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"Dior, J'adore": The role of contextual information of luxury on emotional responses to perfumes

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ABSTRACT

Luxury conveys values of quality and rarity and holds a particular emotional meaning. Yet, studies conducted on the impact of contextual information of luxury on emotional responses to products remain scarce. In this study, we tested whether contextual information, in particular evoking luxury, could influence emotional responses to perfumes, which are known to be powerful elicitors of emotion. More specifically, we measured the subjective, physiological, and expressive components of participants' emotional responses. We conducted an experiment in which participants had to smell and assess perfumed pens as well as blank pens (i.e., without perfume) presented either in a luxurious context (i.e., name, brand and bottle), a non-luxurious one, or no information. Results indicated that participants tended to rate perfumes as more pleasant and rated them as more familiar when presented in a luxurious context than in a non-luxurious one or without context, and the blank pen as more irritating in a non-luxurious context than in a luxurious one. However, we did not find evidence of a significant contextual information effect on expressive or physiological indicators. Our findings suggest that contextual information of luxury can moderately influence the subjective component of participants' emotional responses, while no evidence for such effect was found with respect to the physiological and expressive components.

1. Introduction

Despite the financial crisis, luxury has remained a sustainable growing industry with a market value that went from € 128 billion in 2003 to € 251 billion in 2015 (Bain, 2016). Luxury stands for quality and rarity and holds strong hedonic meanings (Berthon, Pitt, Parent, & Berthon, 2009). Going beyond functional benefits, luxury consumption relies on emotional and socio-psychological benefits (Bauer, von Wallpach, & Hemetsberger, 2011; Vigneron & Johnson, 1999, 2004) delivered through the symbolism of an expensive yet thriving experience of unicity and aesthetics (Belk, 1988; Megehee & Spake, 2012). The subjective value of luxury products/services is enhanced by their scarcity, increasing individuals' willingness to pay a premium price (Truong & McColl, 2011). According to Hagtvedt and Patrick (2009), the difference between consumption of luxury versus non-luxury goods/services lies in the hedonistic versus utilitarian motives, respectively. While luxury is assumed to guarantee emotional benefits at a superior cost, non-luxury offers low-priced products but uncertain emotional value.

Emotional responses to products go beyond the evaluation of liking (e.g., Delplanque, Coppin, & Sander, 2017). Emotions are drivers of behavior and influence attitudes toward the environment (Ekman, 1992; Grandjean, Sander, & Scherer, 2008; Lavender & Hommel, 2007). One consensus among emotion theorists is that emotions emerge in response to a relevant event or a situation and help an organism to react by adapting to the environment (Ekman, 1992; Grandjean et al., 2008; Lerner, Li, Valdesolo, & Kassam, 2015; Russell, 1980). Emotions are manifested as changes in several components of the organism, i.e., cognitive processes, physiological response, feeling, facial expression, and action tendencies (Grandjean et al., 2008).

Given the specific anatomical overlaps between olfactory and emotion-related neural structures (Anderson et al., 2003; Carmichael, Clugnet, & Price, 1994; Dalton, 2002; Grabenhorst, Rolls, Margot, da Silva, & Velazco, 2007; Zelano, Montag, Johnson, Khan, & Sobel, 2007),

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olfaction stands out in the sensory landscape for its particular and close relation with the world of emotions. Odors affect behavior (Bensafi et al., 2002a, 2002b), mood, and well-being (Alaoui-Ismaïli, Vernet-Maury, Dittmar, Delhomme, & Chanel, 1997; Rétiveau & Milliken, 2004; Warrenburg, 2005), as well as cognitive processes such as memory and preference acquisition (Herz, Eliassen, Beland, & Souza, 2004; Leppänen & Hietanen, 2003). The importance of perfumery through the ages (Le Guérer, 1994) attests to the close links between odors and phenomena such as emotions. Preference for a given perfume relies on affective processes such as attachment and nostalgia related to it (Lambert-Pandraud & Laurent, 2010), or to striving for an ideal self (Belk, 1988).

Interest for a perfume is triggered by the evaluation of the information related to it. Contextual information plays a key role in the evaluation of products. Several studies have investigated the effect of store environment (e.g., odor, music, lighting, and human crowding) on feelings and, subsequently, on shopping behavior (for summary, see Lam, 2001). Further investigation on the importance of emotional responses to products' characteristics revealed effects of the product's name (Porcherot et al., 2012), color (Porcherot, Delplanque, Gaudreau, & Cayeux, 2013), and packaging (Ng, Chaya, & Hort, 2013) on individuals' emotional response to odors, beverages, and fabric softeners. A product's name and brand constitute the first line of the marketing strategy (Akdeniz, Calantone, & Voorhees, 2013; Dawar & Parker, 1994). For perfumes, elements such as the design of the bottle and the advertising environment provide individuals with information and allow them to form an initial idea about the product (Julien, 1997). The name settles the desirability of the perfume in potential individuals' minds. Highly related to semantic references, the name transmits information about the perfume itself, but also reflects the brand.

In the present study, we tested whether contextual information, in particular evoking luxury, could influence emotional responses to a perfume. More precisely, we hypothesized that contextual information of luxury would elicit the concept related to luxury (e.g., prestige and quality) and influence the emotional response. Since an emotional response is understood to consist of changes in several components, not only should we be able to retrieve changes via questionnaires (measuring feelings), but other indicators of emotional components should also emerge through physiological responses and facial motor expressions (for an overview, see Meiselman, 2016). We conducted an experiment in which participants had to smell perfumes and assess them while physiological and expressive measures were recorded. Perfumes were presented to the participants in association with a luxurious brand name and bottle or a non-luxurious name, brand and bottle or a number. We assessed the extent to which contextual information of luxury could influence emotional response, as measured with subjective, physiological, and expressive components.

2. Method

2.1. Preliminary study and selection of the stimuli

Nine commercially available perfumes were pre-selected as luxurious (see Table 1) and a preliminary study was conducted to control the perceived luxury of their brand and name. This preliminary study was approved by the ethics committee of the Psychology Department of the University of Geneva. Sixty undergraduate female students (mean age = 20.27 ± 3.1 years) from the Psychology Department at the University of Geneva filled out a questionnaire regarding the luxury character of different perfumes based on the perfume's name and brand. Participants were asked to rate the luxury of each perfume's brand and name on a seven-point Likert scale ranging from 1 ("not luxurious at all") to 7 ("very luxurious") by answering the following question: To what extent does this perfume seem luxurious to you? This questionnaire included nine perfumes pre-selected as luxurious and 18 perfumes that were preselected as non-luxurious. The order of the perfumes was counterbalanced across participants. On the basis of average luxury ratings, we selected the nine least luxurious perfumes among the initial 18 supposedly non-luxurious perfumes. A repeated measures analysis of variance (ANOVA) with luxury (2 levels) and perfumes (9 levels) as within subject factors performed on luxury ratings confirmed that the luxurious group of 9 perfumes was evaluated as more luxurious (mean = 5.55 ± 0.63) than the non-luxurious group of 9 perfumes (mean = 3.04 ± 0.67, $F(1, 59) = 546.67$, $p < .001$; $\eta_p^2 = .90$).

