants were shown a photo of a restaurant (see Figure 11) and we asked them to imagine that they dined in this restaurant with their friends and agreed to pay the bill individually. We described their experience at the restaurant to be good and presented them with a bill amount (after taxes). The specific instructions were, "Imagine that you and some of your friends go to a nice restaurant in a city (in US) you are visiting. This restaurant has been recommended to you by some of the people you know from this city. Imagine yourself sitting in the restaurant (see picture above) and enjoying the food and company of your friends. The food was good and you had a nice experience in the restaurant. You all decided to pay separately. The total amount for you is [amount based on conditions] including taxes."

Then the participant advances to the next page. Here s(he) is presented with the task of choosing a tip for the waiter at the restaurant. The specific instructions were, "You get the check. Now you have to decide how much tip to leave. Imagine that you will be paying by card (credit or debit). Please tick the option from below that corresponds to the total amount (including tip) and tip amount you would select." These choices were based on general tipping percentages in the US.

We altered the bill amounts to create two conditions, where in the rounded condition participants saw one option with a rounded total and a comparable but nonrounded option in the nonrounded condition. The bill amount in the rounded condition was $34.80 (including

taxes), while in the nonrounded condition, it was $35.10 (including taxes). In both conditions, participants were shown four options, corresponding to 12.5%, 15%, 17.5% and 20% tip on the bill amount. These percentages were not shown to the participants. Participants saw the total amount (i.e. bill amount plus tip) and the tip amount for each option, displayed as "Total amount::" and "Tip:". The options presented to the participants (total amounts and the tips) for each condition were: $39.15 with tip of $4.34, $40.00 with tip of $5.20, $40.89 with tip of $6.09 and $41.76 with tip of $6.96 for the rounded condition and $39.49 with tip of $4.39, $40.36 with tip of $5.26, $41.24 with tip of $6.14 and $42.12 with tip of $7.02 for the nonrounded condition. Participants were asked to choose the amount they would be more likely to pay.

