INDIVIDUAL DIFFERENCES AND THE PERCEPTION OF COMPLEX SCENTS

by

ANNLYSE N. RETIVEAU

Ingénieur des Industries Alimentaires, Ecole Nationale Supérieure d'Agronomie
et des Industries Alimentaires, 2000
M.S., Kansas State University, 2002

AN ABSTRACT OF A DISSERTATION

Submitted in partial fulfillment of the

Requirements for the degree

DOCTOR OF PHILOSOPHY

Food Science Graduate Program

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2004

ABSTRACT

Three independent panels evaluated a total of 22 scents. Two panels were highly trained in sensory analysis techniques and performed descriptive analysis of the fragrances. In the third panel, 318 untrained respondents completed demographic questionnaires, personality tests, and surveys on fragrance attitudes and behaviors. They also evaluated the 22 scents: their perceptions of the fragrances' sensory qualities and hedonic value were recorded, as well as the images and personalities they associated with these particular fragrances.

Some methodological issues were tested, emphasizing the need for standardized procedures and consistency in fragrance evaluation. The use of consistent methodology in the preparation of fragrance samples is critical to accurately assess fragrance sensory properties. Additionally, consistent use of validated questionnaires constitutes an important strength for the fragrance industry: to better understand consumers, develop marketing strategies, and improve customers' guidance and education.

The interplay of individual differences with fragrance perception, whether from an attitudinal, sensorial, hedonic, or associative standpoint, appears complex. From a perceptual standpoint, sensory profiles generated by trained panels were representative of consumers' perceptions, yet trained panelists discriminated better among fragrances and provided more detailed and actionable profiles. From an attitudinal and behavioral standpoint, demographic and psychological differences explained independent aspects of motivations and attitudes toward fragrances, but were not sufficient to fully account for the variability in attitudinal and behavioral patterns. Lastly, in terms of fragrance perception and image and personality associations, the combination of both intrinsic sensory characteristics and fragrance hedonic value was necessary to understand patterns of image and personality traits associated with fragrances. Interestingly, most findings were consistent even when individual differences in liking patterns for fragrances were taken into account. However, some specific dimensions, such as mood associations were preferred by clusters of respondents and depended upon individual differences.

Although more research is needed to better understand the interrelationships among individual differences and all aspects of fragrance perception in real-life settings,

this research provided valuable insights into these phenomena – insights that have direct implications, including understanding consumer perceptual processes, assessing potential influences of fragrances on social interactions, and providing strategic planning for marketing and advertising of personal fragrances.

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Approved by:

Major Professor
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ACKNOWLEDGMENTS

Several individuals deserve my highest regards and appreciation. I first would like to express my most grateful thanks to my family whose love and encouragements helped me achieve my goals, and whose calls, letters, and occasional visits brought a little bit of home when I most needed it, throughout my graduate student life. My very special thoughts also go to those, near and far, who blessed me with their friendship, care and faith. Thank you for your constant support throughout trying times and your presence on my side during happy moments. Thanks for helping me become the person I am today.

I also would like to express my sincerest thanks to Dr Edgar Chambers IV, my major professor, for sharing his knowledge, guidance and expertise throughout my graduate education. I am especially grateful to him for encouraging me strive for scientific excellence, inculcating to me the necessity of practicality, and constantly reminding me of the need to acquire further knowledge through his most famous questions: ‘so what?’ and “now what?’.

My grateful appreciation also goes to Dr Delores Chambers, Director of the Sensory Analysis Center, for her encouragement and support. In addition, I would like to send my warmest regards to Dr William Turnley and Dr George Milliken, who not only served on my committee, but also helped me dig deeper into scientific principles, further grasp concepts related to personality and behaviors, and better understand statistical modeling.

I would like to extend my thanks and appreciation to my peers and mentors in the industry. Among them, Gail Vance Civille especially deserves my deepest thanks for encouraging me in furthering my knowledge, and guiding my advancement in the field of sensory analysis. In addition, I would like to thank all who made this research project become a reality: Carol Christensen, Stephen Warrenburg and their sensory team at International Flavors and Fragrances, whose help, collaboration and guidance was greatly appreciated; Clare Dus, Lee Stapleton and the wonderful staff of Sensory Spectrum, Inc., whose noses and brains contributed greatly to the success of this project; and Sherry McGraw, Alicia Jenkins, Kathy Smiley, and the panelists and students at the Sensory Analysis Center, whose positive influence, constructive criticism and help went way beyond contributing in this research project.

INTRODUCTION

Social interactions are driven largely by the impressions we form of other people. It is generally accepted that much of human communication relies on verbal or written cues. However, a large body of research suggests that non-verbal cues also play a large role in the formation of impressions. Numerous studies have focused on the formation of attitudes and first impressions based on visual and auditory cues. A person's lifestyle, personality and mood is thought to be reflected in the way that person presents him/herself in public in terms of appearance, facial expression, clothing, voice tone, demeanor, and attitudes. Although the use of cosmetic products has been found to enhance appearance and to help convey favorable impressions, little is known about the role of personal fragrances and perfumes in this respect. In the human world, little attention has been paid to the use of odors as a communication tool, whereas numerous studies have demonstrated that olfactory stimuli perceived in the environment constitute a rich source of information in the animal world (Jellinek, 1991). In contrast, humans seem more likely to experience odors more as pleasurable sensations than as sources of information. However, in a survey conducted in the United States with 800 women, smell was found to be one of the personal attributes that was the most noticed by women at the first meeting. With 43% of the women mentioning 'smell', scent was slightly less indicated than 'face', 'eyes' and 'voice', but more often mentioned than 'hair', 'dress', 'skin' or 'hands' (Byrne-Quinn, 1988). Because scent often is noticed at the first meeting, it seems legitimate to hypothesize that olfactory cues also might affect the formation of social impressions and lead to inferences about personality.

The fact that odors, and especially body odors, convey information about a person's physiological state is now well established, as shown by the large body of research and the recent focus on human pheromones and their potential impact on physiological status, sexual arousal, and behavior (Gower,1997). However, in a world where people tend to mask natural body odors by using scented products such as soaps, creams, and fine commercial fragrances, one can ask whether the natural and synthetic scents used in those products also convey information about the underlying personality or

mood of the users, have an impact on impression formation, and ultimately influence approach behavior and other social interactions.

Individuals are said to display approach behavior when they remain in a setting and explore it, or when they interact with and like the objects or other individuals in the setting (Mehrabian, 1980). The influence of the environment on approach behavior seems to be mediated by the individual's emotional response to that environment (Mehrabian, 1980; Gardner, 1985). Pleasant environments are thought to elevate a person's mood, which, in turn, increases approach behavior. In contrast, unpleasant environments are believed to affect mood negatively and consequently lead to a decrease in approach behavior. Research has shown that environmental stimuli such as noise and temperature can influence emotional state and approach behavior. In the field of olfactory psychology, which encompasses numerous olfactory effects on behavior, recent findings lead to the conclusion that scents may not only influence mood (Schiffman and Sattely-Miller, 1995; Steiner, 1997; Jellinek, 1994), self-perception, and self-acceptance for the wearer of the fragrance (Nezlek and Shean, 1990; Schiffman and Siebert, 1991), but also bystanders' moods (Sugano and Sato, 1991; Redd and Manne, 1995; Lawless,1991) and perceptions of the environment and of the fragrance wearer (Ehrlichman and Bastone, 1992). Scents also affect interpersonal attraction and constitute a tool for impression management (Baron, 1981; Baron, 1988). Consequently, scents are likely to have an impact on exploratory and social behavior. Research has shown that appropriate fragrances enhance the time spent in shops or museums (Teerling *et al.*, 1992; Knasko, 1989; Knasko, 1993), generate positive effects on approach responses for products (Fiore *et al.*, 2000), and increase altruistic social behavior, such as helping a stranger (Baron, 1997). However, some findings have been contradictory. Knasko (1995), for example, found that pleasant environmental fragrances did not have any impact on social interactions. Most research has been conducted based on the theory that the more pleasant an environment the greater the likelihood of approach behavior. Thus, studies have been conducted mainly with pleasant fragrances designed to enhance the pleasantness of the surroundings; only a few of the studies took the intrinsic sensory characteristics of the fragrance into account. However, fragrances that differ in their sensory characteristics, but that are similar in liking, affect different mood factors and

dimensions (Retiveau *et al*., in press). One might wonder then, if the formation of impression, and ultimately social interaction, is driven by the hedonic value of a fragrance, by its sensory characteristics or by a combination of both. Additionally, individual differences in reaction to various fragrances have not yet been thoroughly examined. How do individuals perceive olfactory information? How do their perceptual and cognitive processes lead to the association of a specific image and personality with a fragrance? Ultimately, how do individuals cope with first impressions and how do they influence behavior?