Table 1
Names and brands of perfumes used. In the non-luxury condition, the association of the luxury perfume with the non-luxury brand, name and bottle was as follow: Light blue with Belissama; J'adore with Roxy; Samsara with Ensoleille moi; Flower with So Pink; CK One with Sun; Romance with Quicksilver; Chanel5 with Eau Vitaminée; Trésor with Naturelle; Angel with Chewing Gum.

Luxury condition		Non-luxury condition	
Perfume name	Brand	Non-luxury perfume name	Brand
Angel	Thierry Mugler	Bellissima	Eau Jeune
Chanel n°5	Chanel	Chewing gum	Pimkie
Ck One	Calvin Klein	Eau Vitaminée	Biotherm
Flower	Kenzo	Ensoleille moi	André
J'adore	Dior	Naturelle	Yves Rocher
Light blue	Dolce & Gabbana	Quiksilver	Quiksilver
Romance	Ralph Lauren	Roxy	Roxy
Samsara	Guerlain	Sun	Gil Sander
Trésor	Lancôme	So pink	GAP

2.2. Participants

Twenty-one students from the Faculty of Psychology at the University of Geneva (all females; mean age = 22.7 ± 3.3 years) took part in this experiment. The study was approved by the ethics committee of the Psychology Department of the University of Geneva. Participants were individually tested and paid 50 Swiss Francs (approximately 50 US dollars) for their participation. On the days of testing, participants were asked not to wear any perfume. They all self-reported a normal sense of smell and were free from respiratory infections when they participated. Because of impedance problems with electromyography (EMG) electrodes, we could not record EMG during baseline sessions for two participants. We consequently removed all their data from the analyses.

2.3. Material

In the main experiment, the 9 luxury perfumes previously selected were used as olfactory stimuli. We added two blank pens (i.e., without perfume) that were associated to the name, brand, and bottle of either two luxury perfumes ("Acqua di Gio, Giorgio Armani" and "Nina, Nina Ricci") or to the name, brand, and bottle of two non-luxury perfume ("L'eau de Kookaï" and "Fleur de vigne, Caudalie"). Blank pens were introduced to control participants' compliance with the instructions, to help maintaining participants' attention and because they may be used to investigate the influence of luxury information in the absence of a perfume.

2.3.1. Subjective ratings

During the main experiment and for each trial, participants reported their subjective experience of the perfumes as well as their evoked feelings using several scales presented on paper sheets.

Subjective ratings: each perfume was evaluated on continuous 10-cm rating scales on pleasantness [*very unpleasant* (left of scale = 0 cm) to *neutral* (middle of scale, 5 cm) to *very pleasant* (right of scale, 10 cm)], intensity [*not perceived* (left) to *medium* (middle) to *strong* (right)], and familiarity [*not familiar at all* (left) to *very familiar* (right)] (see

Table 2
Subjective ratings for each trial. For the feelings, terms in bold represent the main feeling term as defined by the three other terms in regular text. For readability, all terms are presented here in English; however, they were presented in French to the participants.

Subjective Attributes	Feelings categories (bold text) with the evaluated items (regular text)					
	Pleasant feeling	Sensuality	Unpleasant feelings	Relaxation	Sensory pleasure	Refreshment
Pleasantness	Happiness	Romantic	Disgusted	Relaxed	Nostalgic	Energetic
Intensity	Well-being	Desire	Irritated	Serene	Amusement	Invigorated
Familiarity	Pleasantly surprised	In love	Unpleasantly surprised	Reassured	Mouthwatering	Clean

Delplanque et al., 2008, for details).

Feelings elicited by the perfume: we used the Geneva Emotion Odor Scale (GEOS; Chrea et al., 2009). Participants had to evaluate their feelings associated with the perfumes according to three terms summarized in one main feeling term (see Porcherot et al., 2010). Instructions were as follows: "We would like you to describe your feelings associated with each perfume you are going to smell. We would like you to rate the intensity of different feelings evoked by the perfume using a series of three terms corresponding to each main type of feeling. To answer, place the cursor along the scale at the point that corresponds to the intensity of your feeling, on a scale from "*Not at all intense* (left of scale = 0 cm)" to "*Extremely intense* (right of scale, 10 cm)". Perfumes were rated on the following main feelings: pleasant feeling, sensuality, unpleasant feeling, relaxation, sensory pleasure, refreshment (see Table 2).

2.3.2. Physiological recordings

The methodology for physiological recordings was the same as described in Delplanque et al. (2009) and Pichon et al. (2015). Physiological signals were acquired with the MP150 System (Biopac Systems, Santa Barbara, CA; 500-Hz sampling rate).

Respiratory activity was assessed by placing on the participant two respiratory belts that measured abdominal and thoracic expansion and contraction. Electrodermal activity was recorded using the constant-voltage method (0.5 V). Beckman Ag–AgCl electrodes (8-mm diameter active area) filled with a skin conductance paste (Biopac) were attached to the palmar side of the middle phalanges of the second and third fingers of the participants' non-dominant hand. Heart rate was assessed by fixing Biopac pregelled disposable electrodes under the participants' left and right wrists. A third electrode was placed on the left ankle. The signal was amplified by 1′000 and low-pass filtered at 30 Hz. Surface electromyography (EMG) recordings were collected, digitized, and stored (bandwidth 0.1–417 Hz, sample rate: 2′048 Hz) with a BIOSEMI Active-Two amplifier system (BioSemi Biomedical Instrumentation, Amsterdam, the Netherlands). Four active electrodes were placed over the right corrugator and zygomaticus regions of the face, corresponding to two distinct bipolar montages of interest (Fridlund & Cacioppo, 1986). Two additional electrodes placed above the inion (the common mode sense active electrode and the driven right leg passive electrode) were used as recording reference and ground electrodes, respectively (see http://www.biosemi.com/faq/cms&drl.htm, for more information).