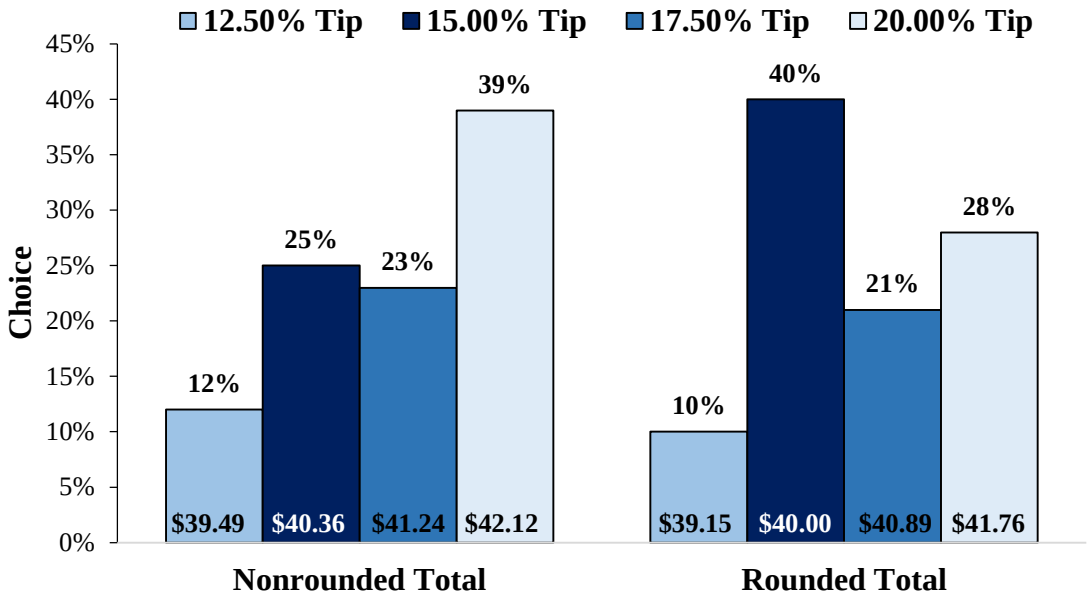
Results

Choice distributions differed significantly between conditions, $\chi^2(3) = 7.80$, $p = .05$ (see Figure 12). Specifically the choice of the 15% tip (i.e. $40.00 vs $40.36), which was either a rounded total (rounded condition) or not (nonrounded condition) differed marginally between conditions, $\chi^2(1) = 3.72$, $p = .054$. In the nonrounded condition, 25% of the participants chose the 15% tip (i.e. $40.36 with tip $5.26). This increased to 40% of the participants in the rounded condition (i.e. $40.00 with tip $5.20).

These results indicate that the rounded total nudged people to choose the 15% tip option. The results are interesting as the highest tipping option was the dominant choice (i.e. 39% of participants chose 20% tip) in the nonrounded condition, indicating stronger preference of participants towards this tipping amount. However, this dominant choice shifted to the 15% tip option as it made the total amount rounded in the rounded condition.

Figure 25. Restaurant picture for tipping studies.

Figure 26. Results of Study 7. Total amounts (i.e., bill amount + tip) are shown at the base of each bar, and choice %s are shown at the top.



STUDY 8: TIPPING WITH ADDITIONAL CONTROL CONDITION

The current study tested the Rounding Off effect in the context of tipping with two control conditions, one with slightly higher and other with slightly lower total amount than the rounded total. This is done in order to show that the rounded bill amounts are not only preferred compared to a smaller bill amount but also to a slightly higher one, thereby ruling out any effects due to the change of leftmost numerical digit in case of rounded bill amounts (i.e. $40.00 has a 4 at the leftmost place but a slightly lower total would have 3). We also replicate the findings from the previous tipping study using a different way to manipulate total amounts.

