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The Effect of Ambient Scent on the Experience of Art: Not as Good as It Smells

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ABSTRACT

This study examines the impact of ambient scent on the perception and memory of art, in terms of perceived valence, arousal, and remembering of artworks. Because art perception evokes emotions and embodiment, the experiential marketing literature suggests using sensorial stimuli to enhance the experience of visiting art exhibitions. Although a fragrance in the environment can make visiting enjoyable, we examine more specifically the effects of scent on perception and memory of art, including potential interactions between different scents and artworks. In a between-participant experiment, this study shows some counterintuitive effects of scent on both evaluation and memory of art: a pleasant ambient scent can decrease evaluations of artworks and hinder memory of those artworks. Furthermore, scent and art have an interactive effect on arousal, such that incongruent scents and artworks increase arousal relative to congruent scents and artworks. In conclusion, enhancing experiences through sensorial cues can counterintuitively hinder the evaluation and memory of art. To the extent that art institutions aim to spread knowledge and appreciation of art, managers should be aware that ambient scents can actually interfere with this mission. © 2014 Wiley Periodicals, Inc.

This paper addresses the complex relationship between sensory factors and perception of art. In particular, it examines the influence of scent on perception and memory during an art exhibition. Ambient scent is often used during art exhibitions to enhance the relationship between audience and art. Scent can create a pleasant or unpleasant environment (Donovan & Rossiter, 1982), and it is an environmental cue that arts institutions can easily control. Thus, scent is a potentially effective lever for arts institutions to engage their audience.

Indeed, art institutions increasingly seek to engage their visitors (Bourgeon-Renault, 2003). Due to the recent reduction of public and private funds, art institutions are facing stronger competition (Colbert, 2009, 2012) that pushes them to more efficiently reach their goals of spreading knowledge and passion about the arts (Evrard & Colbert, 2000). This challenge is double: First, art institutions must attract a larger number of visitors by offering engaging experiences that are based on focused attention, feedback, control, activity orientation, and intrinsic motivation (Csikszentmihalyi, 1990). Second, art institutions must also more effectively educate their visitors (Scollen, 2010). By diffusing knowledge and passion for the arts, art institutions can gain visitors' loyalty, attract new visitors through word-of-mouth, and potentially attain funds (which are typically granted to institutions that maximize their impact on the audience). Creating positive experiences is an effective way to promote education, which in turn promotes loyalty because visitors who learn are more likely to develop a positive relationship with the art institution (Harrison & Shaw, 2004).

Aesthetic experiences are "an intense involvement of attention in response to a visual stimulus, for no other reason than to sustain the interaction" (Csikszentmihalyi & Robinson, 1990, p. 178). They depend on many factors (Hirshman & Holbrook, 1982), with environmental sensorial stimuli assuming an important role for their ability to influence viewers' emotions. Indeed, emotions are embedded within the aesthetic experience of art (Joy & Sherry, 2003; Silvia, 2005), which is the result of a complex interaction between cognitive appraisal and corporeal feelings ("embodiment," underlined as in Csordas, 1994). Because environmental stimuli affect appraisal through the senses, ambient scent could impact art perception and memory for paintings through the mechanism of emotion.

The next section will shortly debate the challenge of immersive experience for art institutions in order to underline the importance of sensorial stimuli in current art institutions' marketing strategies. The literature review on art perceptions and emotions will introduce the hypotheses of this article on the unexpected

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relations between art perception and ambient scent: pleasant ambient scent can decrease the perception of art and an interaction occurs between scent and the specific content of artworks in term of congruency. At the end of the article, it will be clear that leveraging pleasant sensorial stimuli can be less positive and more complex than expected.

ART INSTITUTIONS AND THE CHALLENGE OF IMMERSIVE EXPERIENCE

To face the challenging tasks of attracting and maintaining an audience, while also educating that audience, art institutions have begun to focus on the experiential nature of visiting an exhibition (Bourgeon-Renault, Urbain, Petr, Le Gall-Ely, & Gombault, 2006; Petkusjr, 2002). The central idea is to facilitate the immersion of visitors into an aesthetic experience (Carù & Cova, 2006; Csikszentmihalyi & Robinson, 1990; Joy & Sherry, 2003) in order to engage visitors and enhance their understanding of the art. Thus, art institutions are increasingly using an experiential marketing approach (Pine & Gilmore, 1999; Schmitt, 1999) in the design and management of their exhibitions (McIntyre, 2009). Immersive experiences can be created by encouraging visitors to interact with museum objects by reproducing "real situations" around the artworks (Hede & Thyne, 2010), by supporting consumers in appropriating the art contents (Carù & Cova, 2005), and by creating enchantment (Joy & Sherry, 2003) through stimulating visitors' senses in order to *immerse* them into multidimensional flows. Immersion has a high potential for creating enchanting experiences, especially in artistic settings (Duhaime, Joy, & Ross, 1995; Maher, Clark, & Motley, 2011), and it can generate pleasure and facilitate learning the arts into which visitors are embedded.

Environmental sensorial cues (e.g., music, lights, scents) can act as levers to make an experience more pleasant and immersive. In research on retailing, environmental sensorial stimuli have been studied at the level of store atmospheres (Donovan & Rossiter, 1982) and their impact on customers' product evaluations (Emsenhuber, 2011; Hulten, Broweus, & Van Dijk, 2009; Lindstrom, 2005). For example, lighting, music, and scent impact perceptions and memory of brands and product quality. Some conflicting findings have been obtained, but environmental sensorial cues are generally considered to affect customers' cognitions.

