Chapter 14
Online Information Processing of Scent-Related Words and Implications for Decision Making

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Abstract This paper takes a multi-method approach, combining neuroscience methods and behavioral experiments to investigate emotions triggered by olfactory-related information and related consumer decision-making outcomes. In the online context, olfactory information is limited to visual forms of triggering olfactory sensations. The effectiveness of using sensory congruent brand names in online ads to trigger emotions, and the influence on attitudes toward the ad, brand and purchase intentions are examined. Moreover, individual differences in olfactory sensitivity were considered, revealing moderating effects on cognitive and emotional processes. Findings provide managerial and organizational implications for online advertising, branding decisions and market segmentation decisions.

Keywords Emotions • Information processing • Neuroscience • Olfactory • Sensory

14.1 Introduction

With the rise of e-commerce and online-based shopping, the trend from retail e-commerce sales in the U.S. is growing from 225.5 billion U. S. dollars revenue in 2015 and is predicted to almost double to 434.2 billion in 2017 (Statista 2015). Online advertising and promotional strategy decisions become all the more

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influential in sales and purchase decisions of consumers. Product categories that rely on attributes that are processed by senses other than visual may be challenged to reinvent and accommodate the lack of sensory input. For example, consumers typically base their purchase decisions for products such as laundry detergent on a set of important attributes, including olfactory input. However, scented products have less leverage in online platforms. To compensate for the lack of odor and scent information provided online for decision-making processes, visual olfactory-related information is the main source of reliance for judging and influencing scent-based purchase decisions made online. In this paper, we examine how purchase decisions are made in the absence of actual scent in online shopping scenarios, focusing on visual information, such as branding and advertising strategy decisions.

Scent is strongly associated with emotions and memory (Goldkuhl and Styvén 2007; Morrin and Ratneshwar 2003) which are formed early in human development and are enhanced through life (Holland et al. 2005). Factors contributing to individual differences in olfaction include demographic factors such as gender (Ship and Weiffenbach 1993), age (Doty et al. 1984; Ship and Weiffenbach 1993) and culture (Herz 2007). However, other evidence indicates that sensitivity to scent exists across individuals in the population (Chebat et al. 2009; Cross et al. 2015). We argue that varying differences in olfactory ability across consumers can have an impact on the intensity of emotions perceived. We also contend that examining valence effects can assist us in understanding how valence is processed across the different olfactory groups.

Our research question is twofold. First, how do individuals process scent-related words emotionally, in the absence of actual scent, in an online environment? Further, how do individual differences in sensitivity to smell play a role in providing a nuanced understanding of purchase decisions (of products where scent is relevant) and emotional processing of scented-brand names (using scent associated words in brand names)? To address these questions, two studies were conducted to understand purchase behaviors online and the underlying emotional processes.

Two different methods were combined in this paper to explore the online purchase behaviors of individuals with varying olfactory orientations and investigate the underlying affective processes involved. In the first study, emotional reactions in response to reading scent-related words (vs. non-scent-related words) across individual olfactory ability were examined using electroencephalography (EEG). A passive task (bottom-up processing) of reading is compared to a task involving a more elaborate process incorporating olfactory imagery (top-down processing; cf. Hajcak and Nieuwenhuis 2006). Another dimension included in the investigation was the valence (pleasant vs. unpleasant) of odor-associated words. Valence differences are compared for scent-related words relative to non-scent related words in order to examine the emotional processes underlying passive reading and olfactory imagery. In a second study, the impact of scented brand names (vs. non scent related brand names) on online purchase decisions, attitude towards the product and product performance were investigated using online ads. Discoveries from the first study provide a deeper understanding of how regulation of emotions varies across individuals based on olfactory orientations and hence influences online decision making process.

Findings from this paper provide implications for branding and online advertising managerial decisions. These decisions involve very different considerations when compared to offline branding and advertising decisions, particularly for organizations in the scent product industry. This paper focuses on understanding the nuances in consumer online information processing and provides additional insight for supporting managerial and organizational decisions on market segmentation and targeting strategies.

14.2 Study 1: Individual Differences in Affective Responses to Scent-Related Words

14.2.1 Literature Review and Hypotheses

The relationship between odor and emotions are strongly connected (Herz et al. 2004) and consequently influences the perception and decisions of consumers (Chebat and Michon 2003; Bone and Ellen 1999). Previous studies have found that in the absence of actual scent, olfactory imagery can play a significant role in inducing sensations similar to that of processing actual odors, as evidenced by neuroscience data (Bensafi et al. 2003). Past research has focused on the effect of odors in the marketplace and its impact on purchase decisions and behavior. However, the "experience of odor" can be elicited without the scent being present, as in the form of imagined odors. Stevenson and Case (2005, p. 244), defined olfactory imagery as "being able to experience the sensation of smell when an appropriate stimulus is absent." They noted how this had resulted from cumulative evidence, mostly self-reported data, in three forms: (1) participants report such experiences; (2) descriptions of these experiences are similar to those of actual smelling; and (3) their reactions to certain forms of these experiences involve appropriate behavioral responses.

Odor valence, pleasant versus unpleasant, is weighted asymmetrically within individuals. In particular, unpleasant odors have a functional purpose—human survival. Thus we believe that the effect of odor valence (represented by pleasant or unpleasant odor-associated words in this study) will vary across the two olfactory groups: (1) individuals with a normal sense of smell and (2) individuals with a heightened sense of smell. However, regardless of individual sensitivity to smell, which can be categorized into: heightened, normal or decreased (Cross et al. 2015), unpleasant odor associations, represented by unpleasant odor-associated words, will elicit increased emotions compared to non-odor associations. This reflects the function of unpleasant odors as a warning against exposure to ingestion of hazardous or harmful substances. Also, there is a higher probability of activation of the amygdala for negative emotions, such as fear and disgust, relative to positive emo-