In an attempt to better understand the interrelationships among individual differences, fragrance perception, fragrance liking and image and social interactions, two models were developed. Figures 1 and 2 represent the interrelationships from the potential fragrance wearer's and perceiver's perspective respectively. The dotted box in both models corresponds to the part that is common to both models. This part of the models will be the main focus of the present dissertation. In addition, the motivations for fragrance choice and the attitudes and beliefs toward fragrance use presented in Model 1 will be studied and the impact of individual differences on these factors discussed.

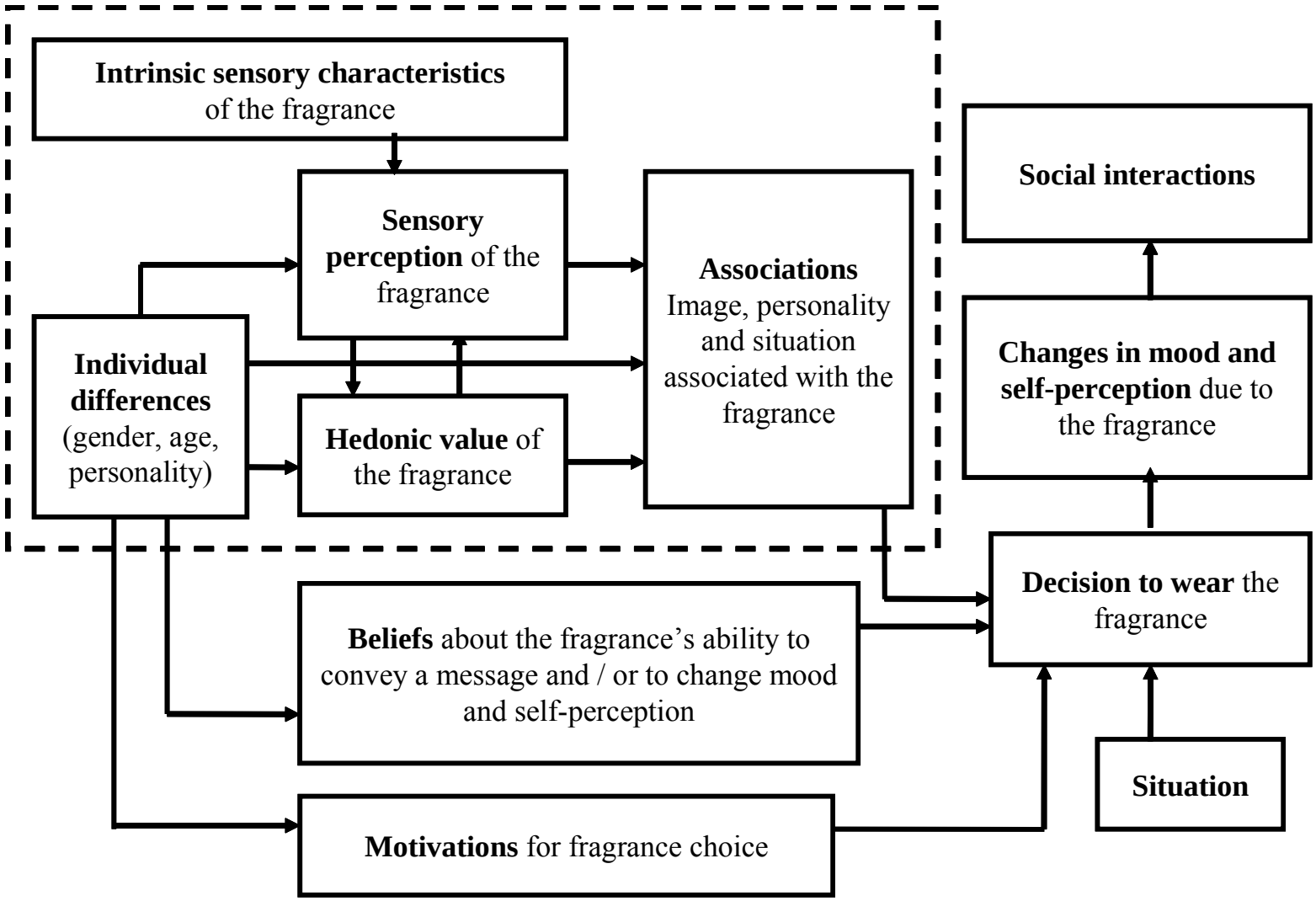

FIGURE 1: The fragrance wearer's perspective - Influence of individual differences and fragrance perception on social interaction.