Art institutions are also beginning to dedicate resources to enhance the environmental sensorial richness of exhibitions. The Melbourne Museum in Australia, the Kelvingrove Museum and Art gallery in Glasgow, the National Museum of Scotland in Edinburgh (McIntyre, 2009), and the Jewish Museum in Berlin are all examples of museums designed (or redesigned) to enhance sensorial stimuli in order to foster immersion. However, a deeper understanding of the link between sensory factors and art perception is needed. Joy and Sherry (2003), who studied "the way the body informs the logic of thinking about art" (p. 259), provided an important contribution on this issue. These authors argue that aesthetic experience is imbued of corporeal percepts, according to the idea of "embodiment" (Csordas, 1994). The authors offer a clear perspective on the investigation of art perception: it is not only a matter of cognitive interpretation (Kesner, 2006), because senses also play a definitive role. Individuals perceive art both consciously and unconsciously, and corporeal percepts are part of the latter.

Among sensorial factors, scent is the only one that individuals cannot avoid (Muller, Alt, & Michelis, 2011). Furthermore, scent neither requires consumers to engage in a specific activity, nor does it require a specific layout or level of crowdedness. Thus, scent is particularly powerful as a sensorial factor and its use is becoming more widespread in experiential contexts. Analyzing the impact of ambient scents on art perception will reveal the potentials and the limits in the use of sensorial stimuli during exhibitions, and hence can help art institutions to design their exhibitions more effectively.

ART PERCEPTION, EMOTIONS, AND AMBIENT SCENT

Art Perception and Emotions

In their pioneering studies on environmental psychology, Mehrabian and Russell (1974) characterized the impact of ambient stimuli on individuals in term of pleasure, arousal, and dominance. Since then, emotions have been characterized more generally along two primary dimensions of arousal and valence (Russell, 2003). Although *arousal* describes how calming (e.g., sleep) or exciting (e.g., sex) a stimulus is,[1] *valence* describes how negative (e.g., frown) or positive (e.g., smile) it is. These dimensions of arousal and valence are theoretically independent and neurologically dissociable: Arousal and valence are processed in different cortical networks and activate overlapping, but distinct, brain regions (Kensinger & Corkin, 2004; LaBar & Cabeza, 2006). Thus, studies on emotion typically examine differential effects of arousal and valence on various behaviors of interest.

Aesthetic experience in art is intimately connected with emotions. In his influential studies, Berlyne (1971, 1974) proposed that factors, such as complexity, novelty, and uncertainty (called "collative variables") characterize specific artworks. These factors arise by comparing incoming information with the perceiver's past perceptions of artworks. For instance, properties of a

[1] In our model we refer to arousal as the extent of reaction to environmental stimuli (Schacter, Gilbert, & Wegner, 2011).

specific painting are compared with past perceptions (i.e., "expected information"), thereby yielding perceptions of relative complexity, novelty, and uncertainty of the painting. A painting is "uncertain" if its characteristics contrast the expected characteristic of something already known (i.e., recognition). Berlyne considered collative variables as strictly embodied into the specific artwork. This intuition formed the basis of information-theory models of aesthetics (Moles, 1966): the emotional response to the artwork is explained as the hedonic effect of structural features of the specific artwork (e.g., novelty or complexity). The reward and preference that occurs at the end of this evaluation process is driven by arousal, and emotions in this context are states of high arousal.

Against these theories that reduce emotions to merely states of arousal, the appraisal theory (Lazarus, 1982, 2001; Roseman & Smith, 2001; Roseman & Evdokas, 2004) considers emotions as the outcome of a cognitive process of appraisal. A stimulus (such as a painting) is cognitively appraised and emotions occur as the result. Individuals cope with emotions in terms of both physiological and cognitive reactions. Silvia (2005) tested this framework in the art context. He examined interest in art (both poetry and visual art) and he found that the appraisal model better explains the heterogeneity in individuals' behaviors, which Berlyne's arousal model was not able to explain. However, the appraisal model considers only the artwork as the stimulus, without taking into account environmental characteristics. Thus, this approach does not consider how appraisals can be influenced by ambient sensorial stimuli. In the present study, we therefore consider the influence of external stimuli (i.e., ambient scent) on the evaluation and memory of artworks.

Ambient Scent and Perception

Marketing researchers have studied effects of product scent on consumer perception. Schneider (1977) analyzed how package fragrances can act as signals of danger, activating the attention of an individual, while Schmitt and Schulz (1995) examined the effect of fragrances on the perception of a brand. More recently, attention has shifted from the smell of a specific object to ambient scent (Vinitzky & Mazursky, 2011), which is a "scent that is not emanating from a particular object but is present in the environment" (Spangenberg, Crowley, & Henderson, 1996). Spangenberg, Crowley, and Henderson found that a pleasant ambient scent can modify an individual's behavior and her evaluations of the experience, relative to a no-scent condition. The presence of a pleasant scent in retail environments improves customers' attitude toward a store and the quality of its assortment (Bone & Ellen, 1999; Hirsch, 1995; Michon, Chebat, & Turley, 2005; Mitchell, Kahn, & Knasco, 1995; Morrin & Ratneshwar, 2003).

Although the prior research has revealed many important effects of ambient scent on consumer behavior, the implications for arts management are less clear. First, the phenomena observed within a retail context may not generalize to an art exhibition, given how different the two consumption experiences are. In a retail environment, consumers typically compare and evaluate products and services, and hence their judgments are influenced primarily by rational or cognitive factors (Yi, 1990). In contrast, an art exhibition is typically an aesthetic experience in which emotions play a relatively more important role (Tan, 2000). Second, the vast majority of prior studies have focused on the presence or absence of scent, without examining effects of different scents (for a notable exception see Spangenberg, Crowley, & Henderson, 1996). Given the increasing use of ambient scent in art environments, it is crucial to develop a more specific knowledge of which scents produce what effects on art experiences.