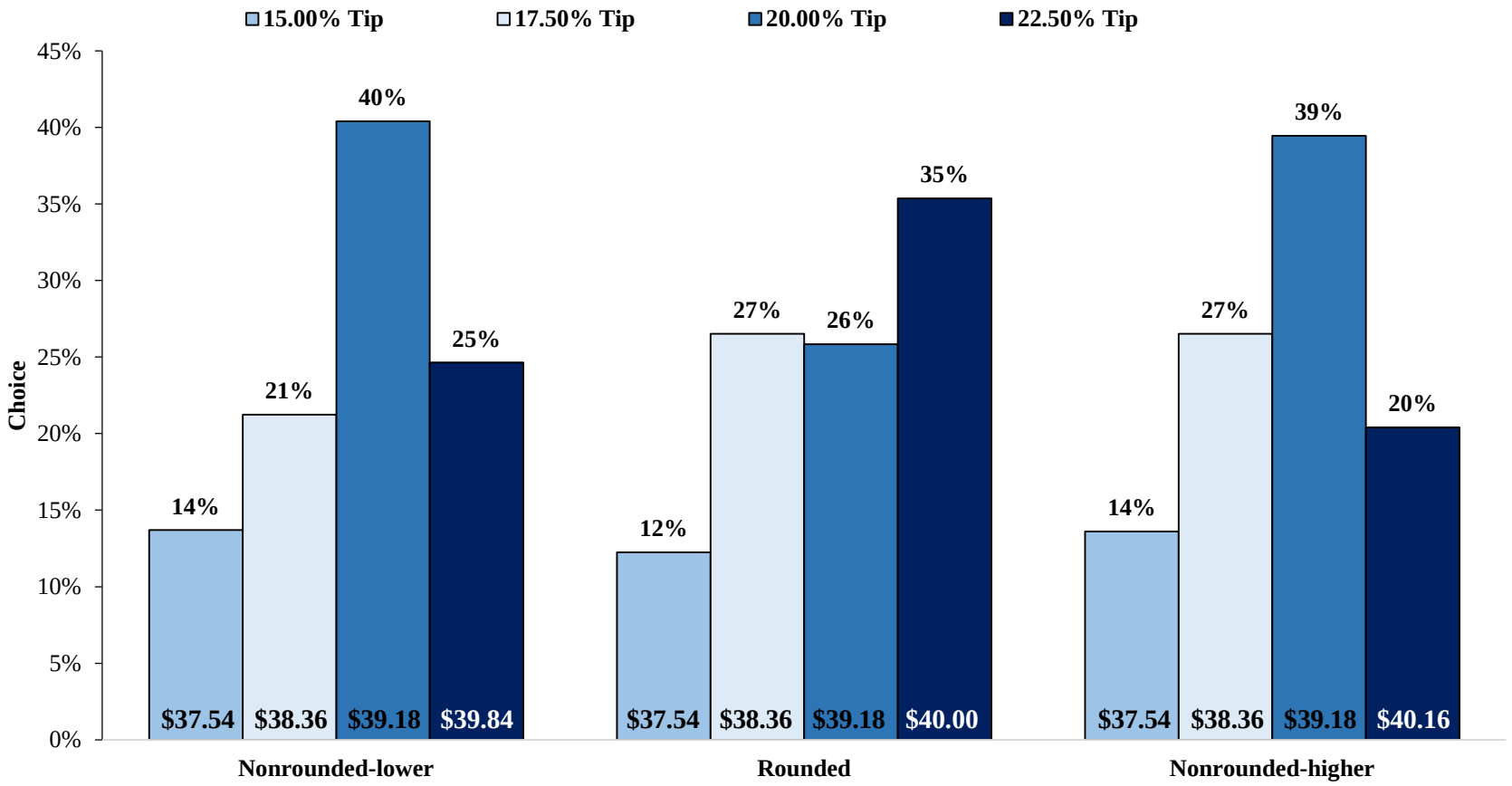
Methods

Design. Participants were randomly assigned to one of the three between conditions in which the total amount was either nonrounded-lower (than rounded), rounded, or nonrounded-higher (than rounded).

Participants. Participants were 452 US-based respondents (M = 35 years, SD = 11; 197 male) recruited on Amazon's Mechanical Turk. Twelve participants who failed the attention check were excluded from analyses (3%), leaving 440 valid participants.

Procedure. Participants completed the introductory block and read about the restaurant (see previous tipping study). They were told to imagine that the bill amount (including taxes) is $32.65. They were presented with four options to choose the tip amount and the total amount (i.e. bill amount plus tip), corresponding to tip of 15.00%, 17.50%, 20.00% and 22.50%. In all options, the total amount and the tip amount are specified.

Figure 27. Results of Study 8. Total amounts (i.e., bill amount + tip) are shown at the base of each bar, and choice %s are shown at the top.



The first three options were the same in all the conditions: $4.89 tip (total amount of $37.54), $5.71 tip (total amount of $38.36) and $6.53 tip (total amount of $39.18). Critically the last and the highest tip option differed between the conditions. The final option was $7.19 (total amount of $39.84) in the nonrounded-lower condition, $7.35 (total amount of $40.00) in the rounded condition and $7.51 (total amount of $40.16) in the nonrounded-higher condition.

Results. Choice distributions differed significantly between conditions, $\chi^2(6) = 13.30$, $p = .038$ (see Figure 13). Specifically the choice of the 22.50% tip in the nonrounded-lower, rounded or nonrounded-higher conditions (i.e. $39.84 vs $40.00 vs $40.16) differed significantly between conditions, $\chi^2(1) = 6.58$, $p = .037$. 25% of the participants chose the 22.50% tip in the nonrounded-lower (i.e. $39.84) and 20% of the participants chose the 22.50% tip in the nonrounded-higher (i.e. $40.16). This increased to 35% of the participants in the rounded condition (i.e. $40.00) for the 22.50% tip. This study shows that rounded total amounts are preferred by diners, which leads to tips that make a rounded total. This effect is not dependent on the change of leftmost digit in the case of the rounded total amount.