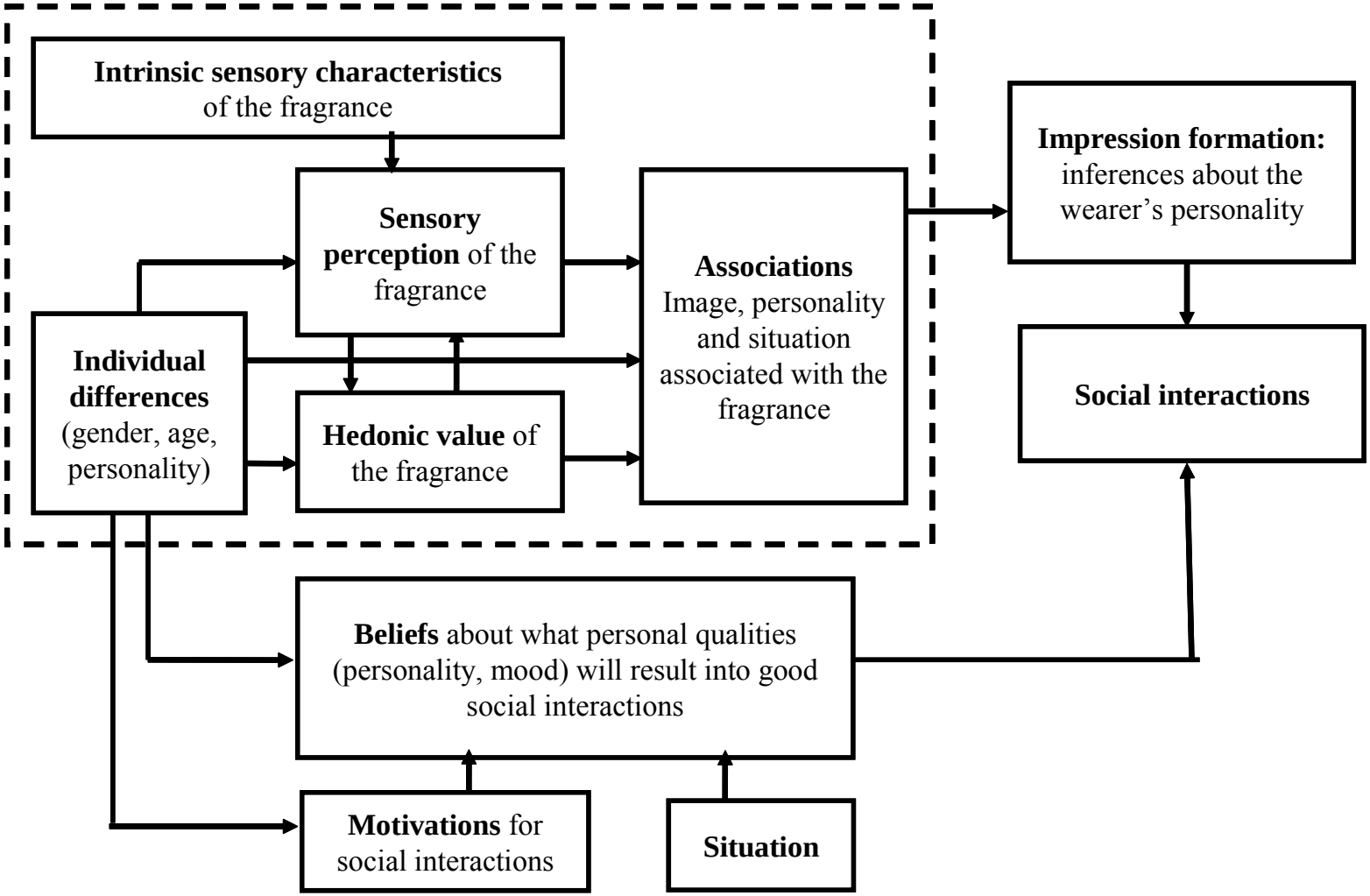

FIGURE 2: The fragrance perceiver's perspective - Influence of individual differences and fragrance perception on social interaction.

In the first part of the present report, the relationships shown in the models are discussed through a brief review of the literature. After defining individual differences, which encompass biological (age, gender, etc.), physiological, psychological (personality, moods and emotions), cultural and socio-economic factors, the discussion focuses on individual differences and their impact on the perception, recognition, and naming of fragrance characteristics. The impact of psychological and demographic characteristics on hedonics and fragrance acceptability is then discussed, followed by the influence of individual differences in motivations on fragrance choice and perception of the fragrance image, situational fit and personality. Last, the role of individual characteristics, hedonic value and fragrance sensory characteristics as drivers of the formation of impressions and associations is examined.

The second part of this report presents three independent experiments that focus on the common part of the models (Figures 1 and 2), i.e., the interrelationships among individual differences, fragrance acceptance and sensory perception, and the inferences about the image, qualities, and personality traits associated with a particular fragrance. In the first experiment, 22 fragrances were described by a sensory panel of highly trained panelists with prior experience in fragrance evaluation. The second experiment consisted of a descriptive analysis of the same fragrances by a highly trained sensory panel with no prior experience in descriptive analysis of fragrances. In the third experiment, 318 naïve subjects, divided into 6 groups by age and gender, evaluated the sensory characteristics, hedonic value, image, and personality characteristics associated with the 22 fragrances. Additionally, these subjects completed a personality test and answered a survey on their beliefs and attitudes towards fragrances, along with a questionnaire assessing the criteria they usually consider while choosing a fragrance for themselves.

The third part of the report focuses on methodological issues. The first chapter deals with a comparison of two sample preparation methods and the impact of preparation method on perceived sensory properties. The second chapter discusses the development of a survey to assess respondents' attitudes and behaviors toward fragrances as well as their fragrance selection process.

Last, a fourth part focuses on individual differences and fragrance perception and provides some key results that answer some of the questions raised by the models presented in Figures 1 and 2. In the first chapter, the impact of panel size and training on the description of fragrance sensory characteristics is discussed by comparing fragrance sensory profiles generated by a highly trained panel in descriptive techniques with prior experience in fragrance descriptive analysis, a trained panel in descriptive techniques without prior experience with the product category and a naïve respondent panel with no prior training in descriptive analysis. The second chapter focuses on fragrance choice and beliefs and attitudes towards fragrances. The effect of individual demographic and personality variable on attitudes toward fragrances is first discussed, provided an a priori hypothesis. A consumer segmentation approach with no a priori hypothesis is then discussed. The two methods are compared and contrasted and marketing and advertising implications for the fragrance industry are discussed. In a third chapter, the impact of hedonics and intrinsic fragrance characteristics on personality and image associations is studied. Last, in the fourth chapter, groups of respondents are defined based on their patterns of liking for different fragrances and assesses differences in demographic and psychological makeup, attitudes and behaviors and patterns of image and personality associations among the generated segments.

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PART I.

LITERATURE REVIEW

1. Individual differences – a definition:

A large body of research deals with individual differences, and their effect on preferences, perceptual and cognitive processes, and ways of coping with the environment. Individual differences encompass biological (age, gender…), physiological, psychological (personality, moods, and emotions), cultural and socio-economic factors. Personality constitutes a large source of individual difference and is thought to have a large impact on the way individuals interact with their environment. Numerous definitions of personality are found in the literature. For example, personality has been described as "a person's private, central, inner core" (Hunt, 1982). Included within this inner core are the motives, attitudes, interests, beliefs, fantasies, cognitive styles, and other mental processes of an individual. Personality also is defined as "the relatively stable set of psychological characteristics that influences the way an individual interacts with his or her environment" (Johns and Saks, 2001). In a more global and holistic regard, personality is a "unique composite of inborn and acquired mental abilities, temperaments, attitudes, and other individual differences in thoughts, feelings, and actions … associated with a fairly consistent, predictable pattern of behavior" (Aiken, 1999). In that sense, personality is an organized composite of qualities and characteristics, the sum total of the physical, mental, emotional and social qualities of a person, synonymous with the psychology of the individual.

Based on these definitions, theories and models have been developed in an attempt to completely and accurately describe personality. Among these models, the Big Five dimensions of personality (Goldberg, 1990), in which five relatively independent personality-related dimensions have been determined to describe personality, is a widely accepted model (PersonalityResearch.org, 2002). The five dimensions of personality are represented by the acronym OCEAN and are:

- *Openness to experience*, also known as Intellect, represents the extent to which a person thinks flexibly and is curious, original, imaginative and receptive to new ideas and experiences. More open people tend toward creativity and innovation, less open people tend to be more unimaginative, dull and to favor the status quo.

- *Conscientiousness* is the degree to which a person is achievement-oriented and responsible. High conscientiousness often is associated with high motivation and dependability, whereas low conscientiousness is linked to low reliability, carelessness and impulsivity
- *Extraversion*, as opposed to introversion, reflects the extent to which a person is extraverted (i.e., sociable, talkative, outgoing) versus introverted (i.e., withdrawn, shy…). High extraverts enjoy social gatherings while introverts prefer aloneness and avoid social situations
- *Agreeableness* reflects the extent to which a person is friendly and approachable. More agreeable people tend to be warm, tolerant, cooperative and considerate whereas less agreeable people are more aloof and cold.
- *Neuroticism* is opposed to emotional stability, which is the degree to which a person has appropriate emotional control. People with high emotional stability are self-confident and have high self-esteem. People with high neuroticism tend toward self-doubt, anxiety and depression.

These five dimensions have been recognized to be stable over a 45-year period starting at the beginning of adulthood (Soldz and Vaillant, 1999) and are considered universal (McCrae and Costa, 1997). However, additional studies have shown that the five dimensions were not sufficient to completely describe personality. Sensuality and Masculinity-Femininity, for example, were determined as additional clusters of traits that fell outside the 'Big Five' (Paunonen and Jackson, 2000).