AMBIENT SCENT AND ART PERCEPTION

We investigate the effect of ambient scent on the perceived valence and arousal of artworks, and on consumers' subsequent memory of those artworks.

The Effect of Ambient Scent on Perceived Valence of Art

Pleasant ambient scent generally enhances emotion (Lorig & Schwartz, 1988), and emotion generally affects art perceptions. In a particularly striking demonstration of the influence of emotion on art evaluation, Eskine, Kacinik, and Prinz (2012) had participants evaluating paintings under conditions of low and high physiological arousal and negative or positive emotions. To manipulate physiological arousal, they had their participants do more or less physical exercise prior to evaluating the artworks. To manipulate valence, they had participants view a negative (scary) or positive (happy) video prior to evaluating the artworks. Their manipulation of arousal did not affect participants' evaluations, and this is consistent with Silvia's (2006) findings about the role of arousal on art perception. However, Eskine, Kacinik, and Prinz found that the paintings were evaluated significantly more positively after the scary video than after the happy video. That is, the same paintings were evaluated more positively after a negative stimulus (i.e., the scary video) than after a positive stimulus (i.e., the happy video). The authors explained this effect in terms of the adaptive significance of negative stimuli: because many negative stimuli are dangerous or threatening, they capture our attention, and focus it on the stimulus, in this case the artworks. This finding is also consistent with much prior evidence that negative stimuli induce processes of *mobilization* and *minimization* (Taylor, 1991). That is, upon experiencing a negative stimulus, one is motivated to escape the negative emotional state in favor of a more positive state. In the case of Eskine, Kacinik, and Prinz's study, watching

a scary video induced a negative emotional state that participants escaped from and minimized by perceiving more positivity in the subsequent paintings.

Eskine, Kacinik, and Prinz's (2012) provocative finding—that a positive stimulus can *decrease* evaluations of art—has served as a starting point for our own investigation. The implication for the current study is that a pleasant ambient scent could counterintuitively decrease viewers' evaluations of artworks. To test this prediction, we had participants evaluate a series of artworks under one of two different ambient scents. Although many studies in retail settings have compared an ambient scent to a no-scent control condition, such a comparison cannot discriminate between explanations based on the mere presence of a scent (i.e., scent vs. no scent) from those based on the specific properties of the given scent (e.g., talcum vs. citrus). To control for possible effects from the mere presence of an ambient scent, we therefore compared talcum and citrus scents. This choice was based on a pretest (see below) that determined the congruence of various scents with two contrasting artists whose works differed substantially. Independent groups of participants then evaluated the talcum scent to be pleasant and the citrus scent to be neutral. Thus, based on the research of Taylor (1991) and Eskine, Kacinik, and Prinz (2012), we predicted the following:

H1: Artworks will be evaluated more positively when viewed with a neutral ambient scent than with a pleasant ambient scent.

The Effect of Ambient Scent on Memory of Art

Morrin and Ratneshwar (2000, 2003) showed that a pleasant ambient scent enhances memory of products. However, because they compared a pleasant scent condition to a no-scent condition, it is unclear whether the memory enhancement was due to the mere presence of a scent or to the pleasantness of that scent. In fact, some research suggests that pleasant scents may actually hinder memory: Individuals in a positive state attempt to prolong that state (Taylor, 1991), often by focusing on its source (Isen, 1984). In the case of a pleasant ambient scent within an exhibition, the source of the positive state may be the scent. Consequently, visitors may focus their attention on the pleasant scent rather than on the artworks, thereby hindering memory for the artworks. Indeed, this hypothesis is consistent with Morrin and Ratneshwar's (2003) finding that the effect of ambient scent on product memory was mediated by attention. We therefore predicted that:

H2: Artworks will be remembered better after having been viewed with a neutral ambient scent than with a pleasant ambient scent.

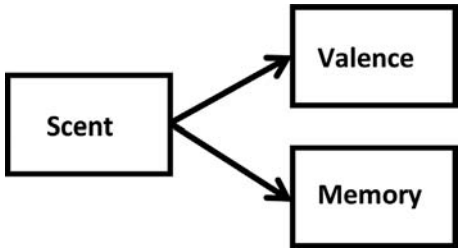

Figure 1. Dual direct effects of scent on valence and memory.

Together H1 and H2 produce a simple model in which scent has dual direct effects on perceived valence and memory, as illustrated in Figure 1. However, we also considered a more sophisticated model in which the predicted effect of scent on memory could alternatively be mediated by valence. It has long been known that emotion enhances several aspects of the remembering process (James, 1890; for review see Buchanan, 2007), from early stages, such as perceptual recognition and identification (Estes & Adelman, 2008; Kuperman, Estes, Brysbaert, & Warriner, in press; Zeelenberg, Wagenmakers, & Rotteveel, 2006), to later stages, such as explicit recognition and recall of emotional stimuli (Doerksen & Shimamura, 2001; Kensinger & Corkin, 2003). Specifically, many studies have demonstrated that valence enhances memory (Kensinger, 2009; LaBar & Cabeza, 2006). For example, in the largest study to date, Adelman and Estes (2013) examined participants' memory for more than 2500 words that varied in arousal and valence. They found that even after statistically controlling for differences in arousal, negative and positive words (e.g., "snake," "dog") were better remembered than neutral words (e.g., "cow"). So, if scent affects valence (H1), and given that valence affects memory, the presumed effect of scent on memory (H2) could be mediated by valence. Although we test this model (see Results), we refrain from including it as a formal hypothesis, because some other findings suggest otherwise. Most notably, Morrin and Ratneshwar (2003) found that the effect of scent on product memory was *not* mediated by emotion.