DISCUSSION

Recent research has revealed several effective methods for eliciting or increasing charitable donations (Freeman, Aquino, & McFerran, 2009; Gneezy, Gneezy, Nelson, & Brown, 2010; Hsee, Zhang, Lu, & Xu, 2013; Koo & Fishbach, 2016; Liu & Aaker, 2008; Schnall, Roper, & Fessler, 2010; Sussman, Sharma, & Alter, 2015; Xygalatas et al., 2013), including the use of nudges like default donation amounts (Goswami & Urminsky, 2016). The present research reveals another nudging method for increasing donations: the inclusion of a rounded total as an option. Our experiments demonstrate a robust preference for donation

amounts (e.g., $3.92) that, together with a purchase amount (e.g., $26.08), add up to a rounded total (e.g., $30.00). This preference can be used to increase both the donation amounts and the number of donors for a charity.

We show that such rounded totals are processed more fluently (cf. Coulter & Roggeveen, 2014; Wadhwa & Zhang, 2015), thereby attracting more and larger donation choices. While a large literature shows positive effects of fluency (e.g., Labroo, Dhar, & Schwarz, 2007; Lee & Labroo, 2004; Petrova & Cialdini, 2005; Reber, Winkielman, & Schwarz, 1998; Winkielman & Cacioppo, 2001), fluency has not been studied in the context of total amounts. It is also important to note that in this case, fluency does not directly increase preference for a product or service (i.e. the rounded total is not our main concern but the associated donation amount is). Rather, its preference indirectly affects the associated donation.

Although some retailers solicit consumers to round up their purchase amount to the nearest dollar as a donation to a partner charity, our results suggest that such campaigns may not realize their full potential. When the total amount was round, a majority of our participants pledged to donate well beyond the nearest dollar. Moreover, this RoundingOff effect occurs even in electronic transactions (e.g., paying via credit card), indicating that the effect is not simply due to an aversion to coins (Vandoros, 2013).

Finally, this effect occurred not only when the rounded total was explicitly stated (e.g., $30.00 total), but also when it was merely implied (e.g., $27.60 purchase and $2.40 donation), demonstrating its vast potential for increasing donations. This also differentiates the construct of total amounts from previous research on prices. We further show that this effect can be extended to other contexts. In two studies, we show that this effect also works for tipping in a

restaurant. In that context, diners chose a tip that would make their total amount (bill amount plus tip) rounded.

Theoretical Contributions

The current research, being at the intersection of marketing and psychology, provides important contributions to multiple areas of prosocial behavior, pricing, rounded numbers, nudges, and fluency. Adding to the discussion on prosocial behavior, we introduce a simple nudge that can increase donations and number of donors. Some of the methods struggle with the effectiveness in the market (e.g. cause marketing, Krishna 2011) or with the consumers' market metacognition (i.e. the social intelligence of the shopper about the marketplace tactics) affecting the outcome (Brown & Krishna 2004). Therefore, there is a need for effective tools for increasing donations, especially ones which are less apparent to the potential donor. In this paper we show a nudge that is based on fluency of round numbers to change the preferences of potential donors. Since here we do not introduce any factor that seems biasing to the potential donors (rounded prices are prevalent in the market already), the RoundingOff nudge might not carry the limitations of some of the other methods.

The basic construct in this nudge is the total amount. Since consumers pay the final total amounts at the point of sale, the properties of these amounts are important. While previous literature has used total amounts, for example when considering in store slack in mental budgeting (Stilley, Inman, & Wakefield 2010), preference for specific totals affecting behavior is under-researched. The current research, by showing that rounded total amounts are preferred over non-rounded totals, shows that some of these properties might affect consumer preferences.