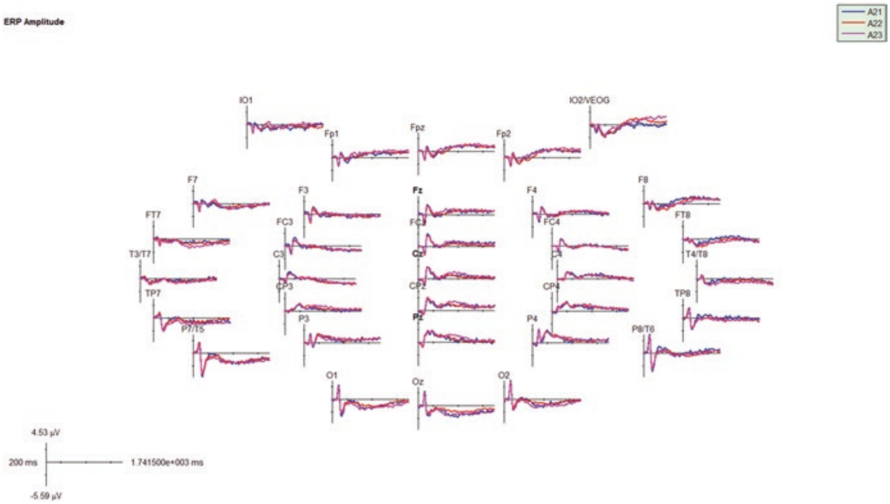

Fig. 14.1 Scalp distribution of Late positive potential (LPP). Displayed are grand average taken from read task. Non-olfactory words (*blue*); pleasant olfactory words (*red*); unpleasant olfactory words (*pink*)

tions such as happiness. This is particularly so for the gustatory-olfactory modalities (Costafreda et al. 2008). In individuals with a normal sense of smell, positive affect is expected to increase when reading positive olfactory words. On the other hand, attenuation of emotions is expected in sensitive individuals. Hence, we predict pleasant odor-associated words will not elicit enhanced LPP, resulting in comparable levels of LPP as the controlled condition. We contend that this reaction is likely due either to the keen olfactory sensitivity in these individuals, negative associations from past experiences through perceived intensity of the scent or suffering from ill effects of scent (Cross et al. 2015).

Event-related potential (ERP) studies utilize what are referred to in the literature as "components." These components have both temporal and spatial characteristics. One such component is the late positive potential (LPP), which is commonly identified spatially in the brain as a midline centroparietal activation that temporally occurs after 300 ms post stimulus and may last up to 1500 ms (see Fig. 14.1 for scalp distribution of LPP). LPP evidences information processing operations associated with emotions and arousal, although it is important to point out that no specific event-related potential (ERP) component has been identified for a certain type of emotion (e.g., disgust). Researchers have used the LPP component to study emotion-relevant stimuli in comparison to neutral stimuli (Cunningham et al. 2005; Hajcak and Nieuwenhuis 2006; Lang et al. 1998; Schupp et al. 2006). Another important characteristic of LPP is its potential to reflect a negativity bias; whereby there is a stronger LPP among negative stimuli (Cacioppo and Berntson 1994; Ito et al. 1998). This negativity bias may be rooted in our evolution, as negative emotion-relevant stimuli may be highly motivationally salient (Weinberg et al. 2013).

However, as reviewed by Weinberg et al. (2013), LPP is also sensitive to motivationally salient pleasant stimuli when contextually appropriate, is strongly predictive of behavioral slowing to task-irrelevant emotional stimuli, and is stably modulated over (does not habituate to) repeated presentations of emotional stimuli.

H1: Odor-associated words will induce elevated emotions (reflected in LPP) in comparison to non-odor associated words. However, the effect of word valence (pleasant or unpleasant) will vary across the two olfactory groups.

H1a: For individuals with a normal sense of smell, emotions (LPP mean amplitude): non-odor associated words < pleasant odor-associated words < unpleasant odor-associated words

H1b: For individuals with a heightened sense of smell, emotions (LPP mean amplitude): non-odor associated words = pleasant odor-associated words < unpleasant odor-associated words

Brain regions involved in odor processing, such as orbitofrontal cortex, anterior insula and piriform cortex, are activated during mental imaging of odors, as evidenced in positron emission tomography (PET) methods (Djordjevic et al. 2005). Recently, researchers have provided evidence using functional magnetic resonance imaging (fMRI) showing hedonic patterns for differences in mentally imaging pleasant odors compared to unpleasant odors, which matches activity in the brain when exposed to real odorants (Bensafi et al. 2007). The ability to perform olfactory imagery has also been shown to vary across individuals. Stevenson and Case (2005) reported that olfactory experts reported more vivid olfactory images than did non-experts.

In Part 2 of our study, the role of olfactory imagery on emotions is investigated by explicitly instructing individuals to perform olfactory imagery, in contrast to passively reading olfactory related words. For individuals who are sensitive to smell (also known as hyperosmics in medical terms), we expect an automatic suppression mechanism to kick in. During passive processing, high olfactory imagery ability will allow hyperosmics to experience intense odor-related emotions because of strong associations from past experience and memory (Stevenson and Case 2005). For hyperosmics, the olfactory imagery task will in fact trigger an automatic protective mechanism to prevent the elicitation of added overwhelming odor-associated emotions compared to the passive read task. This will be reflected in some suppression of the emotions elicited, shown through reduced levels of LPP, especially for unpleasant odor-associated words.

However, for individuals with a normal sense of smell, we do not expect odor-associated word imagery to significantly increase or decrease the emotions elicited. In marketing, a multisensory study that investigated the effect of visual (pictorial) stimuli on the ease of forming olfactory imagery (Krishna et al. 2010) found that using actual scent can aid visual imagery which led to better verbal recall. However, on the contrary, visual stimuli did not enhance better olfactory imagery. In other words, having a picture in an ad does not assist in scent recall (Krishna 2010). This study did not account for the variability of individuals' sense of smell, and hence we can infer the findings from their sample would be more reflective of individuals with a normal sense of smell (or 70% of the population). For these individuals, the ability to smell is generally taken for granted and is relatively not as meaningful, compared to those who feel its absence or suffer its heightened presence (Cross et al. 2015). Odor-related experiences for normal individuals also should not be as strong or as emotionally charged as those of hyperosmics. Individuals with a normal sense of smell possess good, but less fluent olfactory imagery ability in comparison to individuals with a heightened sense of smell. Thus, we do not expect explicit odor-imagery instructions to further enhance (e.g., ceiling effect) odor-induced emotions, although there may be a slight increase stemming from the unpleasant odor-associated word imagery due to the negativity effect.