The Effect of Ambient Scent on Perceived Arousal of Art

Although ambient scents generally increase cognitive arousal (Ehrlichman & Bastone, 1992; Mather, 2007), this effect may depend on the congruence between the scent and the object of evaluation. That is, the effect of an ambient scent may depend on its perceived congruence with a given product or experience. For instance, the congruence between a scent and a specific product category affects consumers' decisions (Mitchell, Kahn, & Knasko, 1995), and the congruence between a scent and a display affects consumers' ability to imagine themselves in the displayed experience (Fiore, Yah, &

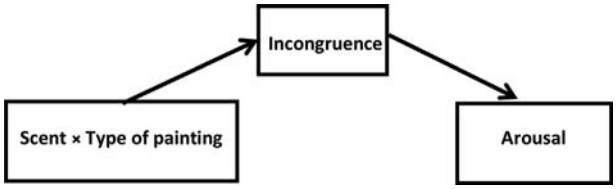

Figure 2. Theoretical model of the indirect effect of scent on arousal mediated by incongruence between the scent and the type of painting.

Yoh, 2000). In terms of the perceived arousal of artworks, we expected that congruence would decrease arousal. When an ambient scent is congruent with a specific artwork, that congruence facilitates or simplifies viewing, so that the viewer is relatively unstimulated. On the other hand, incongruence between the ambient scent and the artwork stimulates attention and should enhance the cognitive arousal perceived in the artwork. Attention is stimulated because scent does not correspond to the nature of the image in front of the individual; scent acts as a sort of "deviance" with respect to the expectation of the individual, given the specific characteristics of the painting. The need to make sense of such an unexpected situation consequently may increase arousal. In our experiment, we used as stimuli the figural paintings of Arcimboldo and the abstract paintings of Rothko. From a pretest (described below), we found that Arcimboldo was congruent with our citrus scent but incongruent with the talcum scent, whereas Rothko was congruent with talcum, but incongruent with citrus. Based on the argumentation provided above, we predicted an interaction between scent and artist on perceived arousal:

H3: Artworks will be perceived as more arousing when viewed with an incongruent ambient scent than with a congruent ambient scent. Specifically, Arcimboldo paintings will be more arousing with a pleasant ambient scent, whereas Rothko paintings will be more arousing with a neutral ambient scent.

This hypothesis is illustrated as a theoretical model in Figure 2.

METHOD

To test the above hypotheses, we conducted a between-participant experiment in which 86 participants viewed and evaluated a series of visual artworks while immersed in an environment diffused with one of two scents that varied in pleasantness. Participants then completed a memory test of the paintings, and they answered a series of demographic and psychological questions.

Environment and Stimuli

Art Exhibition. The experiment was presented as a virtual art exhibition in a behavioral science laboratory. Visual stimuli were 60 paintings, presented individually on computer workstations. We selected two artists whose styles differed strongly: While the Italian painter Arcimboldo produced figural paintings in which a portrait of a human was composed of many smaller objects such as fruits and vegetables, the Russian-American painter Mark Rothko produced abstract paintings consisting of flat rectangles of solid colors (e.g., see Figure 3). These two painters were chosen for their different styles (realism the first, conceptual art the second) in order to test the impact on memory of images that can be easily (Arcimboldo) or less easily (Rothko) recognized. During the experiment, informants were asked to rate each painting in order to control also for the perceived differences in styles.

Fifteen paintings by each artist were randomly selected for the virtual art exhibit, with the remaining 30 paintings appearing only later as nonpresented "lures" in the memory test. Thus, each participant viewed 30 paintings during the virtual art exhibit. The paintings were all presented in approximately equal size, and nearly full size of the computer display. The paintings were presented in a unique, randomly intermixed order for each participant. To simulate the environment of an exhibition, participants viewed each painting for as long as they liked. To advance to the next painting, they clicked an arrow button at the bottom of the display.

Scent. The study was conducted with the collaboration of an executive of a European fragrance designer and retailer (henceforth "fragrance expert"). Two scents were selected from a pretest, as described below. One was a sweet talcum fragrance, and the other was a strong citrus fragrance. Rather than pretest the pleasantness of the scents, we measured it during the experiment. The scents were diffused during the experiment via professional diffusers, implemented by the fragrance expert. To avoid mixing scents, the talcum scent was administered first, followed by a break of 20 minutes to ventilate the laboratory, and finally the citrus scent was administered to the second group of participants.

Pretest: Congruence between Scent and Art

The talcum and citrus scents were selected from a pretest conducted with 131 students from the same population as the experiment. These participants were instructed to smell one of four scents (talcum, rose, citrus, and amber) from a fragrance card while viewing a series of paintings by Arcimboldo and Rothko. The four fragrances were chosen by the fragrance expert according to their market success and likely congruence with the chosen artists, and were administered via unmarked,

Figure 3. Examples of paintings by Arcimboldo (left) and Rothko (right).

scented cards created by the expert's company. While smelling one of the scent cards, participants rated on a scale from 1 (not at all) to 7 (extremely) the extent to which the given fragrance and painting "go together." They were instructed as follows: "we are interested in your ability to judge the relationship between scents and images ... we ask that you rate the extent to which the scent and the painting are congruent, or consistent, with one another ..." The talcum and citrus fragrances were selected on the basis of their perceived congruence with the paintings. Specifically, the talcum scent was more congruent with Rothko paintings ($M = 4.09$) than with Arcimboldo paintings ($M = 2.57$), whereas the citrus scent was more congruent with Arcimboldo ($M = 4.13$) than with Rothko ($M = 3.20$). The differential congruence of talcum and citrus with Rothko and Arcimboldo, respectively, produced a significant interaction, $F(1, 129) = 81.09$, $p < 0.001$ (see Figure 4).