Rounded prices have attracted some attention in the marketing literature in the last decade (Thomas, Simon, & Kadiyali, 2010; Wadhwa & Zhang, 2015; Yan & Pena-Marin,

2017). By showing that consumers prefer rounded totals and that this preference can be used to nudge them to select a higher donation amount, this paper adds to the literature. As indicated by previous research, rounded numbers are processed more fluently in marketing promotions (Coulter & Roggeveen, 2014). Extending this finding, we show that rounded total amounts are also processed more fluently and therefore are preferred by consumers, even when the decision is not about the purchase total but about the associated donation amount. This adds to the fluency literature by showing that not only does fluency of a stimulus affect liking and attitudes (Labroo, Dhar, & Schwarz, 2007; Lee & Labroo, 2004; Reber, Winkielman, & Schwarz, 1998), it also makes potential donors choose to donate because of fluency of the associated total amounts.

These results also peg RoundingOff donations to fluency rather than (at least partially) to an aversion to coins or change (Vandoros, 2013). In addition, by showing that rounded totals are preferred over both slightly lower and slightly higher total amounts, we further provide support fluency as the mechanism rather than any value perception differences in prices. Rounded prices have a higher left-digit than any lower amount, which could indicate higher value of donation. But by keeping another control condition with the same left-digit with a slightly higher total amount, we show that any perceived value difference cannot explain the effect.

Finally, we also add to the literature on nudges in prosocial behavior, specifically charitable donations. We add a nudge that can be used for charitable donations with specific benefits to both individual donation amounts and to the number of donors. In addition, as this nudge is about rounded totals and an associated small amount, it can be extended to other contexts. We specifically show that the RoundingOff effect also works in the context of tipping. Since tips are often variable amounts and that subjectivity often plays a part in

deciding the amount for tips, this context also demonstrated higher tips when they are associated with a rounded total. In addition, we show that these can move to lower amounts if the rounded total is there at a lower tip amount.

Managerial Implications

In an environment of stagnant or decreasing donations, charities increasingly try new methods to attract more donations e.g. many charities have started defaulting choices for the potential donors. While these methods might help (Goswami & Urminsky, 2016), there is a need for more low-cost methods to increase donations. We investigate a nudge, i.e. RoundingOff, which shows that people choose a donation option that makes their total amounts, including purchase, rounded. The results from six studies show that this nudge can help increase donation amounts and increase the overall number of donors based on its formulation. This nudge, with its simplicity and ease of implementation, could be immensely helpful to charities and other organizations seeking donations.

Charities often find potential donors when they are at points of sale. These potential donors are confronted with appeals to donate coins, donate a dollar, etc. While the aversion to coins or change can be a reason why people decide to donate at the point of sale, we show that a separate mechanism of fluency drives the effect for RoundingOff. This is immensely important for the organizations seeking donations, as it means that they could easily go beyond donations of a few cents (i.e. cents to make the unit dollar amount). We show that, in fact, people can donate amounts that are more than 2 or 3 dollars just to make a rounded total amount. This essentially means that charities can potentially double or triple their donations.

The reason for awareness of this effect for the charities lies not only in the benefits of the effect but also in the potential negative effects when charities are not aware of this. We

show in our studies that this effect can also lower donation amounts when the rounded total is made using a low donation amount.

In another interesting finding, we show that it is not necessary to show the potential donor final amounts to achieve the effect. This broadens the range of potential appeals, based on the practicality of the situation. For example, in some self-service kiosks, people see the total amounts, whereas at a manual setup (e.g. exhibitions, fairs, or small markets) they might not. However, irrespective of these appeals, RoundingOff will show positive effects.

Lastly, this nudge is not limited to donations. Other situations that involve a purchase followed by a decision for a variable small amount could also benefit from RoundingOff. To exemplify this, we showed the effect in case of tipping, where people tip higher amounts when these amounts constitute a rounded total. Therefore, managers in general can determine whether the general RoundingOff applies to their context. This could help increase the money allocated for these variable small amounts.

