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Olfactory Cues Modulate Facial Attractiveness

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Abstract

We report an experiment designed to investigate whether olfactory cues can influence people's judgments of facial attractiveness. Sixteen female participants judged the attractiveness of a series of male faces presented briefly on a computer monitor using a 9-point visual rating scale. While viewing each face, the participants were simultaneously presented with either clean air or else with 1 of 4 odorants (the odor was varied on a trial-by-trial basis) from a custom-built olfactometer. We included 2 pleasant odors (geranium and a male fragrance) and 2 unpleasant odors (rubber and body odor) as confirmed by pilot testing. The results showed that the participants rated the male faces as being significantly less attractive in the presence of an unpleasant odor than when the faces were presented together with a pleasant odor or with clean air (these conditions did not differ significantly). These results demonstrate the cross-modal influence that unpleasant odors can have on people's judgments of facial attractiveness. Interestingly, this pattern of results was unaffected by whether the odors were body relevant (the body odor and the male fragrance) or not (the rubber and geranium odors).

Key words: facial attractiveness, olfaction, pleasantness, vision

Introduction

Facial attractiveness is a socially important cue, which can be readily evaluated by human observers. Despite the fact that our preference for certain facial characteristics appears to a large extent to be idiosyncratic, several general features have been shown to contribute to the perceived attractiveness of a face. These include both facial symmetry and the extent to which an individual face conforms to an average prototype (e.g., see Langlois and Roggman 1990; Grammer and Thornhill 1994; Rikowski and Grammer 1999). Physical attractiveness is not, however, solely dependent upon the visual aspects of appearance (Buss 1989) but is often modulated by other sensory cues as well (see Spence 2002). For example, people's voices have been shown to influence their perceived attractiveness (e.g., Zuckerman et al. 1991; Collins 2000; Collins and Missing 2003; see also Casey et al. 2006).

Olfactory cues also play an important role in nonverbal communication (Hold and Schleidt 1977). More importantly for present purposes, Rikowski and Grammer (1999) have highlighted the existence of a significant positive correlation between the rated sexiness of a man's body odor and his facial attractiveness to females. Meanwhile, social psychology research has demonstrated that people tend to rate other people more positively when in the presence of a pleasant ambient fragrance (e.g., Kirk-Smith and Booth 1990). Indeed, Baron has gone so far as to suggest that the personal use of fragrance should be considered as an integral part of one's image management, with different fragrances being chosen for different situations/occasions (e.g., Baron 1981, 1983, 1988; see also König 1972).

It should come as little surprise then that studies of mate selection behavior have reported that body odor represents a very important sensory cue, especially for women (see Herz and Inzlicht 2002). Indeed, research by Wedekind et al. (1995) has shown that a man's major histocompatibility complex will, to a certain extent, determine the attractiveness of his bodily odor to females. Woman's preference for the scent of certain males has also been shown to change during the course of the menstrual cycle (Grammer 1993; Gangestad and Thornhill 1998; Havlicek et al. 2005). Meanwhile, Hungarian researchers have demonstrated that the presence of

human sex hormone-like chemicals can actually influence people's ratings of the perceived masculinity/femininity of pictures of faces (see Kovács et al. 2004).

However, despite the fact that virtually all humans use some sort of fragranced products on their bodies, there are surprisingly few studies that have directly investigated the question of whether the presence of an odor can cross-modally influence a person's judgment of another person's physical attractiveness when assessed visually. Of the few studies that have been published to date, a number of them have failed to demonstrate any modulation of facial attractiveness ratings when odor pleasantness was varied. For example, the male college students in a study by Cann and Ross (1989) had to rate a series of pictures of female faces while in the presence of either a pleasant or unpleasant ambient odor or in the absence of any specific odor. Analysis of the students' attractiveness ratings indicated that the variations in odor had absolutely no effect on these social judgments. It should, however, be noted that the absence of any effect of odor quality on ratings of attractiveness in the study of Cann and Ross (1989) might well be attributable to the fact that the odors were presented as ambient room odors, thus potentially reducing the likelihood that participants would associate the odor with any particular face (i.e., there was little reason for participants to assume that the faces and odors should go together, in other words that they should be unified, see Spence 2007). Furthermore, the rapid habituation of the olfactory system also means that it is difficult to rule out the possibility that the odors were simply not perceived for the duration of the experiment (though note that odors do not always have to be perceived consciously, in order to have an effect on human performance; e.g., Holland et al. 2005). In order to eliminate such potential artifacts in the present study, we investigated the nature of any cross-modal interactions between olfaction and vision using a psychophysical paradigm in which a variety of different odors were presented, with different odors (or clean air) being associated with each of the sequentially presented faces.