2.4. Procedure

Participants were informed that their task was to evaluate perfumes using different scales and that either the perfumes' names, brands and bottles were presented with the perfumes or not. Participants gave their written consent and performed three sessions (counterbalanced between participants), namely, Baseline, Luxurious, and Non-Luxurious, separated by 1 week. In total, there were 11 trials per session (nine perfumes + two blank pens). During each session, the nine luxury perfumes previously selected were presented to participants in random order. During each trial, a perfume's brand, name and bottle was presented on a computer screen according to the sessions (see Fig. 1): in the Baseline condition, the perfume was labeled with a three-digit number and presented with a transparent neutral bottle; in the luxurious condition, its name, brand (see Table 1), and the corresponding bottle were presented; and in the non-luxurious condition, a non-luxurious name, brand, and bottle (see Table 1) were presented. The corresponding luxury perfume was then presented to the participants, who completed the subjective ratings of the perfume. Participants were not told that the perfumes were the same across sessions. For each session, the participant sat in a well-ventilated room next to an experimenter.

This experimenter delivered each stimulation with the odor pen about 1 cm below both the participant's nostrils for 2 s. Before testing, participants were instructed on how to smell the perfumes to minimize the intra- and inter-participant breathing pattern variability, a procedure that has been described in other studies (e.g., Jung et al., 2006). When the participants saw the signal presented on a computer screen in front of them, they were instructed to (a) breathe out deeply through the mouth; (b) wait for the request to inhale (a word presented on a screen in front of the participant); (c) breathe in evenly with the felt-tip pen under the two nostrils (in the training trials, the felt-tip pen did not contain any perfume); (d) breathe out and then rest and relax for 15 s without moving; and (e) rate the subjective and feelings' scales (described below) and wait for the signal to proceed to the next trial (see Fig. 1). The average interval (± SD) between two perfumes' presentation was 97.1 ± 6.1 s.

At the very end of the third session, participants were requested to answer a couple of supplementary questions on paper sheets. Next to each perfume's brand and name, participants were requested to report the extent to which they perceived it as luxurious on an 10 cm analog scale ranging from 0 ("not luxurious at all") to 10 ("very luxurious"). They were also unexpectedly and blindly presented with each perfume once again and had to report if they were able to give the name of the perfume (yes or no) and if they were, what it was.

2.5. Data analyses

All dependent variables were grouped by perfume to test the influence of the presentation context on the measures averaged across participants. We analyzed physiological measures offline using AcqKnowledge v4.1 software.

2.5.1. Respiration parameters

The main respiratory index was the reported maximum voltage amplitude of each respiratory belt during the first inhalation phase after the perfume or blank pen presentation.

2.5.2. Electrodermal activity

Signals were first low-pass filtered at 1 Hz. We measured the magnitude of skin conductance responses (SCRs) to perfumes (microSiemens) and analyzed them offline. As in Delplanque et al. (2009), a response was calculated as the peak conductance (superior to 0.02 microSiemens) starting in the 1- to 4-s interval after the beginning of inhalation (Dawson, Schell, & Filion, 1990). SCRs were square root transformed to normalize the data (Edelberg, 1972).

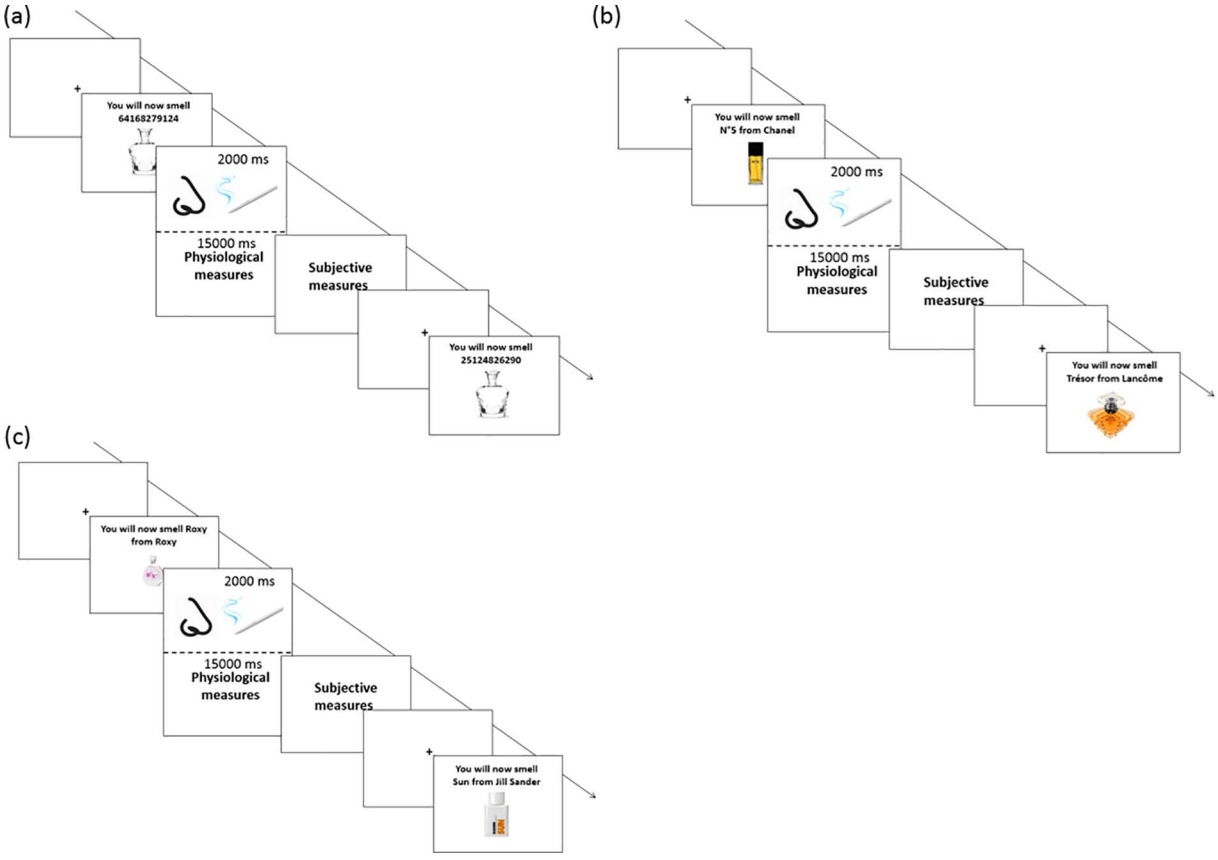

Fig. 1. Procedure for the three sessions: baseline (a), luxury condition (b), and non-luxury condition (c).