Limitations

The current research investigates RoundingOff effect with multiple replications and using different scenarios. In addition, we show that the effect is not limited to charities, as it can also be used in the context of tipping. While we show this extension, the current research did not intend to make a claim about the overall generalizability of the effect. There could be many reasons why this effect may not extend to some scenarios. For example, in both the contexts used in this research, the smaller amounts are quite variable, and people normally decide on the go how much money they want to allocate to these smaller amounts. It is possible that the effect would not hold in a context where the rules or norms are much more defined. For example, in countries where tips are more rigid in terms of percentage, the effect might not be applicable.

Along the same lines as the above, both our contexts are service-related. Therefore, it is not apparent whether these results would hold for small gift items or whether it can increase amounts for ‘pay what you want’ appeals in addition to a purchase. Since products can have more defined values associated with them, the amounts might be independent of whether they constitute a rounded total or not.

Encapsulating both our contexts, it is also possible that the effects are truer for a context where people do not want to spend a lot of cognitive resources. But for a context where the small amounts are more impactful or meaningful to the consumer, it may be that the overall total amount matters less than the individual small amount. This could result in the RoundingOff effect not being valid for such amounts. While the objective of the current research is to demonstrate Rounding Off effect for charitable donations, future research could shed more light on these potential moderating factors.

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CHAPTER 5: CONCLUSION

This thesis explored two routes of cognitive processes in consumer behavior. The three essays in the thesis contribute to these routes, i.e. perception and metacognition. In addition, the essays extend multiple literatures in consumer behavior, including sensory marketing, scent marketing, sensory imagery, prosocial behavior, price perception, and processing fluency. This contribution is in the form of a review of scent marketing literature with identification of future directions and two novel effects with their mechanisms (and moderators).

In the first essay, we review the literature on scent marketing. Sense of smell is one of the most important senses because of its direct relationship with the amygdala and the hippocampus. This makes scents very important for marketing, as they can directly affect emotions and memory (Herz, 2010). As a subfield of sensory marketing, scent marketing has been studied for last three decades. A holistic review of scent marketing literature with a focus on marketing-related outcome variables helps in consolidating the knowledge in this field. With the prior reviews in this area being either too specific (review for a specific context like retail or service sector) or too broad (review of sensory marketing field), the articles in the field have not been consolidated after an initial review by Bone & Ellen (1999).

We selected scent marketing articles from two databases, Scopus and Web of Science. These articles were further refined using defined selection criteria to yield 58 relevant articles. We divided these articles for the review using their application areas (i.e. how they are implemented in marketing). We identified three major application areas: ambient scents, scents in advertising, and product scents. Dividing the articles in this way provided us with novel insights into the literature. We found that almost three-fourths of all scent marketing

articles are in the application area of ambient scents. With the huge literature in this area, there is much proof of existence of the positive effects of scent and its moderators. We also found that the other two areas of scent marketing lack many key research questions, and the literature in these areas is more scattered than that of ambient scents.

We reviewed these areas in detail, focusing on and combining knowledge from all the articles selected for the review. The review showed some recurrent themes in the literature, such as moderation by congruence of scents with factors like environmental stimuli (e.g. Spangenberg, Grohmann, & Sprott, 2005) and product category (e.g. Fiore, Yah, & Yoh, 2000) and retail density (e.g. Madzharov, Block, & Morrin, 2015). Much work in scent marketing has considered congruence an important variable, with congruence being good for evaluations (an important exception is Cirrincione, Estes, & Carù, 2014). However, the congruence research in marketing focuses on thematic and semantic associations of scent. This leaves out any perceptual or physiological effects for congruence. These could offer many new meaningful explanations and mechanisms for congruence effects and expand the discussion in scent marketing.