In another study, Bensafi et al. (2002) conducted an event-related potential (ERP) experiment in which female volunteers had to judge the attractiveness of female faces in the presence versus absence of a pleasant floral odor. In all, 36.2% of the faces were judged as pleasant in the no-odor condition versus 36.8% in the presence of the floral odor. Unsurprisingly, this difference was not statistically significant. However, only dichotomous behavioral ratings were collected (attractive vs. unattractive), and so it could be argued that any subtle modulation of the perceived attractiveness of the faces as a function the presence versus absence of the odor might have remained undetected. This possibility seems particularly plausible given that judgments of attractiveness are likely to give rise to a continuous (i.e., graded) evaluation by participants rather than an all-or-none response, whereas the response alternatives that participants were given in the study of Bensafi et al. (2002) were relatively extreme (i.e., either attractive or unattractive).

Alternatively, however, Bensafi et al. (2002) may simply have failed to find any behavioral effect of the floral fragrance on attractiveness ratings in their study because olfactory cues might primarily affect female's judgments concerning the attractiveness of members of the opposite (rather than same) sex. Given the widespread evidence that olfactory/pheromonal characteristics appear to be particularly relevant for mating behavior (see Herz and Inzlicht 2002; cf. Wedekind et al. 1995), it may not be so surprising to find little or no effect of olfactory cues on intragender attractiveness judgments. Because Bensafi et al. (2002) only assessed female participants' ratings of pictures of female faces, this possibility cannot be ruled out. Finally, it might also be the case that pleasant odors may be less effective in modulating judgments of facial attractiveness than unpleasant odors or that the specific floral fragrance used by Bensafi et al. (2002) may not have been particularly effective (and hence that another odor may have given rise to a significant effect on performance).

However, despite the apparent lack of any behavioral effect in the study of Bensafi et al. (2002), the authors did report ERP differences for the late positive complex (LPC) 550–800 ms after the visual presentation of the faces over frontal sites. Specifically, the LPC evoked by unpleasant faces was more positive than the LPC evoked by pleasant faces only in the odor condition, whereas no differences were found for the no-odor condition. Bensafi et al. (2002) interpreted this effect as reflecting "an enhanced alerting reaction to unpleasant faces preceded by a pleasant odor" (p. 340). Of course, given the lack of any significant behavioral consequences of the odor, it will be necessary to demonstrate some behavioral correlate of such ERP effects in subsequent empirical research before making too much of the findings reported by Bensafi et al. (2002).

The only previous study that we are aware of in which the presence of an odor was shown to modulate people's ratings of the facial attractiveness of others was reported in a book chapter by Kirk-Smith and Booth (1990). The authors found that in the presence of a perfume (the brand Shalimar; once described by Paukner 1965 as being similar to an "ideal erogenous perfume"), both men and women rated half-torso clad photographs of men and women as being significantly sexier and softer as compared with a no-perfume condition. By contrast, no such effect was obtained when banana essence was impregnated into the face mask that participants had to wear instead, presumably due to the incongruence between the odor and the faces (note that the 2 odors were apparently judged as being equally pleasant). However, the prolonged presentation of the odors in the study of Kirk-Smith and Booth (1990) meant that their presence also elicited a change in participants' self-reported mood. In fact, the participants also rated themselves as feeling sexier after exposure to the Shalimar-impregnated face mask. Consequently, it is difficult to separate the effects of the mere presence of the odor on judgments of the people seen in the photographs from the

indirect effects that extended exposure to that odor may have had on a person's mood, which in turn could have given rise to the behavioral effects that Kirk-Smith and Booth (1990) reported (a limitation that the authors themselves fully recognized).