2.5.3. Facial muscle activity

Conventional bipolar montages were calculated from electrode pairs for each muscle by subtracting the activity of one electrode placed over the muscle from the activity of the other electrode nearby by using Brain Vision Analyzer software (Brain Products, Gilching, Germany). Signals were then filtered with a 20–400 Hz band-pass digital filter, rectified, and low-passed filtered below 40 Hz. We used the EMG amplitude for the corrugator supercilii and zygomaticus major during the 1 s before perfumes or blank pen presentation as the baseline. To allow analysis of the temporal profiles of facial EMG for 5 s after inhalation of different perfumes or blank pen, we converted mean EMG amplitudes during the subsequent five 1-s time intervals into a percentage of the mean amplitude of the baseline (Delplanque et al., 2009). This was done to standardize absolute EMG amplitudes and enable comparison between groups and individuals (e.g., de Wied, van Boxtel, Zaalberg, Goudena, & Matthys, 2006). Furthermore, trials for which EMG percentage was superior or inferior to the total mean percentage plus or minus three standard deviations, in any time window, were removed from the analyses to exclude any potential over-representation of a particular trial. We thus excluded, in total, for the Corrugator: 8, 8 and 7 trials in baseline, luxury and non-luxury conditions, respectively, and for the Zygomaticus: 8, 15 and 14 (out of 209 trials per condition).

2.5.4. Heart rate

Electrocardiographic R waves were detected offline, and intervals between heartbeats were converted into heart rate, expressed in beats per minute. The heart response evoked by the inhalation of the perfume consisted of biphasic activity with a peak in cardiac acceleration at about 3 s, and then a decrease in heart rate that reached a minimum at about 6 s after the onset of inspiration (Delplanque et al., 2009; Pichon et al., 2015; Sharvit, Vuilleumier, Delplanque, & Corradi-Dell' Acqua, 2015). We analyzed the maximum negative variation in the 5- to 8-s window following stimulus presentation (heart rate deceleration) to investigate whether this phase was sensitive to perfume pleasantness. We used the heart rate time course during the 10 s before perfumes or blank pen presentation as baseline.

3. Results

Analyses were performed using the Statsoft Statistica 13 software (http://www.statsoft.com). We were interested in the influence of contextual information of luxury on emotional responses to perfumes. Consequently, we conducted separate analyses for the perfumes and the blank pen. Moreover, we only reported analyses relevant to this research question.

3.1. Subjective ratings

First, we investigated whether contextual information of luxury could influence participants' subjective ratings. We conducted three two-way repeated measures analyses of variance (ANOVA) with perfume (9: all perfumes except the blank pen) and contextual information (3: baseline, luxury condition and non-luxury condition) as within subject factors on subjective ratings of pleasantness, familiarity and perfume intensity, separately.

3.1.1. Familiarity ratings

Familiarity ratings were modulated by the contextual information [$F(2, 36) = 4.39$, $p < .05$; $\eta_p^2 = .19$]. Here, participants rated the perfumes in the non-luxurious condition as less familiar than in the luxurious one ($p = .016$), the last two conditions not being statistically different from obtained in the baseline condition ($p_s > 0.14$, Fig. 2). This main effect was qualified by the interaction between perfume and contextual information [$F(16, 288) = 1.86$, $p = .023$; $\eta_p^2 = .09$]. This

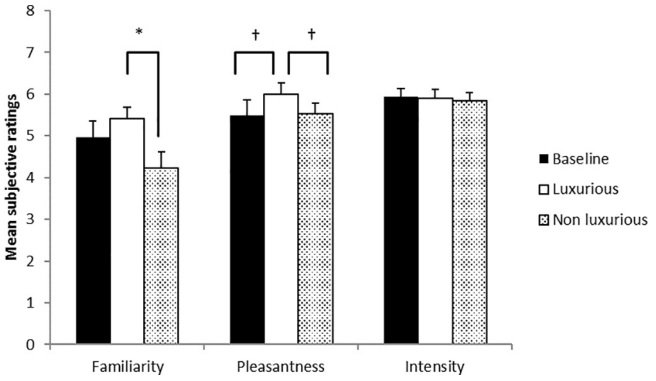

Fig. 2. Mean subjective ratings (with *SEM* bars) of perfumes according to contextual information of luxury. *Note.* $^{*}p < .05$, $^{\dagger}p < .10$.

revealed that information of luxury influenced familiarity ratings in a perfume-dependent manner.

3.1.2. Pleasantness ratings

Pleasantness ratings were also influenced by the contextual information [$F(2, 36) = 3.54$, $p = .039$; $\eta_p^2 = .16$]. More specifically, Tukey HSD post hoc comparisons revealed that participants tended to rate the perfumes as more pleasant in the luxurious than non-luxurious ($p = .075$) or in the baseline conditions ($p = .061$), the last two not being statistically different from each other ($p = .99$, Fig. 2).

3.1.3. Perfume intensity ratings

Perfume intensity ratings were not statistically influenced by the contextual information [$F(2, 36) = 0.40$, $p = .67$].

3.1.4. Feelings ratings

Next, we conducted a three-way repeated measures ANOVA on GEOS ratings with perfume (9: all perfumes except the blank pen), contextual information (3: baseline, luxury condition and non-luxury condition) and feeling category (6: pleasant feeling, sensuality, unpleasant feeling, relaxation, sensory pleasure, refreshment) as within subject factors. Subjective ratings were different across feelings' categories [$F(5, 85) = 13.18$, $p < .001$; $\eta_p^2 = .43$] and across perfumes [$F(8, 136) = 5.28$, $p < .001$; $\eta_p^2 = .23$]. These main effects were qualified by the interaction of perfume × feeling category [$F(40, 680) = 3.49$, $p < .001$; $\eta_p^2 = .17$], showing that the reported feelings depended on the perfume (Fig. 3a). Lastly, no main effect nor any interaction involving the contextual information reached significance ($F_s < 1.14$, $p_s > 0.17$).

3.2. Peripheral physiology

We performed two way repeated measures ANOVAs with perfume (9: all perfumes except the blank pen) and contextual information (3: baseline, luxury condition and non-luxury condition) as within subject factors on skin conductance responses' magnitude, heart rate amplitudes and respiratory belts amplitudes, separately. These analyses did not reveal any statistically significant main effect of perfume, contextual informal nor any interaction ($F_s < 1.54$, $p_s > 0.22$). Results are reported in Figs. 4–7 in the supplementary results material.

3.3. Facial muscle activity

We conducted three way repeated measures ANOVAs with perfume (9: all perfumes except the blank pen), contextual information (3: baseline, luxury condition and non-luxury condition) and time (0–1000 ms, 1000–2000 ms, 2000–3000 ms, 3000–4000 ms, 4000–5000 ms) as within subject factors on the mean percentage of zygomaticus and corrugator activity, separately. The percentage of activity of both muscles increased over time [$F_s(4, 72) = 2.76$, 5.07 $p_s < 0.033$, 0.001; $\eta_{ps}^2 = 0.13$, 0.21; corrugator and zygomaticus respectively] but was neither modulated by the perfume nor the contextual information ($F_s < 1.42$, $p_s > 0.18$). Results are reported in Figs. 8 and 9 in the supplementary results material.