It must be noted that the talcum and citrus scents, in addition to differing in their congruence with Arcimboldo and Rothko paintings, may also differ in other important respects. For instance, in a comparison of several scents, Spangenberg, Crowley, and Henderson (1996) found that citrus scents were the most strongly "activating" (cf. arousing). Similarly, Warrenberg (2005) also found citrus to be particularly stimulating. This and other potential differences between citrus and talcum may in fact explain *why* the different scents are more or less congruent with these particular artists. Given that citrus is relatively arousing, and that Arcimboldo paintings are also relatively arousing (as confirmed in our Results below), this match of arousal may underlie our participants' perception of congruence between citrus scent and Arcimboldo paintings. Likewise, assuming that talcum is relatively calming and Rothko paintings are also calming (see Results below), the match in calmness of talcum and Rothko may explain their perceived congruence. Indeed, below we will examine the effect of this congruence on perceptions of arousal, which would be evident as an interaction of scent and artist (H3).

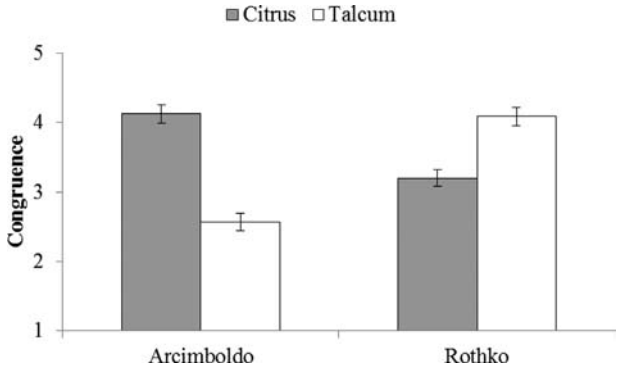

Figure 4. Congruence ratings ($M \pm$ SE) of artworks by Arcimboldo and Rothko viewed with citrus or talcum scent in the pretest.

Participants and Procedure

Eighty-six undergraduates (56 female, 30 male; mean age = 21 years) participated voluntarily and were randomly assigned to one of two scent groups. The laboratory contained 19 independent workstations. Each scent was administered for 1.5 hours, during which time the participants were allowed to arrive and

participate at their own pace. The experiment consisted of two main phases: Participants viewed and evaluated 30 paintings, and then their memory of the paintings was tested. They also completed a brief psychographic questionnaire.

As described above, in the evaluation phase participants viewed 15 Arcimboldo paintings randomly intermixed with 15 Rothko paintings at their own pace. Participants were instructed as follows: "Imagine that you are in an art museum. Think of the environment around you and how you might feel if you saw these paintings in a museum." At the end of the instructions they were also reminded "Remember: Please imagine you can see these paintings in an art museum. Feel free to observe each picture for as long as you want . . . ." Each painting was centered horizontally and anchored to the top of the display, so that its height was approximately 75% of the display. At the bottom of the display were three evaluation scales. Participants rated the arousal (from "calming" to "exciting") and valence (from "negative" to "positive") of the painting, and their liking of the painting (from "not at all" to "very much") in that order. All three measures were 7-point scales, and participants indicated their evaluation by clicking the appropriate response button on screen. They then pressed an arrow button at the bottom of the display to advance to the next painting. The experiment program disallowed participants from going back to previous paintings, and participants were *not* informed that their memory would be tested. The experiment program (Qualtrics) recorded the time spent viewing and responding to each painting. At the end of this evaluation phase, participants indicated their sex and age, they were asked to identify the artists if they could (by typing them into a textbox), and they indicated how often they visit art museums or galleries (5-point scale, from "never" to "more than once per month").

In the memory phase, participants were instructed as follows. These instructions were based closely on those of Taylor, Buratto, and Henson (2013).

> We will now assess your ability to remember the paintings you just saw. We will show you a series of 60 paintings, one at a time. Some will be paintings that you saw in the first part of the study, but others will be completely new. Your task is to identify which ones you saw in the first part of the study and which ones you did not see. You will have three options: "remember", "familiar", and "new".
>
> 1. Respond REMEMBER if you can remember seeing the painting and/or some aspect of its context (the appearance of the painting, what it made you think or feel, etc.).
> 2. Respond FAMILIAR if you are sure you saw the painting, but you cannot remember any details of its context.
> 3. Respond NEW if you did not see the painting in the first part of the study.

Participants then viewed and responded to 60 paintings, consisting of the 30 previously seen and 30 new "lure" items by the same artists (15 Arcimboldo, 15 Rothko). The 60 paintings were presented individually in a randomly intermixed order. Participants indicated their responses by clicking on the appropriate button, and again clicked an arrow button to proceed to the next painting when ready.

Finally, at the end of the memory phase, participants answered a number of additional questions. Participants indicated how much they like the scent in the room (7-point scale from "not at all" to "very good," in order to test the pleasantness of the specific scent), and they then completed an 11-item measure of olfactory sensitivity that was the positive awareness factor of the Odor Awareness Scale (Smeets, Schifferstein, Boelema, & Lensvelt-Mulders, 2008). Participants finally indicated how frequently they smoke (7-point scale from "never" to "several times a day"). The experiment took approximately 40 minutes to complete.

RESULTS

Table 1 summarizes demographic and psychological control factors, participant's knowledge and experience of art, and participants' evaluation and memory of the artworks. Full analyses are reported below.

Manipulation Check

To examine whether the talcum and citrus scents were differentially pleasant, as intended, we compared the two groups on their evaluation of the ambient scent (i.e., how much they like the scent in the room, on a 7-point scale from "not at all" to "very much"). An independent t-test confirmed that the talcum scent was rated significantly more pleasant than the citrus scent (see Table 1), $t(84) = 4.22$, $p < 0.001$. Moreover, the talcum scent was significantly above the scale midpoint of 4, $t(44) = 6.73$, $p < 0.001$, whereas the citrus scent did not differ from the midpoint, $p = 0.68$. Thus, the two scents differed significantly in pleasantness, with the talcum being highly pleasant and the citrus being neutral.