Given the fact that only 1 published study has to date demonstrated any behavioral effect of olfactory cues on judgments of facial attractiveness, we decided to conduct a psychophysical study in order to determine whether briefly presented olfactory cues can modulate visual judgments of facial attractiveness, and in particular, to ascertain whether olfactory cues of differing hedonic value (i.e., pleasant vs. unpleasant) can enhance and/or reduce the perceived attractiveness of a seen face. We only presented male faces to female participants in the present experiment for 2 reasons: first, because previous research has suggested that females may be more sensitive to the effects of olfactory cues than males (e.g., see Doty et al. 1985; Chen and Haviland-Jones 2000; Brand and Millot 2001; Spence 2002), and second, because it has been suggested that females might rely more on olfactory cues in mating behavior than males (see Herz and Inzlicht 2002).

We chose to test 2 pleasant odors (geranium and a male fragrance) and 2 unpleasant odors (body odor and rubber). We thought it possible that odors that can easily be associated with males (such as the body odor and male fragrance) might have more of an effect on female's ratings of male attractiveness than would other odors that are typically not associated with males (such as the rubber and geranium; cf. Kirk-Smith and Booth 1990).

Methods

Participants

Sixteen untrained female participants from the University of Oxford, with a mean age of 26 years (ranging from 20 to 34 years), took part in this experiment. All the participants were naive as to the purpose of the study at the beginning. All the participants completed a confidential questionnaire prior to the start of their experimental session in order to ensure that they had a normal sense of smell, no history of olfactory dysfunction, and normal or corrected-to-normal vision. (In the confidential questionnaire the participants were asked to answer questions about their general health and, in particular, about issues related to their ability to perceive odors and colors. These are some of the questions used in the questionnaire: "Are you currently suffering from a cold/flu, or other temporary respiratory problems?"; "Do you suffer from asthma or any form of air-born allergy?"; "Is there anything else concerning your health that you think we should know about?") The experiment was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki, as well as the ethical guidelines laid down by the Department of Experimental Psychology, University of Oxford.

Apparatus and materials

Forty male faces (13 cm wide × 17 cm high) taken from the standardized database developed by Perrett et al. (1998) were used as the visual stimuli. These faces have been extensively characterized for attractiveness and have been categorized into different attractiveness groups (high, medium, and low). We used 20 faces from each of the high- and low-attractiveness groups in the present experiment. Four odors (synthetic body odor, 2M3M; the male fragrance "Gravity," PD3285, both from Unilever Research, Port Sunlight, UK; Geranium, 576.013/T; Rubber, 381102, from Firmenich, Geneva, Switzerland) and clean air were used. The odors were chosen on the basis of pilot research with the intent being to have 2 odors that would reliably be perceived by participants as being pleasant (i.e., the geranium odor and the male perfume) and 2 odors that would reliably be judged by participants as being unpleasant (i.e., the rubber and body odor; cf. Hold and Schleidt 1977).

A custom-built computer-controlled olfactometer was used to deliver the odorants. The flow rate of medical air through the olfactometer was set at 8 l/min using a flow regulator (CONCOA 03-054, Utrecht, The Netherlands) connected to the gas cylinder (Medical Air Size G, BOC Gas). The odorants were diluted at different concentrations in diethyl phthalate (529633; Quest International, Ashford, England) in order to match them within each odor category (e.g., the male perfume and the geranium odor in the pleasant category) in terms of their perceived intensity. The body odor was diluted at 0.33%, the geranium odor at 1.0%, the male fragrance at 0.5%, and the rubber odor at 1.2%, on the basis of pilot research.

Design

A within-participants repeated measures experimental design was used with the factors of facial attractiveness (high vs. low) and odor pleasantness (pleasant, unpleasant, or neutral). The experimental session consisted of 3 blocks of 40 randomized trials (i.e., participants completed 120 trials in total): Each face was randomly presented 3 times during each experimental session, once with a pleasant odor, once with an unpleasant odor, and once with a neutral odor (i.e., clean air). In order to counterbalance the presentation of each face–odor combination, the entire set of 40 faces was divided into 4 subgroups of 10 faces each (5 highly attractive faces and 5 faces judged to be less attractive) of comparable mean attractiveness. Each subgroup of faces was then presented with 1 different possible combination of pleasant–unpleasant odors, counterbalanced across participants. In this manner, each participant rated a group of 10 faces presented with clean air, the geranium odor, and the body odor during the experiment. A different group of 10 faces was presented with

clean air, the male perfume, and the rubber odor; another group of faces was presented with clean air, geranium odor, and the rubber odor; and the remaining group of faces was presented with clean air, the male perfume, and the body odor. The same odor was never presented to participants on consecutive trials during the experiment. The experiment lasted for approximately 50 min in total.