3.4. Analyses on blank pen

We performed all the analyses presented from 3.1 to 3.3 on the measures obtained for the blank pen. These analyses failed to reveal statistically significant main effects of the contextual information or any interaction with other factors ($F_s < 1.97$, $p_s > 0.15$), except for the GEOS ratings (see Fig. 3b). Thus, for the GEOS ratings, we observed a significant contextual information by feeling category interaction [$F(10, 180) = 2.03$, $p = .032$; $\eta_p^2 = .10$]. We further characterized this interaction by supplementary ANOVAs with contextual information (3: baseline, luxury condition and non-luxury condition) as a within subject factor on each emotional category. These analyses revealed a main effect of the contextual information on "refreshment" (Energetic – Invigorated – Clean) [$F(2, 36) = 3.33$, $p = .046$; $\eta_p^2 = .15$]. Participants rated this feeling as lower in the non-luxurious condition than in the luxurious one ($p = .050$, Tuckey HSD post hoc comparison), the last two conditions not being statistically different from the baseline condition ($p_s > 0.14$). Similar to what we observed for perfumes, corrugator and zygomaticus muscular activities in response to the blank pen increased over time [$F_s(4, 72) = 4.54$, 4.34 $p_s = 0.002$, 0.003; $\eta_{ps}^2 = .20$, $.19$, respectively].

3.5. Additional questions

Ratings results showed that participants reported a priori luxury brands and perfume's bottles as being statistically more luxurious (mean = 5.60 ± 1.73) than a priori non-luxury brands and perfumes' bottles (mean = 3.14 ± 1.41; $F(1, 18) = 86.63$, $p < .001$; $\eta_p^2 = .82$). On average, participants were able to correctly recognize 1.26 ± 1.05 perfumes out of 9 after the three sessions.

4. Discussion

In this study, we tested the extent to which emotional responses to perfumes vary according to contextual information of luxury. The contextual information within which the very same perfumes were delivered was manipulated in three conditions: luxurious name, brand and bottle (i.e., luxury condition), non-luxurious name, brand and bottle (i.e., non-luxury condition) and number only (i.e., baseline). We measured the subjective, physiological, and expressive components of participants' emotional responses to perfumes.

Subjective ratings of familiarity were sensitive to the contextual information of luxury, and ratings of pleasantness tended to be too. More specifically, participants rated perfumes as more familiar when labeled as luxurious rather than non-luxurious. The fact that non-luxury names and brands were less familiar than luxury ones may account for this effect[2]. To further test this idea, we run a complementary analysis where we examined changes between the luxurious and non luxurious conditions. Changes in luxury ratings of the perfume names, brand and bottle were not correlated with changes in perfumes familiarity ratings [Spearman rank test, $r_s(9) = -0.03$; $p = .93$]. This analysis strongly suggests that any effects of contextual luxury information we observed were not driven by familiarity.

[2] In a short online survey (performed with Qualtrics, www.Qualtrics.com), we presented the names, brands and bottles of the perfumes used in the study and we asked 15 participants (11 women; mean age = 28.6 ± 4.4 years) to report how familiar was the presented perfume on a scale ranging from [*not familiar at all* (left) to *very familiar* (right)]. Results showed that the luxury perfumes were more familiar than the non-luxurious ones [$F(1, 14) = 78.3$, $p < .001$; $\eta_p^2 = .85$].

Fig. 3. Mean feelings ratings according to (a) the perfumes (except the blank pen) and (b) the contextual information of luxury (blank pen only).

Participants tended to rate perfumes as more pleasant when labeled as luxurious than when labeled as non-luxurious or not labeled. This suggests that the positive values conveyed by luxury tended to be transferred to perfume's pleasantness. One could argue that participants knew the perfumes they were presented with, knew their names, brand or bottle and were able to correctly identify them. In that case, the luxury condition was a "correct labelling", the non-luxury condition an "incorrect labelling" and the baseline condition a "no labelling". This interpretation appears unlikely since the recall test performed at the end of the experiment demonstrated that participants could not identify what they smelled, even after being presented with the correct names, brands and bottles. This is not surprising since participants were undergraduate students in Psychology and not trained to identify perfumes. More generally, even with an excellent olfactory acuity, it is difficult to identify odors when no cue is presented (Frank, Dulay, & Gesteland, 2003; Fusari & Ballesteros, 2008).

Our results demonstrated that the perfumes evoked different feelings as measured with GEOS but there was no statistically significant modulation of those reported feelings by the contextual information of luxury. The main driver of feelings consequently appears to be the sensory experience of the perfume rather than the contextual information. This idea is consistent with previous findings (e.g., Porcherot et al., 2013) showing that feelings evoked by fabric softeners mostly depended on the perfumes but were hardly sensitive to the contextual information (here, manipulated with different colors, see also Porcherot, Delplanque, Ferdenzi, Gaudreau, & Cayeux, 2016 for a discussion on this topic). In contrast, we found a contextual effect in one of the feelings' categories for the blank pen (i.e., no perfume) when the contextual information may play a more prominent role. Contextual information of luxury reinforced the feeling of "Refreshment" (defined with the terms Energetic – Invigorated – Clean) when no perfume is presented. The interpretation of this effect remains difficult and tentative but we speculate that by contrast with clear-cut olfactory stimulations, in the absence of any olfactory input, participants' expectation to smell a luxurious perfume could have specifically induced an arousal reaction. This reaction would have led participants to rate the blank pen as eliciting more "refreshment" feelings (Energetic – Invigorated – Clean) in the luxury

condition. To our knowledge, there is no direct evidence that luxurious items elicit more arousal than non-luxurious ones and further studies could focus on this important aspect of emotional reactions to luxury.

Similar to the findings by Pichon et al. (2015), none of the physiological or expressive indicators was significantly modulated in response to different perfumes or contexts evoking luxury. These results are not surprising when one thinks of emotions as adaptive responses to a relevant situation (e.g., Sander, Grandjean, & Scherer, 2005). In this framework, the physiological and expressive components of an emotional episode should be adapted to the environment currently faced. Yet, perfumes, all of them being particularly pleasant, are unlikely to require different behavioral adaptations to the environment, even when presented with different contextual information. Previous studies showing sensitivity of the physiological measures to discriminate the emotional response compared wider range of emotional stimulation than perfumes with similar range of pleasantness (He, Boesveldt, de Graaf, & de Wijk, 2016; He, de Wijk, de Graaf, & Boesveldt, 2016). However, recent studies suggested that physiological measures are not sensitive enough to discriminate between olfactory stimuli that are restricted in their pleasantness range (Beyts et al., 2017; Pichon et al., 2015). Pichon et al. (2015) suggested that these measured responses could differentiate among odors polarized along the pleasantness spectrum or evoking representations linked to different functions of olfaction (i.e., relative to ingestion, avoiding environmental hazards and emotional contagion; Stevenson, 2010). This is presumably, why we fail to observe a modulation of physiological and expressive components by contextual information of luxury or in response to different perfumes.