H2: The effect of olfactory imagery, elicited by mental imagery triggered by olfactory-related words, on emotions will vary across different olfactory groups.

H2a: For individuals with a normal sense of smell, olfactory imagery will not further enhance emotions (LPP mean amplitude) for odor-associated words in comparison to the passive reading task.

H2b: For individuals with a heightened sense of smell, olfactory imagery will suppress emotions (reflected in lower LPP mean amplitude) in odor-associated words in comparison to the passive reading task.

14.2.2 Methods and Procedures

The emotional processes occurring during the viewing of scent-related words (vs. non-olfactory related words) are explored using a neuroscience tool, electroencephalography (EEG), to understand the brain's responses during olfactory imagery.

A screener survey was distributed across campus to students and staff members in a large university in the Midwest to recruit participants from the two olfactory categories for the purpose of the study. A self-reported screener question, validated by Lin et al. (2017), asked individuals to select a category, out of the four, that described their sense of smell best: heightened sense of smell, normal sense of smell, decreased sensitivity to smell, and impaired with no sense of smell. This resulted in 24 individuals with normal sense of smell and 23 individuals with a heightened sense of smell. The other two smell categories were not further investigated in this current study due to our interest in understanding the impact of scent-related words for sensitive individuals, which make up approximately 20–25% of the population (Aron 1998).

The study was a three valence (non-olfactory words vs. pleasant olfactory words vs. unpleasant olfactory words) within subject × 2 olfactory ability (normal vs. sensitive) between subject mixed design. In the first task, participants were asked to silently read the words presented to them on the screen. They were shown a list of 72 words displayed on a computer screen one word at a time. The list of words is taken from Royet et al. (2003) and supplemented with words from González et al. (2006). The list consists of 12 non-olfactory related words (e.g., needle, button, saucer), 36 words with pleasant olfactory associations (e.g., rose, coffee, honey) and 24 words with unpleasant olfactory associations (e.g., dumpster, feces, trash). The 72 words are presented in 3 blocks of 24 words apiece, consisting of 4 non-olfactory related words, 12 pleasant olfactory words, and 8 unpleasant olfactory words. The procedure consists of 72 trials showing a fixation cross (+) for 1 s, then a word is displayed for 750 ms. Followed by a blank screen for the intertrial interval (ITI) of 3 s. This is repeated for the first block of 24 words. Then there is a short pause of 1 min, followed by the next block. This continues until the three blocks are completed. Block order is randomized across participants. In the second task, participants were instructed to silently read the word *and also* form a mental image of the corresponding smell represented by the word. For example, to form an image related to the smell of garlic for "garlic"). Practice trials were included to ensure participants understood the instructions.

14.2.3 Electrophysiological Recordings

The electroencephalogram (EEG) (bandpass 0.01–500 Hz, digitized at 2048 Hz, gain 1000, 16-bit A/D conversion) was recorded from an array of 33 sintered silver-chloride electrodes based on a modified 10–20 system using an Electrode Arrays cap (Electrode Arrays, El Paso, TX). These electrodes include the midline sites and occipital sites which are of particular interest for the purpose of our study. All electrodes were referenced to an electrode placed on the nose during recording (Sensorium Inc.), and then re-referenced to an average reference for data analysis. Electrode impedance was lower than 20 kΩ for all participants. Vertical eye movements were recorded from two additional electrodes placed below the right and left eyes. The ground electrode was located 10 mm anterior to the medial electrode (Fz). Processing and averaging of the EEG data was done using EMSE 5.3 (Source-Signal Imaging, San Diego). Ocular artifacts associated with blinks and saccades were corrected using the Ocular Artifact Correction filter in EMSE. Trials contaminated by other high amplitude artifacts (i.e., ±100 μV) were eliminated during averaging. ERPs were averaged for trials related to control, minor violation, and major violation scenarios from −200 to 1500 ms around onset of the decision cue. ERP waveforms presented here are plotted in MATLAB. To correct for violations of sphericity, the Greenhouse-Geisser correction was applied.

14.2.4 Results

We took measurements for the Late Positive Potential (LPP) ERP component, using the window of 600–900 ms recorded at the electrode site Pz (Cacioppo and Berntson 1994; Schupp et al. 2003). Under the passive read task, an ANOVA test of the individuals with a normal sense of smell revealed a strong olfactory words valence

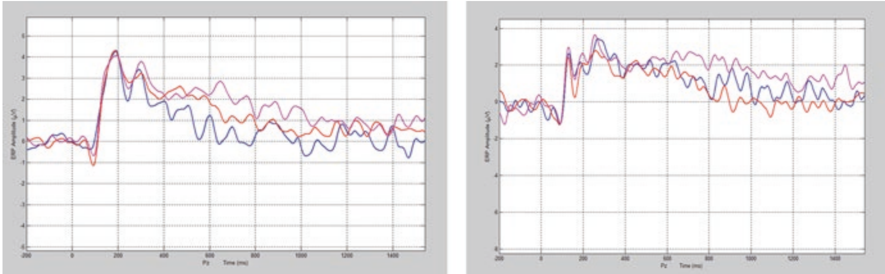

Fig. 14.2 ERP results for LPP at Pz for the reading task for individuals normal (*left*) vs. sensitive (*right*) to smell. Non-olfactory word (*blue*); pleasant olfactory words (*red*); unpleasant olfactory words (*pink*)