Procedure

The participants sat on a chair 70 cm from the computer screen with their chin resting on a chin rest. Figure 1 represents a schematic example of the timeline for 1 trial: The participants were instructed to look at a fixation cross positioned at the center of the monitor. They were instructed to start exhaling through their nose as soon as they heard the quiet tone (55 dB(A) as measured at the participants' ear level, 22 kHz, 200 ms in duration) at the beginning of each trial and to breathe in through their nostrils as soon as they heard the louder tone (57 dB(A) as measured at the participants' ear level, 22 kHz, again 200 ms in duration, presented 1500 ms after the first tone). One of the 4 odors or else clean air was delivered via the olfactometer 500 ms after the presentation of the "breathe in" tone. The participants were then instructed to decide whether an odor had been presented or not (in the case of clean air being presented) by pressing 1 of 2 keys ("z" or "m") on a keyboard with their index fingers. One thousand milliseconds after the onset of odor presentation, the fixation cross disappeared and one of the faces appeared for 500 ms in the center of the screen. As soon as the face disappeared, any odor presentation was also terminated, and clean air was delivered to the participants' nostrils. The screen then turned black (the color that was used as the background color during the experiment itself) for 2000 ms, followed by the presentation on the screen of a 9-point rating scale that the participants were instructed to use to rate the perceived attractiveness of the face that they had just seen. The values on the scale were all represented by digits on the screen, and they went from 1 (least attractive) to 9 (most attractive). The values 1, 5, and 9 were also labeled (least attractive, neutral, and most attractive, respectively). As soon as the participants had made their rating response by pressing the desired number on the keyboard (i.e., from 1 to 9), a fixation cross appeared in the center of the screen for 10 000 ms (i.e., the interstimulus interval). Clean medical air was delivered continuously through the olfactometer except during the delivery of the olfactory stimuli. The participants rested for 5 min after completing every 40 trials in order to limit any possible olfactory adaptation and/or fatigue.

At the end of the experimental session, each participant was asked to smell the odors individually and to rate each odor on several different dimensions (specifically odor intensity, odor pleasantness, and odor familiarity) using a Labeled Magnitude Scale (LMS). The participants gave their responses by marking (with a pen) a point on a paper scale going from 0 (i.e., not at all intense, pleasant, or familiar) to 100 (i.e., the strongest intensity, pleasantness, or familiarity ever experienced). The order of presentation of the odors and the scales was randomized between participants.

Results

The rating data for each participant on trials where they correctly responded to the presence versus absence of odor were analyzed using a mixed model analysis with the random

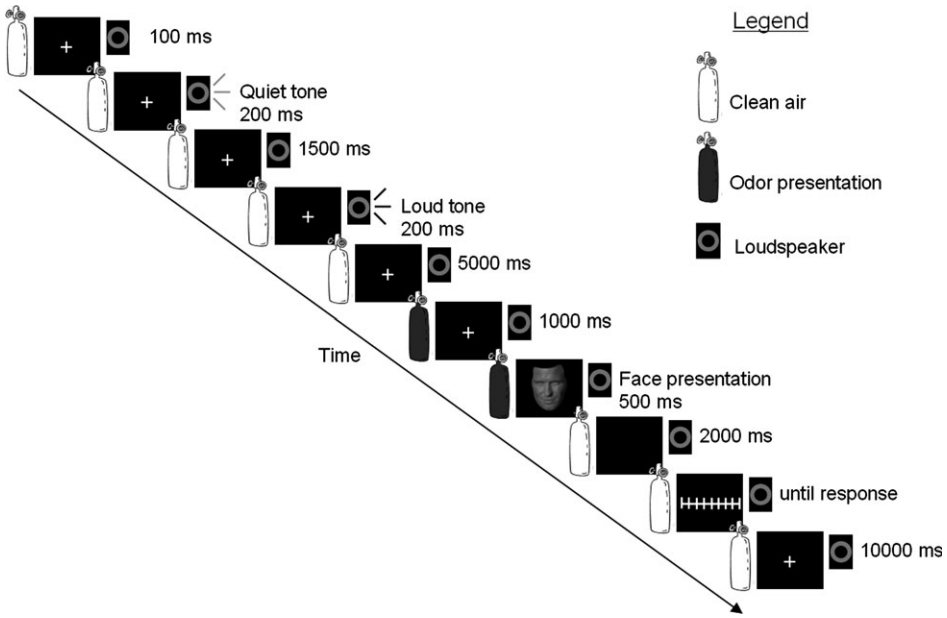

Figure 1 Timeline describing the experimental procedure used in the experiment.