Individual differences, whether demographic or psychological, influence the way people perceive and interact with their environment. Personality, in particular, reflects an individual's style of interacting and coping with the world, and reacting to people, situations and problems. Individual differences seem highly correlated to the processing of information and the preference styles for sensory modalities. For example, Weaver *et al.* (1996) associated personality with different listening styles, while Sojka and Giese (2001) found that individuals with high needs for cognition preferred to process verbal information while individuals with high needs for affect preferred to process visual information. Although no study has been found on any link between individual

differences and the preference for processing olfactory information, it seems legitimate and relevant to not only take into account gender, age, and habits, but also personality differences and familiarity with fragrance descriptive techniques in the study of perceptual processes for olfactory information and their relationship to the formation of impressions.

2. Individual differences and their impact on odor perception and acceptability

a) Individual differences, perception, recognition, and naming of odors' characteristics

Demographic characteristics are related to olfactory abilities (Gilbert and Kare, 1991). Women generally perform better than men in "all the known functions of smell" (Doty *et al.*, 1985). Accordingly, Vroon (1997) states: "the olfactory capacity of women is superior to that of men on all fronts". A large body of literature supports the hypothesis that women have lower detection thresholds for many odors and can identify, recognize and name odors better than men (Brand and Millot , 2001; Doty, 1991). Lehrner (1993) showed that women performed better than men on odor recognition memory, and also determined that the superiority of women in this respect was due to sensory rather than cognitive factors. Gender differences are more pronounced for some odors (e.g., androstenone or galaxolide) than for others (Brand and Millot, 2001; Koelega, 1994).

Similarly, age seems to have a large impact on the ability to detect, identify and name odors. Elderly people are less sensitive to odors than young adults (Cain and Gent, 1991; Schiffman, 1983). Results from two large studies conducted with respondents ranging in age from 5 to 99 years revealed that people ranging in age from their mid-twenties to late forties performed best at odor identification tasks (Doty *et al.*, 1984; Wysocki *et al.*, 1991). If the ability to detect an odor decreases with age, on average, this decline is nonetheless heterogeneous and highly variable depending upon subject, odorant and the measure of the response (Gilbert and Kare, 1991; Pelchat, 2001). Figure 1 illustrates this point by showing detection patterns among men and women in

different age groups for different odorants. The odorant-specific shape of the age-response curves is of special interest.

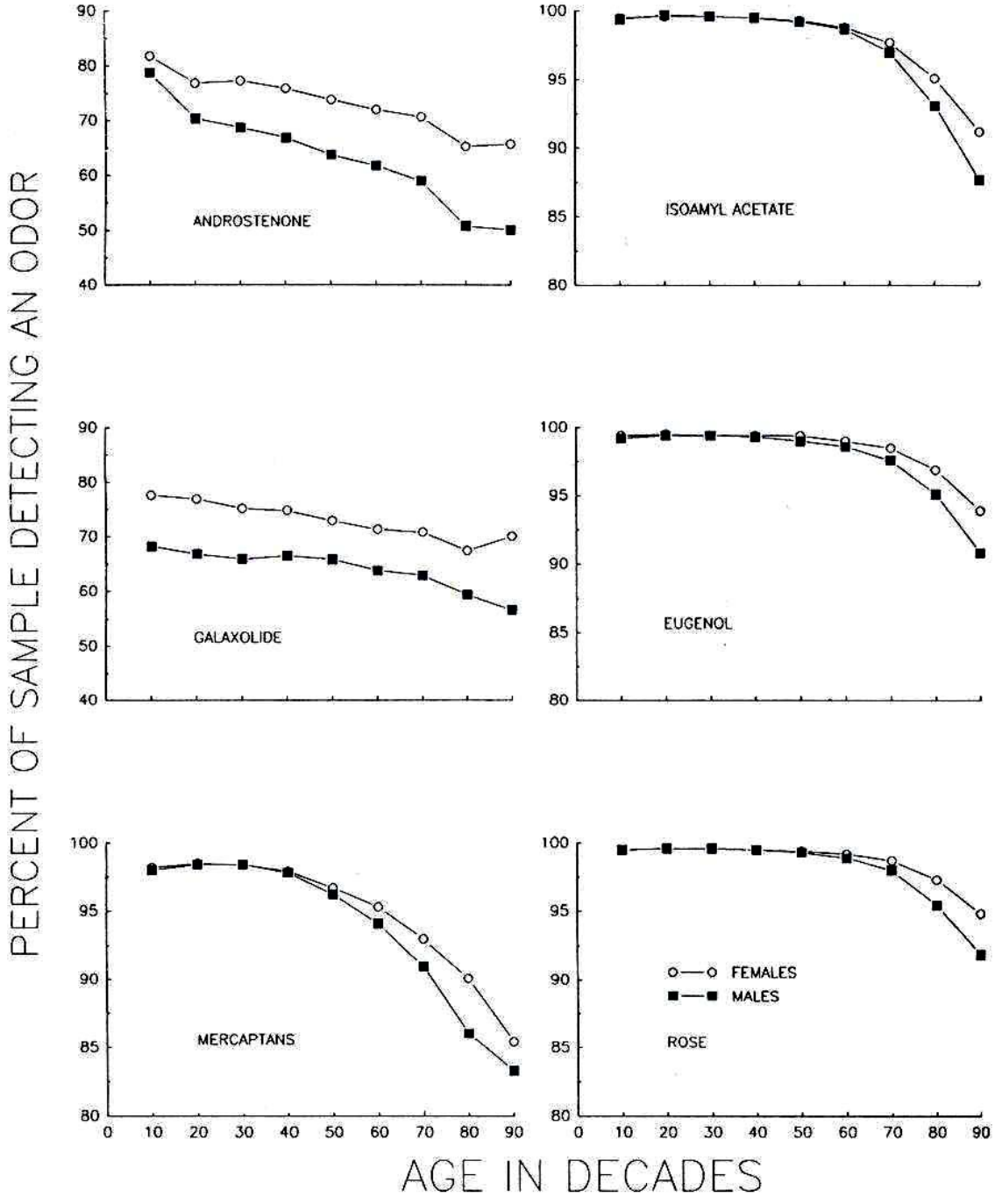

FIGURE 1. Percentage of the National Geographic Smell Survey respondents able to detect an odor, plotted as a function of age, collapsed by decade. (Source: Wysocki & Gilbert, 1989)

In an attempt to ascertain other possible sources of individual variability, Larson *et al.* (2000) examined the influence of age, gender, cognitive abilities and personality styles on odor identification. They found that both detection and identification of olfactory information were impaired with age, a result that was consistent with that of previous studies. Surprisingly, in the Larson et al. (2000) study, gender did not seem to have any effect on either detection or identification of olfactory stimuli. Personality style, i.e., neuroticism, impulsivity, and lack of assertiveness, was found to be a potent predictor of successful odor identification.

Additionally, cultural background and prior exposure to a fragrance can results in different cognitive and emotional reactions to a scent. Dalton (2000) states that odor familiarity influences not only the perceived pleasantness of an odor, but also the successful identification and perceived intensity of the scent.