Control Factors

Several of the measures were included as control factors only. Independent samples t tests confirmed that the two groups did not differ in their frequency of visiting museums or galleries, frequency of smoking, olfactory sensitivity (Cronbach $\alpha = 0.77$), average time spent viewing each painting ($M = 21$ seconds), or time taken to answer the demographic questions between the evaluation phase and the memory test, all $p > 0.15$. Similarly, a chi-square test confirmed that the two groups did not differ in their likelihood of correctly identifying the artists. Thus, participants in the two groups were matched for several experiential factors, such as

Table 1. Psychographic Factors, Art Knowledge, Methodological Factors, Art Evaluation, and Art Memory Across Neutral (Citrus) and Pleasant (Talcum) Scents.

	Scent				
	Neutral ($n = 41$)		Pleasant ($n = 45$)		
	M	SD	*M*	SD	*p*
Psychographic factors					
Age (years)	20.76	0.44	20.93	0.54	0.10
Olfactory sensitivity	45.34	4.98	44.56	5.81	0.50
Frequency of smoking	1.78	1.31	2.27	1.75	0.15
Art knowledge					
Knowledge of artists (%)	46.34	–	40.00	–	0.55
Museum/galley visits	2.83	0.92	2.73	0.96	0.64
Methodological factors					
Scent evaluation	3.88	1.87	5.36	1.35	**<.001*****
Break duration (seconds)	44.95	31.34	45.54	42.96	0.94
Art evaluation					
Arousal	4.53	0.47	4.51	0.46	0.85
Valence	4.03	0.46	3.76	0.55	**0.02****
Liking	4.15	0.83	3.81	0.89	0.07
Art memory					
Remember (%)	71.71	13.73	65.11	16.69	**0.05****
Familiar (%)	1.38	11.71	5.70	12.73	0.11

Note: Olfactory sensitivity was measured via the Odor Awareness Scale, where higher scores indicate greater sensitivity. Frequency of smoking was measured on a scale from 1 (never) to 7 (several times a day). Knowledge of artists is the percentage of participants who correctly identified one or both of the artists. Frequency of museum/gallery visits was measured on a scale from 1 (never) to 5 (more than once per month). Scent evaluation was a manipulation check that measured how much participants liked the scent in the room, on a scale from 1 (not at all) to 7 (very good). Break duration was the duration of the delay between the evaluation phase and the memory test. Arousal, valence, and liking were rated on 1–7 scales, where higher scores indicate greater excitement, positivity, and liking. Remember and familiar scores are the percentage of correct "remember" and "familiar" responses to viewed items, minus the incorrect "remember" and "familiar" responses to new items, respectively.

museum visits, recognition of the artists, and olfactory sensitivity, and also for important methodological factors, such as the time spent viewing the paintings and the delay before the memory test (see Table 1).

Effect of Ambient Scent on Evaluation

Before testing whether scent affected evaluation of the paintings, we first examined the relationships among arousal, valence, and liking ratings (collapsed across the two scents). Arousal did not correlate with either valence or liking (both $p > 0.12$), but valence and liking correlated strongly ($r = +0.59$, $p < 0.001$). The lack of relationship between arousal and valence/liking is consistent with Silvia (2006) and Eskine, Kacinik, and Prinz (2012).

To examine the predicted effect of scent on evaluation of the paintings, and to examine its generality across the two artists, we then conducted a 2 (scent, between-participants) × 2 (artist, within-participants) mixed ANOVA on the arousal, valence, and liking ratings. First, there were many differences between artists, indicated by significant main effects: The Arcimboldo paintings were rated significantly more arousing, $F(1, 84) = 46.01$, $p < 0.001$, but less positive, $F(1, 84) = 39.75$, $p < 0.001$, and less liked, $F(1, 84) = 23.70$, $p < 0.001$. More importantly, the ambient scent significantly affected the valence of the paintings, $F(1, 84) = 6.05$, $p < 0.05$: The paintings were rated significantly more positive when viewed with the neutral citrus scent than with the pleasant talcum scent (see Table 1). This result supports H1. The effect of pleasantness of ambient scent on liking was marginally significant in the same direction, $F(1, 84) = 3.46$, $p < 0.07$. As shown in Table 1, scent had no main effect on arousal, $p = 0.85$.

However, there was a significant scent × artist interaction on perceived arousal, $F(1, 84) = 8.22$, $p < 0.01$. Although Arcimboldo paintings were more arousing with the talcum scent than with the citrus scent, Rothko paintings were more arousing with citrus than with talcum (see Figure 5). Recall that in the pretest, the talcum scent was judged more congruent with Rothko, whereas the citrus scent was more congruent with Arcimboldo (Figure 4). Thus, the paintings were judged more arousing when viewed with the *incongruent* scent than with the congruent scent. H3 was thus confirmed. This interaction was not observed in valence or liking ratings (both $p > 0.50$).