We also found many areas that are understudied in the scent marketing literature. The areas that are missing (or understudied) from multiple application areas are the interactions of different scents (or a scent with a cue to olfaction) and olfactory imagery. The first area of interaction of different scents is becoming important, as most of the retail environments (e.g. grocery stores and food stores) are scented. Therefore, all the product scents (e.g. food products) interact with the scents in the environment. In addition to the smell of the product itself, all scented products also contain cues to the scents (like a picture of a lemon on a cleaning product).

These cues can interact with the scents in the environment either because they can aid in the generation of olfactory imagery (demonstrated in the second essay) or because these cues have language-based associations with the environment's scents. Other than the practical relevance of this area, this research would also expand the discussion around how people process conflicting sensory information from a product and environment, whether people ignore products with conflicting scents or try and resolve this inconsistency and reduce the rating of the scents. Some indication for the first path comes from research done by Lwin, Morrin, Chong, and Goh (2016). However, more exploration of this area is required.

The other understudied area in scent marketing is olfactory imagery. Scents have many limitations to their implementation in marketing. For example, the implementation of scents is impractical for online ads, television ads, product labels, et cetera. and scents are expensive for magazine ads and billboards. A simple and less costly way to generate olfactory imagery can change this landscape and exponentially increase the market implementation of scents. Prior research has provided indications of the similarity of olfactory imagery to real scents in terms of activation of olfactory-specific regions in the brain. Therefore, it is possible to reap the positive effects of scents without using actual scents. We focused on this understudied area in the second essay of the thesis.

The second essay uncovers a novel effect, i.e. the visual olfactory effect. As identified in the review of scent marketing, olfactory imagery is an understudied area with strong implications for the scent marketing field. The second essay focused on the generation of olfactory imagery and its effects using non-food products. Non-food products were used to reduce the impact of gustatory (taste of food) and haptic (texture of food) senses in the evaluation of the products. In addition, it reduced any impact of alternate mechanism like craving on product evaluations.

Previous studies have found that it is difficult to generate olfactory imagery from just reading the names of the scents (Stevenson & Case, 2005). In fact, previous studies in marketing have asked people to imagine a smell as a way to generate olfactory imagery. This method makes the impact of olfactory imagery limited. This is firstly because, in the real world, ads attract only a limited amount of attention from consumers, and secondly, after being asked to imagine a smell, consumers can choose whether to undertake such an effort or not. We instead used pictures of the scented objects to generate olfactory imagery without any instructions to imagine them from the marketer. Since visual and olfactory senses are strongly intertwined (Jadauji, Djordjevic, Lundstrom, & Pack, 2012), with one affecting the other, visuals could be much more effective in the generation of olfactory imagery.

In six studies, the second essay showed that pictures of scented objects on product labels or ads could increase the evaluation of the product. This increase in evaluation is because of the generation of olfactory imagery of the scent of the object in the picture. Furthermore, we show that the visual olfactory effect is moderated by pleasantness of the smell of the scented object in the picture, relevance of the scent to the product, and the hedonic or utilitarian nature of the offering. In these studies, we also rule out informativeness and visual attractiveness of the picture impacting the visual olfactory effect.

Pictures showing unpleasantness of a smell are used by many marketers to show effectiveness of a product, like that of a cleaning product or an air freshener. While these pictures do convey the effectiveness of the product, they also help in generating an olfactory imagery of the object present the picture. We show that in this case, these pictures, rather than increasing the evaluations of the product, in fact decrease them.

The second moderator of the effect is relevance of scents to the product. Bosmans (2006) showed that the positive effects of a scent do not work if the scent is salient and there

is a mismatch between the product and the scent. We extend this finding to olfactory imagery by showing that a picture of a scented object only helps evaluations if the scent is relevant to the product. For a product for which scent is irrelevant, there is no visual olfactory effect. In fact, for some products (highly-scent irrelevant), this effect could even be negative (i.e. reduce evaluations). It is important to note that, since in the study both the label with the picture of the scented object and the label without this picture carry the "Lemon scented" indicator (specifying that the product is scented), the effect is not due to an awkward label. In fact, the effect demonstrates what happens if a visual cue to olfactory imagery is placed on such a label. Also, by showing that findings for real scents (Bosmans, 2006) also extend to olfactory imagery, we show that olfactory imagery generated is similar to real scents in terms of its impact on consumers.