Last, the level of training in descriptive analysis of fragrances and familiarity with sensory descriptive techniques and fragrance categories might constitute another source of variation that could explain differences in odor recognition and ability to name and accurately describe fragrances. Although it has been commonly accepted that trained sensory experts describe more accurately and use more specific descriptors than untrained consumers when evaluating the sensory profile of a product, this fact has been challenged over the past decade by a few researchers, though details often have been lacking. Moskowitz (1996) stated that, although sensory profiles generated by experts and consumers may differ in the terminology used, both "sets of profiles can be related to each other, or at least approximated, so that given one profile the researcher can estimate the other". Based on that belief, even though the naming and description of odors might differ between consumers and experts, both trained and untrained panelists would categorize products similarly based on their sensory properties.

b) <u>Psychological and demographic characteristics and their influence on hedonics and fragrance acceptability</u>

Individual differences including gender, age, familiarity, and personality have effects on a number of preferences, including preferences for forms and colors (Eysenck,

1940; Eysenck, 1941); aesthetic judgments (Peel, 1945; Moffet and Dreger, 1975; Juhasz and Paxson, 1978; Eysenck, 1992; Furnham and Avison, 1997); music (McCown *et al.*, 1998; Schwartz, 2002); leisure pursuits (Jin and Austin, 1995) and exercise (Courneya and Hellsten, 1998); as well as learning styles (Blickle, 1996) and occupations (Segal, 1992; Judge *et al.*, 1999). Of special interest is the body of research concerning food choice and consumption as a function of personality (Furnham and Heaven, 1999). Numerous models have been developed in an attempt to explain eating behaviors and food preferences. These models emphasize the interrelationships between food intrinsic properties, i.e. appearance, odor, flavor, texture…, hedonics, individual differences including psychological, socio-economic, physiological and cultural factors, and environmental influences (Shepherd, 1989; Shepherd and Farleigh, 1989; Shepherd and Sparks, 1994; Raudenbush *et al.*, 1995; Goldberg and Strycker, 2002). Such models represent a starting point for modeling relationships among odor intrinsic characteristics, hedonics, individual differences, and environmental influences.

In the domain of fine fragrances, i.e., any harmonious and recognizable composition of odors diluted with ethyl alcohol that might be used to perfume oneself, demographic characteristics have a large impact on fragrance acceptance. It is well known, for example, that children prefer fruity and sweet smells, whereas adult women tend to have high acceptance for floral or oriental scents, and men generally like citrus or woody scents. The fragrance classifications suggest that some scents are better suited to women than men, although recent trends toward unisex fragrances show that feminine and masculine fragrances may not be highly different as shown by the Haarmann and Reimer Genealogy of Perfume, (Bork et al.,1991) and the classification of the Comité Français du Parfum (CFP, 1998). Vroon (1997) states that "after the age of twenty the hedonic order and the appreciation of smells remains more or less the same". However, even after 20, specific perfumes appeal more to some age groups than others (Mensing and Beck, 1988). Mensing and Beck's work (1988) has been of tremendous importance in the study of the relationship among odors, individual differences, and hedonics. In a study conducted with 600 German women, these researchers examined the influence of extraversion and emotional stability on fragrance preferences and found that women with similar personality types liked similar perfumes. For example, high extraverts wore and

liked more noticeable, energizing, fresh scents, whereas high introverts liked warmer, more comforting, oriental scents. Similarly, emotionally ambivalent persons liked more floral-powdery notes, whereas emotionally stable women preferred aldehydic-floral or Chypre (i.e., green, mossy, woody) types of fragrances. Based on those findings and on a knowledge of the relationship between color preferences and personality, a "color rosette" was constructed to predict the fragrance category that would best appeal to women with a certain personality (Mensing and Beck, 1988; Haarmann-Reimer. com, 2002).

3. Individual differences: how they influence fragrance choice and perception of the fragrance image, situational fit, and personality.

From the fragrance wearer's perspective, one of the main reasons for using scented products and perfumes is to send information about oneself. Data from group discussions and personal interviews revealed that women are especially concerned with the message they send out about themselves when they use perfume (Byrne-Quinn, 1988).

- The message can be directed towards others in general. That type of motivation is called the "social dimension" (Bain, 1997) or "other's perception motive" (Graham, 1993) for fragrance and cosmetics selection.
- The message also can be directed towards a specific person. This is known as the "interpersonal attraction motive" (Graham, 1993) or the "interpersonal dimension" of fragrance choice (Bain, 1997). This dimension is largely correlated with the desire to be sexually attractive. In this case, perfumes are used to enhance the body and to inform the target about qualities and personality aspects that are likely to be attractive.
- "Self-perception" (Graham, 1993) or the "inner directed dimension" (Bain, 1997) constitutes the third motive for using scented products. A person will use a fragrance to please her/himself. For women, other inner-directed reasons relate to the desire to

express femininity and individuality, to enhance self-esteem, to feel better about oneself, to express a need for social approval, and to enhance self-image.

The choice of a fragrance is thus largely influenced by the wish to enhance self-satisfaction and to fit in a social setting. Perfumes not only evoke a hedonic experience, but are used in order to please oneself; as an aesthetic, sensual, and exciting tool; and as a means to convey messages that give the user confidence in obtaining "social or biological-psychological" gratifications (Byrne-Quinn, 1988). According to Disdet (1994), the choice of a perfume "must be in complete agreement with what a woman wants to express". In a social setting, a fragrance is used as a tool for the wearer to increase self-efficacy for social interactions and provide confidence in the ability to engage in interpersonal communication, to seek acceptance in a group that is aspired to, or to maintain or even strengthen social position among peers.

Here again, however, individual differences need to be taken into consideration when studying the motivations for using fragranced products. A survey conducted by the Sense of Smell Institute and the New York Times Magazine (1995) showed that men's fragrance selection was driven mainly by the desire for interpersonal attraction. Men are more likely to consider the opportunity for romance as the most important factor in selecting a fragrance. On the contrary, women seem to be more motivated by "inner-directed" motives. They consider the sense of smell to be primarily a key to self-satisfaction rather than a tool to attract others (The New York Times Magazine, 1995). Additionally, personality seems to play a large role in the selection of fragrances. Snyder (1990) compared the motivations of high and low self-monitors in fragrance choice. Self-monitoring is "the extent to which people observe and regulate how they appear and behave in social settings and relationships" (Johns and Saks, 2001). High self-monitors, also known as social chameleons, chose fragrances on the basis of image consideration: they use fragrances for fashioning and controlling their social images, they wear different fragrances to display different images for different social occasions, and thus choose fragrances for their appropriateness to the context in which they are to be worn. High self-monitors are particularly sensitive to image consideration in advertising. By contrast, low self-monitors choose fragrance on the basis of actual scent properties.

Instead of using fragrances to create images and play roles, they use fragrances to reinforce and express their own personality. Moreover, they try to find that particular fragrance that best fits their personality and use it across a wide variety of situations and are more sensitive to information about the fragranced product itself, rather than the image to be gained by using the fragrance (Snyder, 1990; Snyder and Attridge, 1995).

It is clear that individual demographic and psychological characteristics influence motivations for fragrance choice. Based on the theory of attribution and projection, it is likely that, when perceiving a fragrance, a person will attribute their own thoughts and feelings to the person who is wearing that fragrance and perceive the fragrance keeping in mind his/her own motivations. In theory, for example, if one wears fragrance to enhance self-confidence, it is likely that one will discriminate among fragrances based on the self-esteem, self-confidence dimension they project. If one's motivation is directed towards interpersonal attraction, one probably will discriminate fragrances on image attributes such as sensual, romantic, and on personality attributes such as seductive and sexy. Similarly, a low self-monitor probably will not discriminate fragrances on situational fit and will rate the fragrances they like as an appropriate fit for many situations, whereas a high self-monitor will carefully choose fragrances to match specific situations. Individual differences might thus lead to attributions and inferences on different dimensions of fragrance situational fit, personality and image.

4. Individual characteristics, hedonic value, and fragrance sensory characteristics: what drives the formation of impressions and associations?

a) Non-specific effects of fragrances on image and personality associations – the primacy of hedonics

Several studies have been carried out in the past few years about the psychological effects on self-image, others' perceptions, and interactions between people arising from the use of cosmetics (Graham and Jouhar, 1980; Jouhar *et al.*, 1986).