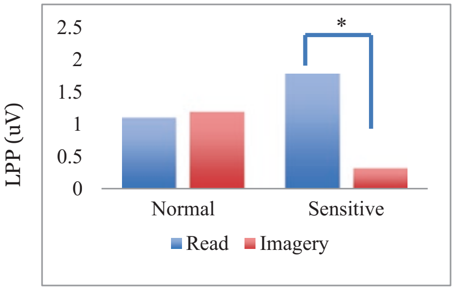

Fig. 14.3 Interaction effects of olfactory orientation (Normal vs. Sensitive individuals) and task (Read vs. Imagery of words) on affect (reflected in LPP levels)

effect, $F(2, 44) = 13.00$, $p < 0.001$. The LPP is significantly increased for pleasant olfactory words ($M_{pleasant} = 1.02$ μV vs. $M_{non\text{-}olfactory} = 0.25$ μV, $p < 0.05$) while significantly increased for unpleasant olfactory words ($M_{unpleasant} = 2.17$ m μV vs. $M_{non\text{-}olfactory} = 0.25$ μV, $p < 0.05$) compared to non-olfactory words (Fig. 14.2). These results confirm H1a, where emotions are elicited most under unpleasant odor- association words, followed by pleasant odor-associated words in comparison to non-olfactory words.

Olfactory word valence for the LPP is also significant with hyperosmics ($F(2, 42) = 5.65$, $p < 0.05$). As predicted, the LPP is not increased for pleasant olfactory words ($M_{pleasant} = 0.78$ μV vs. $M_{non\text{-}olfactory} = 0.38$ μV, $p > 0.1$) but is strongly increased for unpleasant olfactory words ($M_{unpleasant} = 1.71$ μV vs. $M_{non\text{-}olfactory} = 0.38$ μV, $p < 0.05$) compared to non-olfactory words. Results are consistent with H1b.

For effects due to the olfactory imagery task, there are additional differences between the groups (Fig. 14.3). Individuals with a normal sense of smell were not affected by the imagery task instruction. Neither pleasant nor unpleasant olfactory word stimuli were differentially affected by the more passive read task versus the more resource-demanding imagery task. In contrast, hyperosmics were affected by the imagery instructions and resulted in suppressed LPP. Imagery did not affect the processing of pleasant words, however, under the imagery task, words related to unpleasant smells *reduced* the LPP magnitude in relation to the response to non-olfactory related words.

For individuals with a normal sense of smell, the effect of imagery is not significant, $M_{read} = 1.11$ μV vs. $M_{imagery} = 1.20$ μV; $F(1, 22) = 0.012$, $p > 0.1$. This non-effect is consistent for both valence comparisons across tasks (p's > 0.1), which confirms H2a.

In hyperosmics, there is a significant difference in the effect of the task on the LPP amplitude ($M_{read} = 1.78$ μV vs. $M_{imagery} = 0.33$ μV; $F(1, 21) = 5.1$, $p < 0.05$) confirming H2b. Individuals sensitive to smell appear to be automatically processing the affect information by just engaging in the reading task. When instructed to perform olfactory imagery, affect reflected by LPP is suppressed (Fig. 14.2). Further examination shows no difference under the pleasant olfactory word condition ($M_{read} =$ 1.2 μV vs. $M_{imagery} = 0.48$ μV; $F(1, 23) = 0.69$, $p > 0.1$). For the unpleasant olfactory condition, there is a significant task effect ($M_{read} = 2.72$ μV vs. $M_{imagery} = 0.92$ μV; $F(1, 23) = 5.0$, $p < 0.05$). Confirming H2b, the olfactory imagery task results in a suppression effect in hyperosmics, reflected in reduced LPP, in the unpleasant condition.

14.2.5 Discussion

Summarizing results for the two valence categories of pleasant versus unpleasant olfactory words during the read task shows there is a clear negativity bias. Unpleasant olfactory words generated significantly higher LPP amplitudes for both olfactory groups. This is consistent with the role of smell in warning against unsafe conditions and substances.

However, emotional reactions during the reading of pleasant olfactory words were not different from non-olfactory words in individuals with a heightened sense of smell. To further understand the relationship of olfactory imagery fluency and olfactory orientation, the following analysis was conducted from the data gathered in the prescreener survey.

Fluency in performing scent related imagery through reporting of the level of vividness of their olfactory imagery varies across individuals. Olfactory imagery ability can be measured through the Vividness of Olfactory Imagery Questionnaire (VOIQ; Gilbert et al. 1998); an imagery scale modeled after the visual imagery scale by Marks (1973). We believe that the ability to perform olfactory imagery, reflected by the VOIQ scale, will be highly correlated with the level of olfactory sensitivity in individuals. In other words, hyperosmics have better olfactory imagery abilities compared to individuals with a normal sense of smell, and hyposmics have the lowest performance in olfactory imagery. To examine this aspect of individual differences, we surveyed undergraduates using the VOIQ scale ($N = 518$). Results showed that smell category strongly predicts VOIQ scores ($F(2, 514) = 17.62$, $p < 0.001$) while gender was not significant. Hyperosmics reported lower scores (reflecting higher vividness in olfactory imagery) ($M_{hyperosmic} = 33.56$) followed by individuals with a normal sense of smell ($M_{normal} = 39.82$). Those with a diminished sense of smell (hyposmics) reported the highest scores and the least vividness in olfactory imagery ($M_{hyposmic}$ = 46.98). The correlation and direction between VOIQ and the three smell categories confirmed that vividness likely plays a role in the effects of olfactory imagery on emotions.

With these findings in mind, the suppressed affect during imagery in sensitive individuals is even more likely an effect of automatic suppression. On the contrary, automatic affect response to reading the olfactory pleasant words is supported by the fact that individuals who are sensitive to smell implicitly (hence automatically) process affective associations of olfactory words.