Lastly, we show that the visual olfactory effect is applicable only for utilitarian offerings and not for hedonic offerings. As previous research shows, hedonic attributes help in improving evaluations more for utilitarian offerings compared to hedonic offerings (Gill, 2008; Klein & Melnyk, 2014). In addition, since for hedonic offerings emotional and sensorial attributes are already salient, the addition of a picture would not help in the generation of olfactory imagery and improving evaluations. We show that, in fact, the utilitarian or hedonic nature of the offering moderates the generation of olfactory imagery.

In the case of a utilitarian offering, the generation of olfactory imagery is increased in the presence of a picture of a scented object. However, no such increase is present for the hedonic offering. This moderator also shows one of the important differences between previous research in olfactory imagery and this essay. Previous research in olfactory imagery (Krishna, Morrin, & Sayin, 2014) showed positive effects of olfactory imagery for a hedonic food product. When we used non-food products, we did not find any effect of pictures on

evaluations through olfactory imagery. Therefore, by showing this simple yet effective way to implement scents in marketing through olfactory imagery, we extend the conversation in the scent marketing literature.

After reviewing the field of scent marketing and demonstrating the visual olfactory effect (and three moderators for this effect), we moved to the second cognitive route that we contributed to in the consumer behavior literature. In this route, related to metacognitive ease of processing information, we focused our attention on the effects of rounded totals. We use the fluency associated with a total amount to nudge people to choose the donation amount associated with this total amount.

This nudge, i.e. the RoundingOff effect demonstrated in the third essay, can increase individual donation amounts and overall donor numbers. This effect shows that during a purchase, if consumers are asked to make a donation, they would prefer a donation amount that makes their total amount (i.e. purchase plus donation) rounded. This effect is due to the processing fluency associated with rounded totals, which makes people select this fluent option. We operationalized processing fluency as simplicity and ease of processing of totals. Since the rounded totals are formed by combining a purchase amount and a donation, this preference of rounded totals impacts the preference for this donation too. Using a slightly different way of asking, we show that the number of people who are willing to donate can also be increased using this nudge. We further show that this effect is further extendable to other contexts, e.g. tipping in a restaurant.

We differentiate the rounded totals from numbers by showing that this effect still holds if the total amount has to be calculated by the consumer. Therefore, rather than focusing on the donation amount (which is higher than that in the control condition), consumers again prefer the donation that makes a rounded total. Furthermore, we rule out that the RoundingOff

effect is present due to people's aversion to receiving loose change or coins by using electronic payment. This makes the possibilities to increase donation amounts even more attractive, as charities can ask people to go beyond donations to the next dollar amount. We show in our studies that we can nudge people to donate to make their total rounded to the next tens-of-dollars amount (e.g. $30 instead of $27.54).

This paper, while showing a new construct that needs more attention in consumer research, i.e. total amounts, also adds to the literature on effects of fluency. In this essay, the fluency of the rounded total actually nudges people to choose the respective donation amount. This adds to the previous research on fluency in consumer research that demonstrates the positive effects of fluency on outcome variables for the stimulus itself, like attitudes towards a brand (Lee & Labroo, 2004), choice of a travel destination (Petrova & Cialdini, 2005), liking of a product (Labroo, Dhar, & Schwarz, 2007), and reactions to a visual stimulus (Reber, Winkielman, & Schwarz, 1998; Winkielman & Cacioppo, 2001).

To sum up, in three essays this thesis contributes to two different cognitive routes in consumer research, i.e. perception and metacognition. This extends our knowledge in the fields of scent marketing and fluency associated with rounded totals. In addition, the essays have strong managerial implications and can immensely help commercial firms and not-for-profit charities.

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