factor of facial attractiveness (low vs. high) and the fixed factors of odor pleasantness (pleasant, unpleasant, or neutral) and body relevance (related, unrelated, or neutral). The results revealed a significant main effect of odor pleasantness on participants' facial attractiveness ratings, $F(1, 155) = 8.11$, $P < 0.01$ (see Table 1). Interestingly, there was no significant effect of body relevance, $F(1, 155) = 1.36$, not significant (NS). Subsequent Bonferroni-corrected planned comparisons highlighted the fact that the participants evaluated the faces as being significantly less attractive when presented together with an unpleasant odor (mean = 4.42) than when presented with either a pleasant odor (mean = 4.85, $t(15) = 5.45$, $P < 0.001$) or with the neutral clean air (mean = 4.9, $t(15) = 3.64$, $P < 0.01$; see Figure 2). There was, however, no significant difference in participants' mean facial attractiveness responses under conditions of pleasant versus neutral olfactory stimulation ($t < 1$).

In order to analyze the LMS data, we collapsed the mean ratings according to each odor category (i.e., pleasant, unpleasant, or neutral) and compared them using Bonferroni-corrected t-tests (where significance was set at $P < 0.017$; see Figure 3). The analysis of the odor intensity scores revealed that both the pleasant and the unpleasant odors were perceived as smelling more intense (mean = 39, $t(15) = 4.66$, $P < 0.001$; mean = 48, $t(15) = 4.24$, $P < 0.001$; respectively) than the clean air (mean = 14), just as expected, but that there was no significant difference between the intensity of the pleasant and unpleasant odors ($t(15) = 1.64$, NS). In terms of the odor hedonics, the unpleasant odors (mean = 13) were perceived as being less pleasant than the pleasant odors (mean = 45, $t(15) = 6.13$, $P < 0.001$) but they just failed to be judged as being significantly different from the neutral clean air (mean = 33, $t(15) = 2.51$, $P = 0.024$). No significant difference was observed between clean air and the pleasant stimuli ($t(15) = 1.42$, NS). The analysis of the odor familiarity data revealed that the 3 categories of odors were equally familiar to the participants: the pleasant odors (mean = 47) were rated as no more familiar than the unpleasant odors (mean = 41, $t(15) = 1.36$, NS) or clean air (mean = 43, $t < 1$), and there was also no difference between the unpleasant and neutral odors ($t < 1$).

Discussion

The results outlined here demonstrate that the trial-by-trial presentation of a pleasant versus unpleasant odor (or clean air) can modulate female participants' ratings of the perceived attractiveness of briefly presented male faces. The crucial result to emerge from our study was that female participants consistently rated the male faces as being slightly, though significantly, less attractive when presented with an unpleasant odor than with a pleasant or neutral odor. This effect would seem to be related to a modulatory effect exerted by the unpleasant odors as compared with the other odor categories (i.e., pleasant or neutral) as no significant difference in facial attractiveness ratings was found between the latter 2 odor types. This interpretation is also consistent with the LMS ratings of the odors, where no significant differences in familiarity or odor intensity were observed. The analysis of the data also revealed that significant differences in facial attractiveness ratings were driven by the pleasantness versus unpleasantness of the odor but were unaffected by whether the odor was body relevant or not (cf. Kirk-Smith and Booth 1990). These results add to previous evidence demonstrating that the presence of fragrance cues can influence people's evaluation of job applicants (Baron 1983; see also Baron 1981). They are also consistent with other research suggesting that putative human pheromones such as androstenol (which is naturally secreted in axillary sweat) can influence everything from people's judgments of the written descriptions of others (Cowley et al. 1977) to their ratings of the sexual attractiveness of pictures of women (see Kirk-Smith et al. 1978; Kirk-Smith and Booth 1990).