14.3 Study 2: Evaluations and Behavioral Intentions to Scented Brand Names

14.3.1 Literature Review and Hypotheses

The congruency theory predicts that processing pieces of congruent information increases fluency of processing and enhances the likeability and evaluation of the product (Bosmans 2006). The advantages of congruent information across multiple sensory inputs have been demonstrated using the visual and auditory senses to increase learning (Kim et al. 2008). The congruency theory further suggests that congruent visual and olfactory information also assisted better recall of the product (Herz 1997). Similar findings were demonstrated when studied across tactile and scent-associated information (Krishna et al. 2010). The congruent (vs. incongruent) role of ambient scent has also been studied in the context of variety seeking behaviors in order to understand the nuances in the consumer decision making process. Holistic processing is enhanced when congruent information, such as the scent and target product, are presented. Time spent in store and browsing is increased (Mitchell et al. 1995). Product evaluation is also influenced by the level of congruency between ambient scent and the target product (Bosmans 2006). In this study, evidenced by what congruency theory predicts, visual information of odor-associated products (i.e., home fragrance, cookies) was presented in ads along with scent (vs. no scent) brand names. Based on previous findings in sensory congruency research, we expect that brand, ad, product evaluations are rated higher during the more congruent relationship of odor-associated product and scent-related brand names, in comparison to the pairing odor-associated product and non- scent-related brand names.

H3: Individuals will rate products with a scent-related brand name (vs. a non-scent-related brand name) higher in attitudes toward the ad (Aad), attitudes toward the brand (Abrand), attitude toward the product (AProduct), and beliefs of product functionality (Beliefs) and purchase intentions (PI).

To reiterate, individual differences in sensitivity to smell do play a role in purchase decisions and consumption behavior. While congruency theory suggests that attitudes toward the product are enhanced under the influence of congruent information presented in multisensory situations, we expect deviations to such expectations are fostered by the influence of sensitivity to smell. In a common setting, individuals with a normal sense of smell are likely to follow the congruency theory predictions and rate odor-associated products with scent-related brand names more favorably.

However, based on earlier ERP findings revealed in Study 1, the differentiated effects between normal (vs. heightened) individuals are expected. In support of the congruency effect, affect (reflected in LPP) is enhanced in individuals with a normal sense of smell while reading olfactory-related words. However, findings in Study 1 also suggest that processing of emotional reactions to olfactory-related words is automatically suppressed in sensitive individuals. Based on these findings, we expect individuals sensitive to smell will suppress affect responses towards olfactory related information. Hence, ratings of Aad, Abrand Aproduct and Beliefs of a product paired with a scent-related-brand name will not be rated higher than a product with a non-scent-related brand name. These affective outcomes are likely to result in lower product evaluations. Fishbein and Ajzen (1975) conventional theory of reasoned action suggest that attitudes are strong predictors of behavioral intentions. We contend that the environment (online) and individual difference (olfactory orientation) will have different consequences for online purchase behaviors. Without the presence of an actual scent, accompanied by the resultant suppression of emotional reactions to scent-related information, individuals with a heightened sense of smell are still able to make sound purchase decisions. These individuals are likely to rate online purchase intentions comparably to individuals with a normal sense of smell.

H4: Differential effects of affective vs. behavioral responses will vary across individual differences in sense of smell. In particular,

H4a: Individuals with a normal sense of smell will rate perception and affect ratings of ad (Aad) and brand (Abrand) higher for scent-related brand names (vs. non-scent-related brand names). Affect toward scent-related brand names (vs. non-scent-related brand names) will not be rated higher in sensitive individuals.

H4b: Individuals with a heightened sense of smell will rate behavioral purchase intentions (PI), target product (Product) and cognitive beliefs of product performance (Belief) higher for scent-related brand names (vs. non-scent-related brand names). Scent-related brand names (vs. non-scent-related brand names) will not increase behavioral purchase intentions of individuals with a normal sense of smell.

14.3.2 Method and Procedures

Two product categories often associated with a scent were selected for creating the online ads, including a home fragrance product and a food item (cookie). Ads were pretested for likeability and product association with scent.

Words used to construct brand names in this study were chosen from a database with normality ratings to ensure gender and mood neutral words. Scent-related words (e.g., lavender, orange blossom, caramel) and non-scent-related words (e.g., bingo, symphonies, compass) were also selected from normality ratings on olfaction association levels. The scent-related brand name version and non-scent-related brand name version of the ads were constructed so the only variation is the brand name between the two conditions (Fig. 14.4).

A total of 256 participants from a mid-size university in the United States were recruited and given class credit for their participation. A screener question to survey the smell orientation of the individuals was asked and used to group participation into four groups based on their sensitivity to smell: no sense of smell, decreased sense of smell, normal sense of smell and increased sensitivity to smell. The two olfactory groups of interest for our study, sensitive and normal, resulted in 66 sensitive individuals and 163 individuals with a normal sense of smell. A total number of 229 participants were included in the analyses.

Participants were randomly assigned into the two ad conditions: scent-related word brand ad and non- scent-related word brand ad. This resulted in 35 sensitive individuals in the scent-related word brand condition and 31 in the non-scent-related word brand. Eighty-four and 79 normal individuals were included in the two conditions respectively. The ads were presented on a computer screen simulating an online shopping scenario and participants were instructed to perform olfactory imagery, "Please take a minute or two to try to form a mental image in your of what

Fig. 14.4 Example of the home fragrance product with the scented brand "Aroma Fresh" used in the online ad study

the product must smell like." Questions related to vividness of imagery (e.g., "please identify the strength of the smell that came to mind when thinking about the product") on a 5-point scale were included in the survey and later used as a manipulation check. Ratings were included as covariate. Participants were then asked to rate their attitudes towards the ad (A_{ad}), brand (A_{brand}), product ($A_{product}$), and purchase intentions (PI). Beliefs related to the functionality/performance of the product was asked for each product (e.g., "judging from the ad and brand, I believe this home fragrance gets rid of odors effectively").