Graham and Jouhar (1981) observed the effects of cosmetics on the way people perceived individuals who used cosmetics and found that the use of cosmetics (facial make-up and haircare products) led to more favorable appearance ratings and also to

more favorable ratings of personality, as perceived by others. Use of fragrance led to the highest attractiveness ratings when compared with the use of other types of commonly used cosmetics. These observations led to the hypotheses that "what has been made beautiful is good" and that a pleasant fragrance will be associated with positive image and personality traits: "We would expect perfume to significantly enhance perceived attractiveness and personality, along dimensions similar to those we know are affected by other products, such as make-up. For example a person using a pleasant fragrance should be attributed more desirable characteristics, such as being more sociable, confident, interesting…" (Graham, 2000).

Studies on the effects of fragrances on mood showed that odors can influence moods based on hedonics: pleasant odors can enhance and unpleasant odors can depress mood (Rotton, 1993; Rotton *et al.*, 1978; Schiffman, 1998; Warren and Warrenburg, 1993). Additionally, pleasant fragrances seem to enhance self-image and self-confidence (Nezlek and Shean, 1990; Nezlek and Shean, 1995; Baron, 1990), increase attraction and produce positive shifts in social perception of the wearer (Baron, 1981). The use of perfume in combination with avoidance of additional non-verbal image-enhancing tactics positively affected 'liking and attractiveness' (Baron, 1988). The presence of a fragrance in a product (e.g., hand cream, lotion, or soap) favorably modified perceptions of the user's appearance and personality (Jouhar *et al.*, 1986).

Thus, it appears that the more pleasant a fragrance, the more positive the image and personality associated with it. However, studies suggest that, independent of hedonics, specific sensory characteristics also may drive the association of specific moods, images, and personality traits with the fragrance.

b) <u>Fragrance intrinsic characteristics, and their relationship to hedonics, image, and psychological effects</u>

Of major interest in the study of fragrance's intrinsic characteristics, their relation to image and psychological effects and their suitability for a specific type of women is the theory developed by Paul Jellinek in 1951 and reevaluated in 1997 (Jellinek, 1997a; Jellinek, 1997b; Jellinek, 1997c). These postulates are of great interest when determining

the factors that underlie fragrance image and personality. The core of Jellinek's theory is his distinction between sensory descriptions of odors (such as sweet or flowery) and the psychological effects of fragrances (such as calming or sultry). He developed a heuristic device, the Odor Effects Diagram, in the shape of a diamond, whose opposite vertices are labeled narcotic vs. stimulating and erogenous vs. anti-erogenous (refreshing). Figure 2 presents Jellinek's Odor Effect Diagram and the odor notes associated with it.

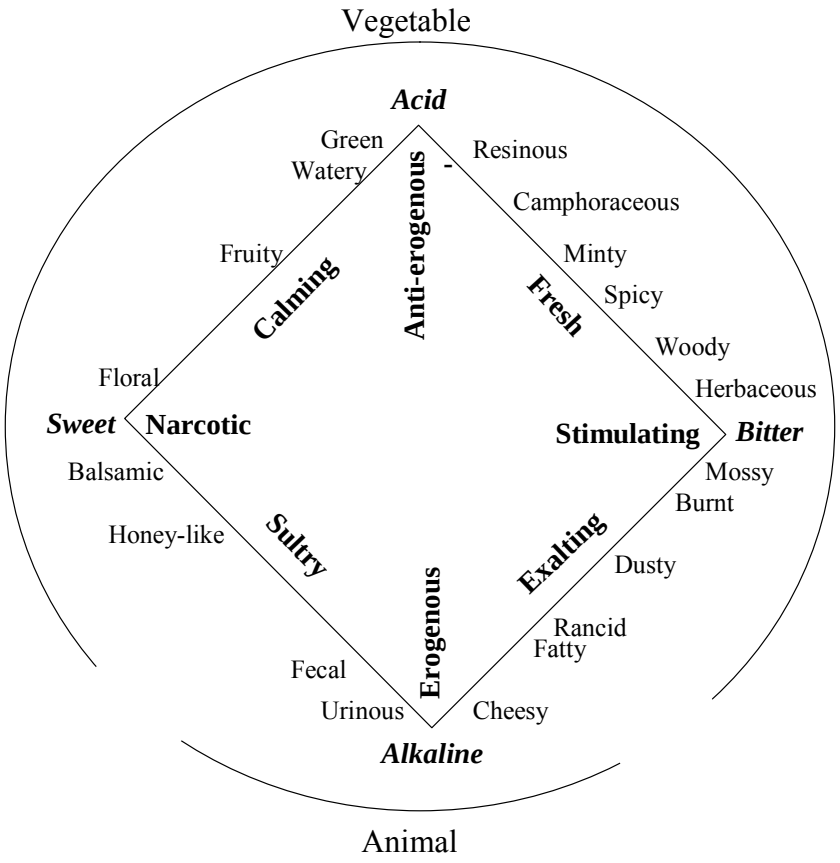

FIGURE 2. Paul Jellinek's Odor Effect Diagram and odor notes (Source: Jellinek, 1997)

Sensory characteristics of a fragrance are linked to its psychological effects, and both are used to determine the suitability of the fragrance for a particular type of woman. Jellinek used psychographic, sociologic, demographic and physical information such as hair type, mother-mistress dimension, activity, age, femininity, and naïve vs. artful

behavior to determine the type of fragrance that would best suit an individual woman. For example, according to his theory, floral-fruity fragrances are associated with a narcotic, calming effect and best suit blonde or brunette feminine women, in their 40s-50s, expressing their love in a motherly manner whereas spicy, woody scents are fresh and stimulating, and best suit blonde or redheaded masculine women in their 20s, expressing their love more as a mistress than as a mother. This theory provides encouraging insights but relies on the view of a perfumer rather than on the view of the fragrance wearers or perceivers (Jellinek, 1990; Jellinek, 1992). Moreover, it tended to relate sensory characteristics of the fragrances with their mood effects more than with the image they project about personalities, and implied that liking of a fragrance depends on psychological effects of the fragrance. Kirk-Smith and Booth (1987) suggested that human responses to odors are acquired by association with emotionally significant effects, and that odors' effects on mood are subject to large inter-individual variance and seems to be highly correlated with demographics, personality, and socio-cultural background.

Studies are rare in the current literature, that were conducted with naïve respondents and attempted to relate sensory characteristics of fragrances to image and personality attributes. In a recent study, Moskowitz (1998) discussed the relation between sensory, liking, and image attributes for soaps. Sensory attributes were clearly related to liking, but no clear relation was found between sensory and image attributes. Assuming that respondents could validly assign ratings to image attributes of soaps, it was impossible to trace the image ratings back to the sensory inputs.

In the domain of fine personal fragrances, few studies have focused on the specific effects of specific odorants on social interactions. However, studies have focused on specific effects of fragrances on mood, arousal, relaxation, or self-confidence. Steiner (1986), for example, explored a number of evaluative and behavioral measures on 76 volunteers. Results showed that in the presence of a specific fragrance "A", subjects recorded their mood as significantly higher in "high spirits", "extroverted feelings" and "arousal" and lower in "despondency" and "introverted feelings" than in the control condition. The subjects who were exposed to fragrance "B" while rating their mood, showed a significant increase in "arousal", "despondency", "introversion", "lethargy",

and “dreaminess” and a significant decrease in “high spirits” and “self-confidence” i.e., they rated positively on arousal but not on mood effects. Additionally, respondents’ recall was not significantly improved under the B condition. Since both fragrances A and B did not differ in acceptability, one might conclude from this experiment that, instead of the hedonic value of the odor, the intrinsic nature of odorants would be responsible for the effect that fragrances can have on mood, arousal and memory. Similar results were found while comparing heliotropin and wintergreen oil (Redd and Manne, 1995). Heliotropin reduced stress and anxiety whereas wintergreen did not, although respondents liked the two odors similarly. Similarly, Warren and Warrenburg (1993) measured the mood changes induced by overt presentation of five pleasant “living flower” fragrances to 35-50-year-old women and found that the fragrances elicited, to varying degrees, increases in happiness, sensuality, relaxation, and stimulation and decreases in feelings of irritation, depression, stress, and apathy. Specific fragrances thus seemed to have an impact on specific moods, but also on self-confidence, and self-image as shown by a study conducted by Kirk-Smith and Booth (1992). Additionally, research by Wrzesniewski *et al.* (1999) showed that odors and individual differences strongly influence liking for places, things and people.