One could question whether a simple name, a brand or a bottle presented on a screen, or even the combination of the three as we did here, could properly operationalize luxury.

Luxury brands are known to convey luxury values (Gentry, Putrevu, Shultz Ii, & Commuri, 2001; Vigneron & Johnson, 1999, 2004). Using displays of luxury and non-luxury information, Brucks, Zeithaml, and Naylor (2000) found that participants rely more frequently on brands' cue when evaluating the prestige dimension of a product. Lee, Ko, and Megehee (2015) manipulated logos of luxury and non-luxury brands to evoke the social values associated to the brands. Logos presented on polo shirts influenced wearers' wealth and status evaluated by the participants. This perception of higher status elicited favorable treatment in social interactions, as it would be expected by the global concept of luxury. Manipulating luxury using brands' names or logos has also been demonstrated as powerful enough to differentiate materialistic vs. non materialistic populations (Audrin, Brosch, Chanal, & Sander, 2017) or to influence social rejection and life satisfaction perception (Jiang, Gao, Huang, DeWall, & Zhou, 2014). Brands' name and logos manipulation is also associated with measurable differential activations in reward as well as self-centered cognitions related areas in the brain (e.g., Schaefer, 2009; Schaefer & Rotte, 2007 for a review). These results echoed with the role of luxury brands as rewarding marker of higher status symbol. All these studies provide solid arguments in favor of this induction method since they demonstrated influences on many facets of luxury. Although a field study may be preferable to induce the whole concept of luxury, an experimental study with psychophysiological measures would be almost impossible to conduct reliably in a field context.

Although modest, our results provide evidence for the use of subjective measures, which highlighted differences in reactions to perfumes associated with different contextual information of luxury. Classic psychophysiological measures did not significantly change across the contexts used here. Consequently, the use of classic and easy-to-set-up psychophysiological indicators for subtle measures of emotional response to stimuli such as perfumes may be questioned when one is interested in contextual effects for relatively similarly pleasant perfumes (see also Pichon et al., 2015). However, we should not exclude the possibility that future advancements in physiological recording capabilities and signal processing associated with the use of alternative physiological measures (e.g., neuroendocrines or brain related measures) could provide more fine-grained psychophysiological differentiations of fragrances or bring out more subtle contextual influences.

More generally, though feelings, expressions and physiological emotional responses are related, measured changes in one component do not automatically involve measured modifications in the other. Appraisal theories of emotion (component process model; Sander et al., 2005; Scherer, 1982) posit that the emotional components have synchronized modifications in response to a stimulus, but they remain different and separate processes with specific temporal dynamics, and possibly different sensitivities for the measures typically used. In accordance with previous findings (Pichon et al., 2015), our results underline the need to investigate modifications in different emotional components in order to fully capture an emotional episode.

5. Conclusion

This study shows that contextual information of luxury can lead to limited differences in emotional responses to perfumes: luxury information influenced the subjective component of emotion, and in a moderate fashion. In contrast, our analyses did not reveal any significant sensitivity of the physiological and expressive components to luxury contexts. Hence these results contribute to the literature on emotions by highlighting the importance of investigating its different sub-components.

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Author contributions

Géraldine Coppin, Sylvain Delplanque, Christelle Porcherot, and Isabelle Cayeux designed the study. Géraldine Coppin and Sylvain Delplanque collected the data. Géraldine Coppin, Tiffany Baer and Sylvain Delplanque analyzed and interpreted the data. Géraldine Coppin, Tiffany Baer and Sylvain Delplanque wrote the paper. Christelle Porcherot, Isabelle Cayeux and David Sander made revisions. Tiffany Baer, Géraldine Coppin, Christelle Porcherot, Isabelle Cayeux, David Sander and Sylvain Delplanque approved the version to be published.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.foodqual.2017.12.003.

References

Akdeniz, B., Calantone, R. J., & Voorhees, C. M. (2013). Effectiveness of marketing cues on consumer perceptions of quality: The moderating roles of brand reputation and third-party information. *Psychology & Marketing, 30*(1), 76–89. http://dx.doi.org/10.1002/mar.20590.

Alaoui-Ismaïli, O., Vernet-Maury, E., Dittmar, A., Delhomme, G., & Chanel, J. (1997). Odor hedonics: Connection with emotional response estimated by autonomic parameters. *Chemical Senses, 22*(3), 237–248. http://dx.doi.org/10.1093/chemse/22.3.237.

Anderson, A. K., Christoff, K., Stappen, I., Panitz, D., Ghahremani, D., Glover, G., & Sobel, N. (2003). Dissociated neural representations of intensity and valence in human olfaction. *Nature neuroscience, 6*(2), 196–202.

Audrin, C., Brosch, T., Chanal, J., & Sander, D. (2017). When symbolism overtakes quality: Materialists consumers disregard product quality when faced with luxury brands. *Journal of Economic Psychology, 61*, 115–123. http://dx.doi.org/10.1016/j.joep.2017.04.001.

Bain & Compagny. (2016). Luxury Goods Worldwide Market Study, Fall-Winter 2016.