14.3.3 Results

Control variables included gender, imagery vividness level and product involvement. There were marginal significant effects on the outcome variables, hence these were not included in the following analyses.

In a between subject design, approximately half of the participants were randomly given the scent-related ad and the others were shown the non-scent-related ad. MANOVA test reveals significant main effects on the impact of scent-related brand (vs. non-scent-related brand) in home fragrance ads on the A_{brand} ($M_{scent} = 3.31$ vs. $M_{noscent} = 2.98$, $F(1, 225) = 3.63$, $p < 0.5$) and $A_{product}$ ($M_{scent} = 3.38$ vs. $M_{noscent} = 3.15$, $F(1, 225) = 2.93$, $p < 0.05$). There were marginal effects on purchase intentions ($M_{scent} = 3.75$ vs. $M_{noscent} = 3.50$, $F = 1.55$, $p < 0.08$) and on the Belief of how well the product performs ($M_{scent} = 2.73$ vs. $M_{noscent} = 2.42$, $F = 1.53$, $p < 0.08$). (In the case of home fragrance, how effectively did it get rid of odors?) No significant effect of the brand name on A_{ad} ($M_{scent} = 3.09$ vs. $M_{noscent} = 2.96$ $F(1, 225) = 0.41$, $p > 0.1$). This was due to the removal of confounding effects through pretesting the ads and brand names. Findings confirm H3.

Smell orientation (normal vs. sensitive) also had significant main effects on the A_{ad} ($M_{normal} = 3.16$ vs. $M_{sensitive} = 2.9$, $F(1. 225) = 4.03$, $p < 0.05$) and Belief ($M_{normal} = 2.65$ vs. $M_{sensitive} = 2.22$, $F(1, 225) = 5.59$, $p < 0.01$). There was a marginal significant effect of smell orientation on A_{brand} ($M_{normal} = 3.26$ vs. $M_{sensitive} = 3.05$, $F(1, 225) = 2.51$, $p < 0.08$). There were no main effects of smell orientation on $A_{product}$ ($M_{normal} = 3.35$ vs. $M_{sensitive} = 3.19$, $F(1, 225) = 1.88$, $p > 0.1$) and PI ($M_{normal} = 2.52$ vs. $M_{sensitive} = 2.36$, $F(1, 225) = 0.51$, $p > 0.1$). Results in general confirm H4.

Further, there are marginal interaction effects of smell orientation (normal vs. sensitive) × fragrance scent (scent vs. no scent) on A_{brand} ($F(1, 225) = 1.88$, $p > 0.1$), A_{ad} ($F(1, 225) = 1.84$, $p < 0.05$), $A_{product}$ ($F(1, 225) = 1.88$, $p > 0.1$) and Belief ($F(1, 225) = 1.91$, $p < 0.08$). Planned post-hoc tests in individuals with a normal sense of smell demonstrate that a scent-related brand name, in comparison with non-scent-related brand name, has a significant impact on A_{brand} ($M_{scent} = 3.47$ vs. $M_{noscent} = 3.08$, $t(162) = 2.64$, $p < 0.01$), A_{ad} ($M_{scent} = 3.29$ vs. $M_{noscent} = 3.02$, $t(162) = 1.92$, $p < 0.01$), $A_{product}$ ($M_{scent} = 3.49$ vs. $M_{noscent} = 3.24$, $t(162) = 1.85$, $p < 0.05$) and Belief ($M_{scent} = 2.98$ vs. $M_{noscent} = 2.66$, $t(159) = 1.83$, $p < 0.05$). Scent-related brand name

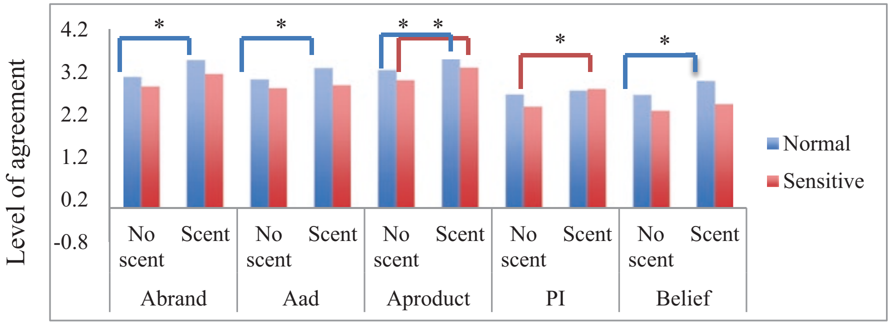

Fig. 14.5 Mean affect related ratings (Aad, Abrand, Aproduct and Belief) and behavioral intention ratings (Purchase intensions) across the two brand conditions (Non-scent-related brand vs. scent-related brand) for the home fragrance ad in the two olfactory orientation groups (normal vs. sensitive). **$p < 0.01$, *$p < 0.05$

did not have an impact on PI ($M_{scent} = 2.76$ vs. $M_{noscent} = 2.67$, $t(162) = 0.48$, $p > 0.1$). Findings confirm H4a (Fig. 14.3).

In contrast, the scent-related brand name had marginal influences on $A_{product}$ ($M_{scent} = 3.3$ vs. $M_{noscent} = 3.0$, $t(64) = 1.43$, $p < 0.05$) and PI ($M_{scent} = 2.80$ vs. $M_{noscent} = 2.38$, $t(64) = 1.74$, $p < 0.05$) for individuals with a heightened sense of smell. Scent-related brand name had no significant impact on affect driven evaluations, A_{brand}, A_{ad}, or Belief. Results support H4b (Fig. 14.5).