Based on these studies, it seems reasonable to assume that specific sensory characteristics of fragrances could have associations with specific personalities and images that could be revealed in a well-planned scientific study.

The present project investigated how individual differences such as age, gender, training for fragrance descriptive evaluation, and personality influenced the perception and acceptance of olfactory accords and fine fragrances. It also assessed how sensory characteristics and hedonic value of a scent might be used to predict associations of this fragrance with a specific image, mood and personality, and, thus lead to inferences about the underlying personality and the current mood state of the person wearing that fragranced product. More specifically, the research assessed the fragrance qualities, situational fit, personality traits and mood states associated with specific sensory characteristics of fragrances (e.g., fruity, floral, citrus, spicy…).

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PART II.

DETAILED MATERIALS AND METHODS

Three independent panels, differing in the number of evaluators and the degree of training/experience in fragrance descriptive analysis, evaluated a total of 22 scents. Each test was conducted independently, using the same samples. Additionally, the three panels differed in the process of lexicon/ballot development: during the study, the ballot was entirely developed by the panel, partly developed by the panelists or determined based on a literature search and preliminary focus groups and provided without discussion to the panelists. Two of the panels were highly trained in sensory analysis techniques and used reference standards to facilitate descriptive analysis of the fragrances. Different individuals used different training systems to train the panels, thereby ensuring the independence of the two panels. The third panel consisted of untrained respondents who were not provided with any references to describe the fragrances. Respondents in this panel were asked to answer predetermined questions on specific sensory properties of the fragrances. These respondents also were asked about their subjective perceptions of the fragrances in terms of hedonic reaction, image and personality associations, and situational fit of the fragrances. A wide range of univariate and multivariate statistical techniques were used to analyze the data, so that each research question would be answered as objectively as possible.

1. Odorants selection

a) Selection process

Odorants were chosen to represent a large spectrum of fine personal fragrances currently on the market. The selection of fragrances was based on the categories of fine masculine and feminine commercial fragrances as presented in different classifications of perfumes: The Haarmann and Reimer genealogy of perfume (Bork et al.,1991) and the classification of the Comité Français du Parfum (CFP, 1998), as well as Edwards' classification (2004). All classifications have been developed by perfumers and perfume professionals to group fragrances into families or classes based on their sensory

characteristics. The classes are then divided into subgroups or subfamilies. For example, the "Floral" family groups the fragrances whose main theme is a single flower such as rose, jasmine, or lily of the valley. The family is then subdivided into subgroups including "Floral green" (a fresh and predominantly green note added to a floral complex to give a sharp freshness) or "Floral fruity" (the floral "body" is still there, but new fruity notes show strongly). Fragrances were chosen to be representative of all families and of the main fragrance subgroups. In addition to the 14 fine personal fragrances, 8 less complex odorants, called olfactory accords, such, as a mostly citrus odorant, a floral mixture, an herbaceous scent, etc., were included in the study.

b) Fragrance set

International Flavors and Fragrances (IFF, New Jersey) provided all fragrances to be used in all tests. The samples studied were 22 scents divided into four categories:

Simple olfactory accords. A set of eight olfactory accords, representative of fragrance categories, were developed at International Flavors and Fragrances (IFF, New Jersey). The set included a citrus accord (219), a musk accord (492), a fruity/sweet accord (621), a oriental wood/spicy accord (412), two floral accords (318 and 196), an ozonic/aldehydic accord (910) and an herbaceous accord (549)

Fine feminine fragrances. A set of six fragrances was selected to represent of a wide variety of fine feminine fragrances

Fine masculine colognes. A set of six colognes was selected to represent a wide variety of fine masculine fragrances.

Shared fragrances. Two additional fine fragrances also were included that were marketed to both males and females.

Table 1 lists all 22 fragrances included in the test, along with the three-digit codes that were used to identify these fragrances throughout the study and a brief description of their sensory properties, as described by IFF for the olfactory accords or provided by a fragrance classification (Edwards, 2004).

TABLE 1.
List of samples included in the study and their descriptions

Olfactory accords			
Code	*Fragrance name and brand*	*Year*	*Description*
219	Citrus Blend (IFF)	N/A	Citrus
492	Musk (IFF)	N/A	Musky
621	Destiny (IFF)	N/A	Fruity sweet
412	Cashmere Sandalwood (IFF)	N/A	Spicy woody (sandalwood)
318	Floral YC (IFF)	N/A	Floral
196	Floral accord (IFF)	N/A	Floral
910	Liquid Air (IFF)	N/A	Ozone aldehyde
549	Herbaceous (IFF)	N/A	Herbaceous
Feminine fragrances			
Code	*Fragrance name and brand*	*Year*	*Description*
359	Coco Mademoiselle (Chanel)	2001	Woody oriental citrus fruity
211	Ralph (Ralph Lauren)	2000	Floral fresh citrus fruity
513	Chance (Chanel)	2003	Woody oriental citrus
715	Gloria (Cacharel)	2002	Oriental classical
316	Vera Wang (Vera Wang)	2002	Soft floral aldehydic
420	Flower by Kenzo (Kenzo)	2000	Floral oriental fresh citrus
Shared fragrances			
Code	*Fragrance name and brand*	*Year*	*Description*
122	Ckone (Calvin Klein)	1994	Citrus fresh
861	Green Tea (Victor)	1996	Citrus fresh
Masculine fragrances			
Code	*Fragrance name and brand*	*Year*	*Description*
237	Romance Men (Ralph Lauren)	1999	Fougère fruity fresh
638	Cool Water (Davidoff)	1984	Fougère citrus fresh
947	Higher (Dior)	2001	Fougère ozone crisp
517	Polo Blue (Ralph Lauren)	2002	Water marine crisp
814	Zanzibar (Van Cleef & Arpels)	2001	Mossy woods classical
759	Le Mâle (JP Gaultier)	1995	Woody oriental crisp

(Source for the fine fragrance descriptions: Edwards, 2004)

2. Descriptive evaluation of fragrances by a highly trained panel with prior experience in the product category (Sensory Spectrum descriptive panel)

A highly trained descriptive panel evaluated a total of 22 scents using two preparation techniques: in the first technique the samples were allowed to air-dry for 15 minutes before being put into closed containers; in the second technique, air-drying lasted only 1 minute. Each fragrance was evaluated twice under each preparation condition. Profiles obtained using the two techniques were generated and compared to evaluate the effect of the dry-down time on fragrance sensory properties.

a) Panelists

The panel consisted of 7 panelists from Sensory Spectrum, Inc. (New Jersey). All panelists were highly trained for the Spectrum method, and had extensive experience in descriptive sensory evaluation of multiple consumer products, including odor evaluation of fine fragrances as well as personal care products.