Effect of Ambient Scent on Memory

Following standard procedures for the remember/familiar memory paradigm (e.g., Taylor, Buratto, & Henson, 2013), *memory scores* were calculated by subtracting the incorrect "remember" responses to the nonpresented lure items from the correct "remember" responses to the presented items. These corrected scores

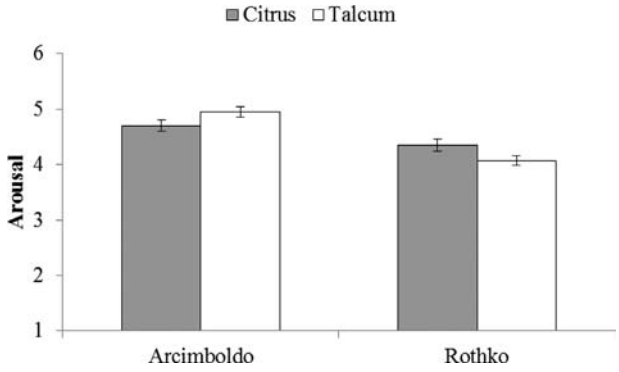

Figure 5. Arousal ratings ($M \pm$ SE) of artworks by Arcimboldo and Rothko viewed with citrus or talcum ambient scent in the experiment.

thus remove the participant's tendency to guess "remember" to items that are in fact new. We calculated *familiarity scores* in the same manner by subtracting incorrect "familiar" responses from correct "familiar" responses. Thus, for each participant we had corrected memory and familiarity scores, for each of the two artists.

To test the predicted effect of the pleasantness of ambient scent on memory of the paintings, and to examine its generality across artists, we conducted a 2 (scent) $\times$ 2 (artist) mixed ANOVA on these corrected scores. Again, significant differences between the two artists were observed as main effects: Arcimboldo paintings elicited more correct memories, $F(1, 84) = 111.36$, $p < 0.001$, and fewer correct "familiar" judgments, $F(1, 84) = 84.36$, $p < 0.001$, than Rothko paintings. In other words, the Arcimboldo paintings were remembered with more specific contextual details than were the Rothko paintings. But more critically, the pleasantness of ambient scent significantly affected memory: The paintings were significantly more likely to be remembered when viewed with the neutral citrus scent than with the pleasant talcum scent, $F(1, 84) = 3.96$, $p < 0.05$. This result supports H2. Scent had no effect on familiarity, and the artist $\times$ scent interaction failed to approach significance for either memory or familiarity, both $p > 0.38$.

As an alternative to the above main effects, we consider a second model that predicts that one effect (valence) mediates the other (memory). To directly test this model, we conducted mediation analyses by bootstrapping (Preacher & Hayes, 2008). Furthermore, to maximize statistical power and hence the likelihood of detecting truly significant effects, we conducted our mediation analyses on trial-level data rather than participant-level data (this method is conceptually similar to mixed-effects modeling, see Zhao, Lynch, & Chen, 2010). To illustrate, a participant-level analysis would have 86 cases, one for each of our participants. In contrast, our trial-level analysis had 2580 cases corresponding to each individual trial by each participant (86 participants $\times$ 30 trials = 2580). Because the dependent variable in this model is categorical (i.e., each artwork was either remembered or not by each participant), we used Preacher and Hayes's bootstrapping method to conduct 1000 resampled logistic regression models with scent (1 = citrus, 2 = talcum) as independent variable, remembering (0 = no, 1 = yes) as dependent variable, and valence rating as mediator. Scent significantly predicted valence, $B = 0.27$, $t = 3.77$, $p < 0.001$. This finding simply replicates the main effect of scent on valence ratings reported above. More critically, valence ratings did not predict remembering, $p = 0.31$, thus rendering it unlikely that valence acted as a mediator. The total effect of scent on memory (i.e., the direct effect + any potential mediated effect via valence) was significant, $B = 0.29$, Wald $\chi^2 = 10.47$, $p < 0.01$, and importantly, the direct effect (i.e., excluding any potential mediation through valence) was also significant and essentially unchanged, $B = 0.29$, $\chi^2 = 9.94$, $p < 0.01$. This observation of a significant direct effect replicates the main effect reported above and further undermines the mediation model, suggesting that if any mediation did occur, it could only have been partial. Finally, and most critically, the indirect effect of scent on remembering via valence (i.e., mediation) did not approach significance, $B < 0.01$, as indicated by bias-corrected confidence intervals that clearly overlapped zero, -0.0053 to $+0.0252$. To be conservative, we also replicated these mediation analyses on the participant-level data with 1000, 5000, and 10,000 resamples, with and without accelerated confidence intervals (see Preacher & Hayes, 2008), and in no case was there any hint of mediation. Collectively, these analyses strongly support the validity of our first model (dual direct effects) over that of the alternative model (indirect effect). There simply was no evidence that valence mediated the effect of scent on remembering, either partially or fully, in any of several analyses that we conducted.

Summary

In sum, the pleasantness of an ambient scent significantly affected both evaluation and memory of art in a virtual exhibition. Two groups of participants, who were matched on a number of experiential factors (e.g., art knowledge, olfactory sensitivity) and methodological factors (e.g., viewing time), were exposed to one of two ambient scents (talcum or citrus) that differed in perceived level of pleasantness while they evaluated a series of artworks by two contrasting artists (Arcimboldo and Rothko). Participants judged the talcum scent to be highly pleasant, but they evaluated the paintings more positively and remembered them better during exposure to the neutral citrus scent. These results support H1 and H2. Furthermore, in a pretest the talcum scent was judged more congruent with Rothko paintings, whereas the citrus scent was more congruent with Arcimboldo paintings. However, in the experiment those paintings were perceived as more arousing when viewed with the incongruent scent, thus supporting H3.

Finally, the effect of scent on memory was direct, not mediated by valence.

DISCUSSION AND CONCLUSION

Literature on experiential marketing suggests a direct relationship between a pleasant environment and positive evaluation of products (Michon, Chebat, & Turley, 2005; Pine & Gilmore, 1999; Schmitt, 1999). According to this assumption, providing positive sensorial stimuli should attract and engage individuals and should be a lever to create conditions that enhance the overall positive evaluation of the experience. Efforts should be made also by art institutions to create pleasant experiences during art exhibitions (Gilmore & Rentlschler, 2000). However, this research has questioned the above conclusion and has investigated the limits of the experiential approach in the art context. In particular, it has examined the role of a specific sensorial stimulus (ambient scent) in the perception of art.