In a different product category using a cookie ad, similar effects were found in the evaluation of the ad. Overall, individuals with a normal sense of smell are more likely to be influenced by the scent-related brand resulting in higher attitude ratings. Individuals with a normal sense of smell rated A_{brand} ($M_{normal} = 3.24$ vs. $M_{sensitive} = 2.88$, $F(1, 225) = 4.95$, $p < 0.01$), A_{ad} ($M_{normal} = 3.35$ vs. $M_{sensitive} = 3.08$, $F(1, 225) = 3.14$, $p < 0.05$), PI($M_{normal} = 3.82$ vs. $M_{sensitive} = 3.43$, $F(1, 225) = 3.14$, $p < 0.05$) and Belief "believed the cookie would taste better" ($M_{normal} = 3.70$ vs. $M_{sensitive} = 3.41$, $F(1, 225) = 5.46$, $p < 0.01$) higher than sensitive individuals.

Overall, Scent-related brand names in the cookie ad were not rated significantly higher than non-scent-related brand ads on A_{brand} ($M_{scent} = 3.14$ vs. $M_{noscent} = 2.97$, $F(1, 225) = 1.09$, $p > 0.1$), A_{ad} ($M_{scent} = 3.29$ vs. $M_{noscent} = 3.15$, $F(1, 225) = 0.86$, $p > 0.1$), $A_{product}$ ($M_{scent} = 3.94$ vs. $M_{noscent} = 3.84$, $F(1, 225) = 0.63$, $p > 0.1$) and Belief ($M_{scent} = 3.56$ vs. $M_{noscent} = 3.54$, $F(1, 225) = 0.02$, $p > 0.1$). Purchase intentions ($M_{scent} = 3.75$ vs. $M_{noscent} = 3.50$, $F(1, 225) = 2.42$, $p < 0.08$) were marginally higher in the scent-related brand ad.

However, individuals with a normal sense of smell were significantly influenced by the scent-related brand name (vs. non-scent-related brand name) and rated A_{brand} ($M_{scent} = 3.43$ vs. $M_{noscent} = 3.05$, $t(162) = 2.41$, $p < 0.01$) and A_{ad} ($M_{scent} = 3.51$ vs. $M_{noscent} = 3.13$, $t(162) = 2.41$, $p < 0.01$) higher in the scent-related brand name condition. The effects were not significant on PI and belief.

Individuals with a heightened sense of smell are not influenced by the scent-related brand name; thus do not rate A_{brand} ($M_{scent} = 2.90$ vs. $M_{noscent} = 2.91$, $t(64) = -0.08$, $p > 0.1$), A_{ad} ($M_{scent} = 3.09$ vs. $M_{noscent} = 3.15$, $t(64) = -0.24$, $p > 0.1$), or Belief ($M_{scent} = 3.50$ vs. $M_{noscent} = 3.36$, $t(64) = 0.51$, $p > 0.1$) higher in the scent-related brand name condition (vs. non-scent-related brand name). However, PI are marginally higher in sensitive individuals ($M_{scent} = 3.66$ vs. $M_{noscent} = 3.25$, $t(64) = 1.43$, $p < 0.08$) when the scent-related brand name was presented.

14.3.4 Discussion

As congruency theory predicted, and in support of H3, findings overall show that scent-related brand names are better perceived and rated higher in positive attitudes towards A_{brand}, A_{ad}, Belief and PI in the home fragrances ad. The scent-related brand name did not strongly influence attitudes for the cookie and could be likely a result of the product category. Home fragrances are normally more frequently associated with a scent than cookies, where taste is the determinant attribute.

The main effects for olfactory orientation were significant in both ads for A_{brand}, A_{ad} and Beliefs where individuals with a normal sense of smell rated the products with scent-related brand names more favorably. The image of a product presented in the ad, which is automatically associated with a scent, triggered lower attitudes toward the brand, ad, and product in the sensitive individuals. Attitudes are not elevated by the brand name for these individuals, whereas the scent-related brand name is seen and rated higher in the normal individuals. Findings in Study 2 coincide and support the ERP results, revealing suppressed affective reactions and responses in processing scent-related information.

However, purchase intention was rated higher in sensitive individuals when scent-related brand name was presented, despite lower attitudes toward the brand, ad and belief. On the surface, this seems to contradict the suggestions offered by the theory of reasoned action. However, we argue that the attitudinal reaction, reflected in non-significant effects of scented brand names on ad and brand ratings, was masked by emotional suppression for the purpose of overall behavioral function in individuals sensitive to smell. Such affect regulation, which has been suggested to foster feeling "right" (vs. feeling "good") based on the demands of the situation (Koole et al. 2008). Further, the online environment was able to mitigate the negative physiological responses that might otherwise yield in a different behavioral outcome.

Findings from this study argue against the perception that attitudes (revealed at the surface level) alone accurately predict beliefs and behaviors. Our results suggest individual difference factors should be considered in the predictive model. Higher ratings of attitudes, as observed in normal individuals, might not translate into purchase behaviors. On the other hand, lower ratings of positive attitudes can still result in increased purchase intentions and beliefs. Underlying explanation for this contrary to conventional belief lies in the automatic suppressing processes of affect discovered in study 1.

14.4 General Conclusion and Discussion

The results in this paper revealed differentiated underlying emotional processes during online purchase decisions. Product decisions that normally use scent as one of the main attributes in driving purchase decisions are constrained by the online environment, in the case of e-commerce or online ads. Our findings suggest individual differences in sensitivity to smell plays a crucial role in purchase decisions related to scent-related products. Further, strongly correlated with olfactory sensitivity is the effectiveness of performing olfactory imagery. These differential effects based on individual difference factors investigated in this paper have ramifications for managerial decisions and strategy planning. In particular, understanding consumer responses to online advertising and sensory related information has implications for organizational branding and online advertising decisions. Customer relationship management and marketing communication efforts should consider (and/or reconsider) these individual difference elements when communicating with their consumers.