Related research on the effect of odor presentation on the processing of faces has been reported by Walla et al. (2003). They conducted an magnetoencephalorgraphic study in which participants were presented with faces that were accompanied by the smell of roses (phenylethyl alcohol) in half of the trials while they had to rate the perceived sympathy of the faces. In a subsequent recognition test phase of the experiment, the same set of faces were presented again as well as a set of novel faces. Recognition performance for those faces that had not been accompanied by an odor in the initial encoding phase of the experiment was better than for those faces that had been paired with an odor. Between 200–300 ms after stimulus onset, brain activity in the left temporal lobe decreased in response to faces that had been previously paired with an odor as compared with faces that had not been paired with an odor. The researchers concluded that the olfactory stimulus may have acted as an attentional distractor for face-encoding processes, resulting in poorer recognition

Table 1 Mean facial attractiveness ratings as a function of the attractiveness group and odor (standard deviations are reported in parentheses)

Facial attractiveness	Odor				
	Clean air	Geranium	Male fragrance	Body odor	Rubber
High	5.70 (0.21)	5.40 (0.23)	5.73 (0.24)	5.39 (0.21)	4.96 (0.25)
Low	4.10 (0.16)	4.06 (0.20)	4.15 (0.20)	3.64 (0.21)	3.72 (0.23)

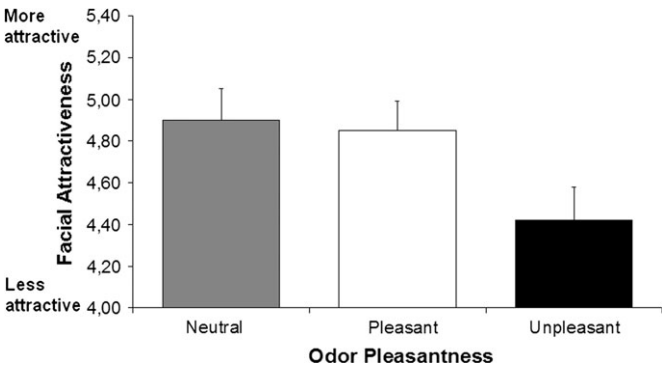

Figure 2 Mean facial attractiveness ratings as a function of the pleasantness of the odor. Error bars represent the standard errors of the means.

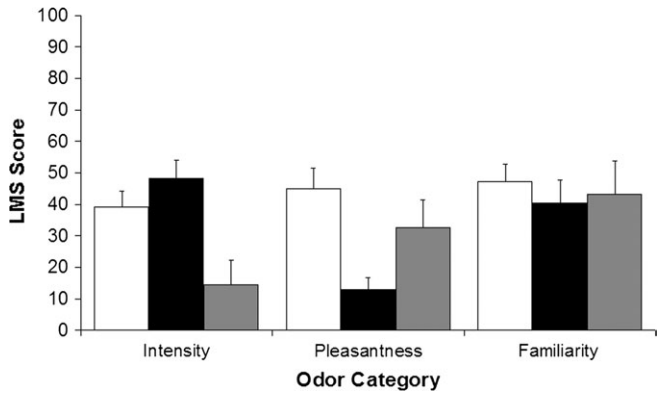

Figure 3 Mean LMS ratings of odor intensity, pleasantness, and familiarity as a function of odor pleasantness (pleasant, white bars; unpleasant, black bars; neutral, gray bar). Error bars represent the standard errors of the means.

performance (cf. Spence et al. 2001). The behavioral results of Walla et al. (2003) therefore show that the presentation of olfactory cues can also impair people's memory for simultaneously presented faces. In another behavioral study, Platek et al. (2004) reported that people detected pictures of their own faces more rapidly when presented together with their own smell than with the smell of another person.

At this point, it is important to consider whether the cross-modal effects reported in the present study might reflect some sort of halo-dumping effect. The term "halo dumping" has been used to describe the observation that when participants (regardless of their level of expertise) are asked to evaluate the sensory qualities of an odor, they sometimes tend to use terms that refer to other sensory experiences (e.g., gustatory sensations) instead, such as "sweet" for a vanilla odor (e.g., see Auvray M, Spence C, unpublished data, for a recent review; see also Prescott et al. 2004). For example, Clark and Lawless (1994) reported that when the participants in their study had to judge the fruitiness of an odor presented together with a sweet taste, they rated other qualities of the odor (e.g., the sweetness) instead which were much easier to evaluate. Generally speaking, it is thought that halo-dumping effects in odor evaluation can be eliminated simply by providing participants with more than 1 rating scale as this allows them an alternative means of highlighting the nature of their perceptual experience.