The perception of art is quite different from the evaluation of consumer goods (Joy & Sherry, 2003; Uusitalo, Simola, & Kuisma, 2012) and the relationship between sensorial stimuli and perception of artworks within an art exhibition may be more complex than in a retail setting. Recent evidence (Eskine, Kacinik, & Prinz, 2012) supports the idea that pleasant ambient scent does not necessarily lead to more positive perception of an artwork. This result suggests that the relation between the pleasantness of sensorial ambient stimuli and the evaluation of art does not appear to be linearly positive.

Scent is a powerful stimulus, because individuals cannot avoid it (Spangenberg, Crowley, & Henderson, 1996). This characteristic makes it an interesting lever for art institutions. The analysis has investigated the effect of the pleasantness of ambient scent on the perception of art, both in term of valence (perceived positivity) and memory. Furthermore, the analysis has investigated the effect on arousal of the congruence between scent and the specific piece of art. Findings indicate that a pleasant ambient scent may not enhance viewers' perception of art. When visiting an art exhibition with a very pleasant scent in the air, attendants tend to perceive artworks less positively. This result, consistent with the emerging literature, challenges some enthusiastic applications of experiential marketing. In the case of art, a highly pleasant ambient scent can actually decrease evaluation and memory of artworks. Finally, an interaction occurs between scent and the painting and it is able to impact on arousal in the perception of the art: the higher the level of congruence, the lower the level of arousal.

While the emerging literature on this issue (Eskine, Kacinik, & Prinz, 2012) has examined only evaluation of artworks, in the present study the effect on memory has also been investigated. This additional information about how scent influences memory for art is crucial for arts management, for which public education (e.g., learning and memory) is an important goal. Furthermore, while Eskine, Kacinik, and Prinz have examined the influence of emotional videos on subsequent art perceptions, this study uses a more practical manipulation of ambient scent, a lever art institutions can immediately use in their exhibition rooms. Thus, whereas in Eskine, Kacinik, and Prinz, visual evaluations of art were preceded by the visual experience of videos, in the present study visual evaluations of art were preceded by a much more subtle and unrelated olfactory experience, so that our study examined the interaction of multiple sensory modalities. Additionally, this study also controls a number of other potentially important factors, such as art knowledge. Finally, this study analyzes the effect of congruence of scents on arousal, opening further research on the complexity of relations among art perception and each sensorial stimulus.

According to the mood maintenance and repair model (Isen, 1984), we can interpret this behavior as the individual's aim of maintaining the positive state that comes from the highly pleasant scent by focusing on the scent itself rather than on the painting in view. In fact, this increased focus on the scent appears to induce decreased attention to the artwork, potentially even leading the artwork to be perceived as a sort of hindering stimulus, as it might interfere with the individual's effort to maintain the positive mood evoked by the pleasant scent. This presumed mood maintenance process would explain the lower evaluations for artworks viewed with a highly pleasant ambient scent. The effect of ambient scent on memory in the art context has also been questioned. The research question is important for art institutions, since they have the mission not only to attract and maintain visitors, but also to diffuse knowledge and passion for the arts. Although scent can enhance memory for consumer goods (Morrin & Ratneshwar, 2003), our results indicate that in the art context more pleasant ambient scents instead diminish memory for the artworks. Viewers' attention appears to be diverted toward highly pleasant scents, presumably in order to maintain the positive mood that they induce, and thus their memory for the artworks diminishes. Thus, the mood maintenance model (Isen, 1984) can explain both the lower evaluations and the worse memory for artworks viewed with a highly pleasant ambient scent.

Finally, the effect of interaction between scent and artwork has been analyzed. Arousal diminishes when scent is congruent with the painting: we can explain this phenomenon as the consequence of the extra effort required to make sense of the incongruence. The extra effort enhances the level of attention and thus the level of perceived arousal of the specific painting. This is an important point: the final effect of sensorial stimuli stems from interaction with the content of the specific artwork. Even if, in the common sense, congruence is perceived as a desirable situation, this article demonstrates that, at the opposite, incongruence can enhance the level of attention. Obviously, the balance between incongruence and avoidance needs to be taken into account.

These results suggest that art institutions should consider the use of sensorial stimuli with the specificities of the art sector. Models proposed by experiential marketing cannot be transferred *tout court* to the art context. When art institutions are concerned, experiential marketing must be utilized carefully. A pleasant environment can attract visitors, but art institutions also have a responsibility to facilitate learning. While using sensorial stimuli for creating pleasant situations can attract new visitors, an excessive use of sensorial stimuli can actually be self-defeating (Carù & Cova, 2005). It is a challenging task for art institutions: on the one hand they have to create pleasant conditions for visiting art exhibitions in order to stimulate return visits (in this way loyalty can be built). On the other hand they have to facilitate perception of the artworks, in order to enhance learning and appreciation of the art. Only art that is understood can be cherished and loved and can ensure customer loyalty.

LIMITS AND FURTHER RESEARCH

The research presented here has some limits, and it also suggests some further research. First of all, we tested only two scents and only two artists: experiments with different artists and different scents could enrich our findings. Furthermore, more work is needed to examine different senses and their interactions, in order to better understand the impact of ambient stimuli on the perception of art from a more holistic perspective. For instance, it will be important in future research to examine whether ambient scents and sounds have interactive effects on art perception. Moreover, it is also important to test whether our observed effects generalize faithfully to real art galleries and museums. As a first step toward this goal, we chose to test our hypotheses under strictly controlled conditions. Although our research was conducted in a consumer behavior laboratory, we also instructed our participants to imagine that they were in a gallery, and we emphasized this gallery environment throughout our instructions. Nonetheless, future experiments should be conducted in real exhibition settings.

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