Bauer, M., von Wallpach, S., & Hemetsberger, A. (2011). 'My Little Luxury': A consumer-centred, experiential view. *Marketing Journal of Research and Management, 1*(11), 57–67.
Belk, R. W. (1988). Possessions and the extended self. *Journal of Consumer Research, 15*(2), 139–168.
Bensafi, M., Rouby, C., Farget, V., Bertrand, B., Vigouroux, M., & Holley, A. (2002). Autonomic nervous system responses to odours: The role of pleasantness and arousal. *Chemical Senses, 27*(8), 703–709. http://dx.doi.org/10.1093/chemse/27.8.703.
Bensafi, M., Rouby, C., Farget, V., Bertrand, B., Vigouroux, M., & Holley, A. (2002). Influence of affective and cognitive judgments on autonomic parameters during inhalation of pleasant and unpleasant odors in humans. *Neuroscience Letters, 319*(3), 162–166. http://dx.doi.org/10.1016/S0304-3940(01)02572-1.
Berthon, P., Pitt, L., Parent, M., & Berthon, J.-P. (2009). Aesthetics and ephemerality: Observing and preserving the luxury brand. *California Management Review, 52*(1), 45–66.
Beyts, C., Chaya, C., Dehrmann, F., James, S., Smart, K., & Hort, J. (2017). A comparison of self-reported emotional and implicit responses to aromas in beer. *Food Quality and Preference, 59*, 68–80. http://dx.doi.org/10.1016/j.foodqual.2017.02.006.
Brucks, M., Zeithaml, V. A., & Naylor, G. (2000). Price and brand name as indicators of quality dimensions for consumer durables. *Journal of the Academy of Marketing Science, 28*(3), 359–374. http://dx.doi.org/10.1177/0092070300283005.
Carmichael, S. T., Clugnet, M. C., & Price, J. L. (1994). Central olfactory connections in the macaque monkey. *The Journal of Comparative Neurology, 346*(3), 403–434. http://dx.doi.org/10.1002/cne.903460306.
Chrea, C., Grandjean, D., Delplanque, S., Cayeux, I., Le Calvé, B., Aymard, L., & Scherer, K. R. (2009). Mapping the semantic space for the subjective experience of emotional responses to odors. *Chemical Senses, 34*(1), 49–62. http://dx.doi.org/10.1093/chemse/bjn052.
Dalton, P. (2002). Olfaction. In (3rd ed.). *Sensation and perception: Vol. 1. Steven's handbook of experimental psychology* (pp. 691–746). New York, NY: John Wiley & Sons, Inc.
Dawar, N., & Parker, P. (1994). Marketing universals: Consumers' use of brand name, price, physical appearance, and retailer reputation as signals of product quality. *Journal of Marketing, 58*(2), 81–95. http://dx.doi.org/10.2307/1252271.
Dawson, M. E., Schell, A. M., & Filion, D. L. (1990). The electrodermal response system. In J. T. Cacioppo, & L. G. Tassinary (Eds.). *Principles of psychophysiology: Physical, social and inferential elements* (pp. 295–324). Cambridge, England: Cambridge University Press.
de Wied, M., van Boxtel, A., Zaalberg, R., Goudena, P. P., & Matthys, W. (2006). Facial EMG responses to dynamic emotional facial expressions in boys with disruptive behavior disorders. *Journal of Psychiatric Research, 40*(2), 112–121. http://dx.doi.org/10.1016/j.jpsychires.2005.08.003.
Delplanque, S., Coppin, G., & Sander, D. (2017). Odor and Emotion. In A. Buettner (Ed.). *Springer handbook of odor* (pp. 101–102). Cham: Springer International Publishing.
Delplanque, S., Grandjean, D., Chrea, C., Aymard, L., Cayeux, I., Le Calvé, B., & Sander, D. (2008). Emotional processing of odors: Evidence for a nonlinear relation between pleasantness and familiarity evaluations. *Chemical Senses, 33*(5), 469–479. http://dx.doi.org/10.1093/chemse/bjn014.
Delplanque, S., Grandjean, D., Chrea, C., Coppin, G., Aymard, L., Cayeux, I., & Scherer, K. R. (2009). Sequential unfolding of novelty and pleasantness appraisals of odors: Evidence from facial electromyography and autonomic reactions. *Emotion, 9*(3), 316–328. http://dx.doi.org/10.1037/a0015369.
Edelberg, R. (1972). Electrodermal recovery rate, goal-orientation, and aversion. *Psychophysiology, 9*(5), 512–520. http://dx.doi.org/10.1111/j.1469-8986.1972.tb01805.x.
Ekman, P. (1992). Are there basic emotions? *Psychological Review, 99*(3), 550–553. http://dx.doi.org/10.1037/0033-295X.99.3.550.
Frank, R. A., Dulay, M. F., & Gesteland, R. C. (2003). Assessment of the Sniff Magnitude Test as a clinical test of olfactory function. *Physiology & Behavior, 78*(2), 195–204. http://dx.doi.org/10.1016/S0031-9384(02)00965-4.
Fridlund, A. J., & Cacioppo, J. T. (1986). Guidelines for human electromyographic research. *Psychophysiology, 23*(5), 567–589. http://dx.doi.org/10.1111/j.1469-8986.1986.tb00676.x.
Fusari, A., & Ballesteros, S. (2008). Identification of odors of edible and nonedible stimuli as affected by age and gender. *Behavior Research Methods, 40*(3), 752–759. http://dx.doi.org/10.3758/brm.40.3.752.
Gentry, J. W., Putrevu, S., Shultz Ii, C., & Commuri, S. (2001). How now Ralph Lauren? The separation of brand and product in a counterfeit culture. *Advances in Consumer Research, 28*(1), 258–265.
Grabenhorst, F., Rolls, E. T., Margot, C., da Silva, M. A. A. P., & Velazco, M. I. (2007). How pleasant and unpleasant stimuli combine in different brain regions: Odor mixtures. *The Journal of Neuroscience, 27*(49), 13532–13540. http://dx.doi.org/10.1523/jneurosci.3337-07.2007.
Grandjean, D., Sander, D., & Scherer, K. R. (2008). Conscious emotional experience emerges as a function of multilevel, appraisal-driven response synchronization. *Consciousness and Cognition, 17*(2), 484–495.
Hagtvedt, H., & Patrick, V. M. (2009). The broad embrace of luxury: Hedonic potential as a driver of brand extendibility. *Journal of Consumer Psychology, 19*(4), 608–618.
He, W., Boesveldt, S., de Graaf, C., & de Wijk, R. A. (2016). The relation between continuous and discrete emotional responses to food odors with facial expressions and non-verbal reports. *Food Quality and Preference, 48*, 130–137. http://dx.doi.org/10.1016/j.foodqual.2015.09.003.
He, W., de Wijk, R. A., de Graaf, C., & Boesveldt, S. (2016). Implicit and explicit measurements of affective responses to food odors. *Chemical Senses, 41*(8), 661–668. http://dx.doi.org/10.1093/chemse/bjw068.