Normal individuals (vs. sensitive) in general are attracted to scented products and are less concerned about the "side effects" scented products might have on individuals sensitive to smell. Further, they rate the ad, product and brand significantly higher when a scent-related brand (vs. non-scent-related brand) was used. This was replicated in both home fragrance product ad food items. In the case of product performance, normal individuals believed the effectiveness of the home fragrance was enhanced when a scent-related brand name (vs. no scent) was used. Evidenced from findings in the ERP study (Study 1), affective responses in the pleasant valence olfactory words resulted in an attenuated emotional response. These findings are supported by other studies investigating automatic emotional suppression responses from sensitive individuals as a reaction to reduce unpleasant affect (Lin et al. 2017). Gaining these nuanced understandings of decision making processes involved in consumer's online shopping experiences and attitudes, can enhance quality decisions made at the organizational level.

Suppression of affect demonstrated in the ERP study (Study 1) is consistent with findings from online brand attitudes in Study 2. Our combined findings suggest an inhibited processing of emotions in individuals sensitive to smell when olfactory words were presented. This reaction can be viewed as a form of protective mechanism for individuals who have strong memory associations with scent from accumulating experiences in the past. By considering individual difference factors, implicit emotional reactions to scent were demonstrated. Future research should consider generalizing these findings in other areas of individual differences, including personality research and individual differences in other sensory perceptions. Additionally, the two studies suggest that the mind (emotional reactions) develops an automatic emotional suppression mechanism for regulating negative associations, so that the body (behavior) can normally perform and make cognitive driven decisions. The balancing mechanism between emotions and cognitions can occur implicitly and automatically. These findings open doors for future research on emotional regulation and other emotional intelligent related streams of research.

Results from our paper provide insight into understanding online purchase decisions and behaviors that are relevant to product purchases that are often associated with scent attributes. The paper also demonstrates the advantages of utilizing mixed methods. Fundamental mechanisms underlying the differential effects demonstrated through behavioral experiments and surveys were explained and supported through empirical data utilizing neuroscience methods. Through the combined use of methods described, the role of valence, automatic processes during passive view/read of words and images presented through online advertisements was investigated. Particularly, ERP findings provide implicit and almost real time data on emotional processes of scent related information, presented in visual format, which provides an explanation for the inconsistency between self-reported attitudes and behaviors observed in the behavioral study.

Other implications for understanding the interplay between the input of multiple sensory affect, attitudes and behavior are warranted. Clearly, online decision making processes and purchase behaviors may diverge from traditional decisions and behaviors taking place in block and mortar stores. Yet, as this paper shows, the role of scent and the influence of individual differences in sensitivity to scent in online purchase forums remain salient.

One of the limitations to the paper is we only included one end of the olfactory sensitivity spectrum in our investigation. The purpose for the study was to understand vulnerable consumers, sensitive individuals, and their cognitive and emotional processing of online information. Future studies should consider investigating individuals who fall on the other end of the spectrum, individuals who have decreased sense of smell. Previous studies have found that hyposmics reported lower levels of quality of life and lacked enjoyment of many daily consumption activities such as dining in restaurants friends (Miwa et al. 2001). Others have also investigated the full spectrum and discovered that sense of smell is often viewed as part of the consumer's identity and provide many implications for marketers and businesses (Cross et al. 2015). Individuals who find themselves deviated from the societal norms and expectations of following consumption rules in the marketplace have often been neglected and marginalized by the society (Lin et al. 2014). Further, the use of self-reported measure to screen and recruit individuals for the specific olfactory categories has its disadvantages. However, in a separate study, the validation of the scale and support effective use of the scale is demonstrated (Lin et al. 2017).

Biographies

Meng-Hsien (Jenny) Lin is an Assistant Professor of Marketing at California State University, Monterey Bay. Her research interests include studying various individual differences factors in the context of sensory marketing (influence of olfactory sensitivity on consumer behavior), advertising (gender differences and information processing in children), and focuses the mediating role of emotions on these relationships. She studies these topics using multi-methods, including behavioral experiments, survey research, neuroscience, and in-depth interviews. Her work also involves pedagogical research in marketing. Some of Dr. Lin's work has been published in *Neuroscience and Journal for Advancement of Marketing Education*. Her research has implications for theory, public policy, and consumer well-being issues. Dr. Lin received her Ph.D. in marketing and an M.B.A. from Iowa State University.

Terry L. Childers is Emeritus Professor of Marketing at Iowa State University. Prior to this, he was the Dean's Chair in Marketing at Iowa State University. Childers conducts neuromarketing research, or the level of consciousness consumers have when making purchasing decisions. He received the Distinguished Service Award for his exceptional dedication to the Journal of Consumer Research in 2013 at the Association for Consumer Research Conference.

Samantha N.N. Cross is an Associate Professor in Marketing in the College of Business at Iowa State University. Her research examines how diverse entities, identities, perspectives, beliefs, ways of sensing, and consuming co-exist in individuals, households, and society. Current research streams examine diverse cultural influences on decision-making, consumption, and innovation within the home; the impact of sensory influences on consumer identity and purchase behavior within the marketplace; and innovations in research methodology. She has received several awards for her research, including the Jane K. Fenyo Best Paper Award for Student Research, the ACR/Sheth Foundation Dissertation Award, and the Best Paper in Track Award at the American Marketing Association (AMA) Winter Conference. She has presented her work in several forums, both nationally and internationally. Her work has been accepted for publication in the *Journal of Marketing, the International Journal of Research in Marketing, Journal of Public Policy and Marketing, Journal of Business Research, Journal of Macromarketing, and Consumption, Markets and Culture*. Dr. Cross received her Ph.D. in marketing from the University of California, Irvine, her M.B.A. in international business from DePaul University, and a B.Sc. in management studies from the University of the West Indies.

William Jones is an Assistant Professor of Marketing at the Beacom School of Business at the University of South Dakota. Billy's work has explored consumers' use of numbers, behavioral pricing, individual differences in consumers' sensory processes, and issues in marketing education. Dr. Jones's work has been or will be published in *Biological Psychology, Journal for Advancement of Marketing Education,* and *Psychology & Marketing* among other journals and presentations at national and international conferences. Dr. Jones received his Ph.D. in marketing from the University of Kentucky, an M.B.A. from Georgia Southern University, and a bachelor's degree in psychology from the University of Scranton.

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