Given that the participants in the present study had to rate the attractiveness of the faces while refraining from expressing any evaluative response regarding the odor stimuli that happened to be presented, it could be argued that this may have led them to implicitly evaluate the pleasantness of the odors using the facial attractiveness scale. However, we believe this to be a highly unlikely explanation for the present data for a number of reasons. First, halo dumping has primarily been described in the domain of flavor perception (e.g., see Clark and Lawless 1994; Prescott et al. 2004; Kappes et al. 2006), that is, the term is specifically used in order to help explain those interactions taking place between odors and tastes, 2 senses that people have great difficulty distinguishing in everyday life (see Rozin 1982; Stillman 2002; Auvray M, Spence C, unpublished data). The halo-dumping effect thus appears to result from people's "sensory confusion." By contrast, people experience no such uncertainty when discriminating between olfactory and visual (food unrelated) information (i.e., odors and pictures of faces in the present study). What's more, it is important to note that the participants in our study had to perform an odor detection task at the beginning of each trial, thus meaning that they were able to give separate responses, one to the stimulus presented in each modality (vision and olfaction). That is, odor and visual information were responded to by our participants as 2 distinct (and individuated) stimuli, and this is also relevant in terms of making a halo-dumping explanation of our results very unlikely. Finally, it is also important to note that the dimension of "attractiveness" is a quite clear, natural, and easy characteristic to consider when we rate human faces. This means that it is unlikely that our participants had any doubts concerning which variable they were supposed to rate in the task. Taken together, we believe that these various considerations therefore preclude any kind of halo-dumping explanation of the present results.

An interesting question for future research will be to determine whether the modulatory effect of the presentation of pleasant versus unpleasant odors on judgments of facial attractiveness highlighted in the present study would also extend to influence people's social/sociosexual behavior under more ecologically valid conditions (cf. Kirk-Smith and Booth 1987). For example, a number of studies have now shown that both females and males who have been sprayed either with underarm secretions or with one of a number of different synthetic pheromones tend to engage in significantly more everyday sociosexual activities, including sexual intercourse, sleeping next to a partner, formal dating, petting, and affectionate kissing than control participants (e.g., Cutler 1987; Cowley and Brooksbank 1991; Gower and Ruparelia 1993; Cutler et al. 1998; McCoy

and Pitino 2002; see Schaal and Porter 1991, for a review). Should the modulatory effect of pleasant versus unpleasant odor on perceived attractiveness reported here be shown to influence behavior under such more ecologically valid conditions, then it would provide support for Baron's (1988) contention that fragrance should be considered as an important (if currently underrated) aspect of image management (see also König 1972). In the years to come, our findings might also be relevant in the technology sector, given recent developments in the area of multisensory applications, such as the possible use of olfactory cues in messaging applications (Bodnar et al. 2004), electronic picture storage/retrieval (see Brewster et al. 2006), and enhancing the sense of presence in virtual reality (Vlahos 2006).

In conclusion, the results of the present study add to a growing list of studies demonstrating that the presence of olfactory cues can exert a small but significant cross-modal influence on people's judgments of a variety of non-olfactory stimulus attributes/qualities (e.g., see Laird 1932; Allen and Schwartz 1940; Demattè et al. 2006). Such results compliment the more extensive literature showing that vision can influence olfactory perception (i.e., Morrot et al. 2001; Gottfried and Dolan 2003). At present, we believe that the presence of the pleasant versus unpleasant odors did not change the perception of the visual characteristics of the simultaneously presented faces in the present study but rather people's affective reaction to them. Our results converge with a growing body of evidence highlighting the role of human scent in mate selection (e.g., Rikowski and Grammer 1999) and fit with the claim that deriving evidence from multiple sensory cues can improve the veracity of our perceptual experience, including possibly even our mate selection (see Møller and Pomiankowski 1993; Calvert et al. 2004).

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