Herz, R. S., Eliassen, J., Beland, S., & Souza, T. (2004). Neuroimaging evidence for the emotional potency of odor-evoked memory. *Neuropsychologia, 42*(3), 371–378. http://dx.doi.org/10.1016/j.neuropsychologia.2003.08.009.
Jiang, M., Gao, D.-G., Huang, R., DeWall, C. N., & Zhou, X. (2014). The devil wears Prada: Advertisements of luxury brands evoke feelings of social exclusion. *Asian Journal of Social Psychology, 17*(4), 245–254. http://dx.doi.org/10.1111/ajsp.12069.
Julien, M. (1997). *L'image publicitaire des parfums: Communication olfactive.* Montréal: L'Harmattan.
Jung, J., Hudry, J., Ryvlin, P., Royet, J. P., Bertrand, O., & Lachaux, J. P. (2006). Functional significance of olfactory-induced oscillations in the human amygdala. *Cerebral Cortex, 16*, 1–8.
Lam, S. Y. (2001). The effects of store environment on shopping behaviors: A critical review. *Advances in Consumer Research, 28*, 190–197.
Lambert-Pandraud, R., & Laurent, G. (2010). Why do older consumers buy older brands? The role of attachment and declining innovativeness. *Journal of Marketing, 74*(5), 104–121. http://dx.doi.org/10.1509/jmkg.74.5.104.
Lavender, T., & Hommel, B. (2007). Affect and action: Towards an event-coding account. *Cognition and Emotion, 21*(6), 1270–1296. http://dx.doi.org/10.1080/02699930701438152.
Le Guérer, A. (1994). *Scent: The mysterious and essential powers of smell.* New York: Kodansha America.
Lee, J., Ko, E., & Megehee, C. M. (2015). Social benefits of brand logos in presentation of self in cross and same gender influence contexts. *Journal of Business Research, 68*(6), 1341–1349. http://dx.doi.org/10.1016/j.jbusres.2014.12.004.
Leppänen, J. M., & Hietanen, J. K. (2003). Affect and face perception: Odors modulate the recognition advantage of happy faces. *Emotion, 3*(4), 315–326. http://dx.doi.org/10.1037/1528-3542.3.4.315.
Lerner, J. S., Li, Y., Valdesolo, P., & Kassam, K. S. (2015). Emotion and decision making. *Annual Review of Psychology, 66*(1), 799–823. http://dx.doi.org/10.1146/annurev-psych-010213-115043.
Megehee, C. M., & Spake, D. F. (2012). Consumer enactments of archetypes using luxury brands. *Journal of Business Research, 65*(10), 1434–1442.
Meiselman, H. L. (2016). *Emotion measurement.* New York: Woodhead Publishing.
Ng, M., Chaya, C., & Hort, J. (2013). The influence of sensory and packaging cues on both liking and emotional, abstract and functional conceptualisations. *Food Quality and Preference, 29*(2), 146–156. http://dx.doi.org/10.1016/j.foodqual.2013.03.006.
Pichon, A. M., Coppin, G., Cayeux, I., Porcherot, C., Sander, D., & Delplanque, S. (2015). Sensitivity of physiological emotional measures to odors depends on the product and the pleasantness ranges used. *Frontiers in Psychology, 6*, 1821. http://dx.doi.org/10.3389/fpsyg.2015.01821.
Porcherot, C., Delplanque, S., Ferdenzi, C., Gaudreau, N., & Cayeux, I. (2016). Emotions of Odors and Personal and Home Care Products A2. In Herbert L. Meiselman (Ed.). *Emotion Measurement*(pp. 427–454). Woodhead Publishing.
Porcherot, C., Delplanque, S., Gaudreau, N., & Cayeux, I. (2013). Seeing, smelling, feeling! Is there an influence of color on subjective affective responses to perfumed fabric softeners? *Food Quality and Preference, 27*(2), 161–169. http://dx.doi.org/10.1016/j.foodqual.2012.06.011.
Porcherot, C., Delplanque, S., Planchais, A., Gaudreau, N., Accolla, R., & Cayeux, I. (2012). Influence of food odorant names on the verbal measurement of emotions. *Food Quality and Preference, 23*(2), 125–133. http://dx.doi.org/10.1016/j.foodqual.2011.07.006.
Porcherot, C., Delplanque, S., Raviot-Derrien, S., Calvé, B. L., Chrea, C., Gaudreau, N., & Cayeux, I. (2010). How do you feel when you smell this? Optimization of a verbal measurement of odor-elicited emotions. *Food Quality and Preference, 21*(8), 938–947. http://dx.doi.org/10.1016/j.foodqual.2010.03.012.
Rétiveau, A. N., & Milliken, G. A. (2004). Common and specific effects of fine fragrances on the mood of women. *Journal of Sensory Studies, 19*(5), 373–394.
Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology, 39*(6), 1161–1178. http://dx.doi.org/10.1037/h0077714.
Sander, D., Grandjean, D., & Scherer, K. R. (2005). A systems approach to appraisal mechanisms in emotion. *Neural Network, 18*(4), 317–352. http://dx.doi.org/10.1016/j.neunet.2005.03.001.
Schaefer, M. (2009). Neuroeconomics: in search of the neural representation of brands. *Progress in Brain Research, 178*, 241–252. http://dx.doi.org/10.1016/S0079-6123(09)17817-2.
Schaefer, M., & Rotte, M. (2007). Thinking on luxury or pragmatic brand products: Brain responses to different categories of culturally based brands. *Brain Research, 1165*, 98–104. http://dx.doi.org/10.1016/j.brainres.2007.06.038.
Scherer, K. R. (1982). Emotion as a process: Function, origin and regulation. *Social Science Information/sur les sciences sociales, 21*, 555–570.
Sharvit, G., Vuilleumier, P., Delplanque, S., & Corradi-Dell' Acqua, C. (2015). Cross-modal and modality-specific expectancy effects between pain and disgust. *Scientific Reports, 5*, 17487. http://dx.doi.org/10.1038/srep17487.
Stevenson, R. J. (2010). An Initial Evaluation of the Functions of Human Olfaction. *Chemical Senses, 35*(1), 3–20. http://dx.doi.org/10.1093/chemse/bjp083.
Truong, Y., & McColl, R. (2011). Intrinsic motivations, self-esteem, and luxury goods consumption. *Journal of Retailing and Consumer Services, 18*(6), 555–561. http://dx.doi.org/10.1016/j.jretconser.2011.08.004.
Vigneron, F., & Johnson, L. W. (1999). A review and a conceptual framework of prestige-seeking consumer behavior. *Academy of Marketing Science Review, 1*(1), 1–15.
Vigneron, F., & Johnson, L. W. (2004). Measuring perceptions of brand luxury. *Journal of Brand Management, 11*(6), 484–506.
Warrenburg, S. (2005). Effects of fragrance on emotions: Moods and physiology. *Chemical Senses, 30*(suppl 1), i248–i249. http://dx.doi.org/10.1093/chemse/bjh208.
Zelano, C., Montag, J., Johnson, B., Khan, R., & Sobel, N. (2007). Dissociated representations of irritation and valence in human primary olfactory cortex. *Journal of Neurophysiology, 97*(3), 1969–1976. http://dx.doi.org/10.1152/jn.01122.2006.