b) Odorants preparation

Fragrance bottles were stored at room temperature throughout the course of the study. Odorant preparation was performed using the exact same procedure with the exception of the dry-down time: a perfumer's strip was dipped into the fragrance bottle, then the blotter was air-dried for 15 minutes (method 1) or 1 minute (method 2), folded and introduced into the evaluation container. Careful handling of the fragrance bottles ensured that no cross-contamination of samples could occur. Each container was immediately tightly closed in a 4-oz screw-top glass jar. All containers had no identifying features other than the 3-digit codes used to identify samples. The samples were then held at room temperature for exactly 20 hours prior to evaluation to allow for the fragrance to reach equilibrium.

c) Orientation and lexicon development

Orientation and ballot development and refinement occurred over the course of three 2 ½ hr sessions. Each orientation session lasted 1 hr. Each panelist received a packet of information, in which several odor classes were defined. The odor categories included citrus, fruity, aldehydic, ozonic/marine, sweet, spice, floral, green, wood, resin, pine, camphoraceous, mint, herbaceous, moss/chypre, leather/animal, musk, and other. This initial fragrance lexicon had been established during previous studies and was refined during orientation and throughout the evaluation: an odor organization chart was reviewed, discussed and modified by the panel. Issues relating to relationships between classes and potential overlapping of odor categories also were discussed. Additionally, references representative of each odor class were evaluated: panelists described the scents and discussed their impressions, generating further vocabulary terms. Perceptual and categorization differences were discussed and explained, and, when necessary, additional references were employed. The final lexicon and a list of references used by this panel are presented in Appendix 1A.

d) Test design and sample evaluation

Twenty-two 45-min sessions were conducted and a total of four samples were evaluated per session. During the first 11 sessions, two replications were conducted following randomized complete block design (RCB) using the first preparation method, i.e. with 15-minute dry-down. During the last 11 sessions, a similar test design was followed using the second preparation method, i.e., with 1-minute dry-down. The panel used the Spectrum™ descriptive analysis method (Meilgaard et al., 1999). Intensity scores for each attribute were rated on the Spectrum™ universal 15-point numerical scale (from 0 = none to 15 = extremely strong, with 0.1-point increments), using consensus balloting.

e) Initial statistical analysis

In a first step, an analysis by preparation method was conducted on the data to compare the sensory profiles generated by the highly trained panel when fragrances were prepared with two preparation methods differing only in dry-down time. Both univariate and multivariate techniques were used.

Means were computed by sample and method for each descriptive term. A univariate analysis of variance was conducted on data generated by the panel. Data were analyzed using a randomized complete block design, with method and fragrance as the main effect and replication as the blocking factor (SAS®, 1998). Two-way interactions also were assessed (Appendix 1B).

Two Cluster Analyses (CA) were run using data obtained with the two dry-down procedures to determine groups of products that were perceived as most similar to each other. Ward's method was used with Euclidean distances (SYSTAT, 2002). The first CA was performed on the original data, including intensity ratings and main fragrance category scores (i.e., fruity, floral, citrus, animal…) only, for all replications and for all fragrances. The second CA was performed on the mean values segregated by dry-out method (2 replications per method) and included all attributes (fragrance main categories and subcategories) for all fragrances. Additionally, a Principal Component Analysis (PCA), in which only intensity ratings and main fragrance category scores were included, was performed on the correlation matrix of the sample means segregated by dry-down method.

Differences between the two dry-down methods were demonstrated in this study. In a second step, data obtained only with the 1-minute dry-down was used to assess data relationships between the data set obtained by the Sensory Spectrum panel, the Sensory Analysis Center panel, and the untrained consumer panel. A detailed explanation of the statistical procedures involved in the assessment of these data relationships are provided in section 5.

3. **Descriptive evaluation of fragrances by a highly trained panel with limited experience in the product category (Sensory Analysis Center, Kansas State University, descriptive panel)**

a) Panelists

The Kansas State University panel consisted of 7 highly trained panelists from the Sensory Analysis Center at Kansas State University. These panelists had completed 120 hrs of training in all aspects of sensory techniques, and also had completed a minimum of 1000 hrs of general sensory testing on a wide variety of consumer products. However, the panelists had very limited experience in profiling fine personal fragrances and complex odorants.

b) Odorants preparation

The products studied were similar to the ones evaluated by the Sensory Spectrum panel. Odorant preparation was performed using the previously described procedure: a perfumer strip was dipped into the fragrance bottle, then the blotter was air-dried for 1 minute only, folded and introduced in a 4-oz screw-top glass jar, which was tightly closed immediately. All containers had no identifying feature other than the 3-digit codes used to identify samples. The samples were then held for 16 to 24 hrs prior to sample evaluation, to allow equilibrium to be reached within the container.

c) Orientation and lexicon development

A lexicon was developed based on a search of the literature (Müller, 1992, Bork et al, 1991, CFP, 1998; Jellinek, 1997) and references for each fragrance category were identified prior to the study. Each panelist received a packet of information containing descriptions of the fragrance classes and reference identification. In addition, 4 reference kits were shared among panelists. The panel went through six 1½ hr orientation sessions during which all fragrance categories (citrus; fruity, non citrus; sweet; spicy; floral; aldehydic; ozone/marine; green; woody; resinous/piney; camphoraceous/minty;

herbaceous; moss/Chypre; and leather/musk) were discussed. Definitions, experiences and references were discussed and refined. The final lexicon, with definitions and references is presented in Appendix 2A. During the six sessions, the panelists also were familiarized with the fragrances in the test, and, at the end of orientation, all fragrances included in the test had been seen at least once. At the end of the last orientation session, a ballot (Appendix 2B) was approved and would be used for the rest of the study.

d) Test design and sample evaluation

A total of 15 sessions lasting 1½ hr each were scheduled. The panel used a modified Flavor Profile Method (Caul, 1957) adapted to odors only to evaluate the 22 fragrances. Three replications were conducted, following a RCB design, with replication as the blocking structure. Individual ratings were obtained: an intensity score was given to each fragrance category (citrus, floral, herbaceous, etc.) using a 15-point numerical scale (from 0 = none to 15 = extremely strong, with 0.5-point increments). Within one category, each subcategory was rated using a 3-point categorical scale (0 = not present, 1 = present in small quantity, and 2 = mostly present). Panelists were allowed to discuss overall fragrance intensity and identification of general categories, but no further discussion of the results was allowed.

e) Initial statistical analysis

Means were computed by sample for each main fragrance category and frequency tables were computed for each of the subcategories with level 1 and 2 collapsed into a category entitled ‘presence of the characteristics’. A univariate analysis of variance was conducted on the main fragrance category data generated by the panel. Data were analyzed using a split-plot design. Fragrance and replication constituted the whole plot (fragrance by replication was the whole plot error), and panelist was the subplot. The SAS code is presented in Appendix 2C).

4. Fragrance evaluation by an untrained consumer panel

a) Subjects

A total of 318 subjects completed the study. A larger number of respondents were initially screened; respondents who reported fragrance discomfort, anosmia, or any other condition that might have affected their sense of smell were excused. Half of the subjects were from the Manhattan, KS area, the other half was from New Jersey (Union Beach area). Subjects were selected based on their demographic information and approximately equally divided into 6 categories according to gender and age (18-25; 26-40; 41-55 year old). In this age range (18 to 55 yrs), respondents are likely to have stable personality traits (Soldz and Vaillant, 1999), show a relative stability in the order of preference for odors (Vroon, 1997) and demonstrate good performance in odor identification (Doty *et al.*, 1984; Wysocki *et al.*, 1991). Respondents older than 18 yrs are assumed to have a fully developed sense of smell. An upper limit of 55 years was chosen to reduce the likelihood of olfactory impairment. Each of the six groups (age category by gender) contained 47 to 64 respondents. Such a sample size compares well to sample sizes used in similar experiments on the perception of everyday odors. Distel *et al.* (1999) and Lawless (1989) evaluated perceptual differences in odor recognition in subgroups of 39 to 59 individuals and found significant differences. This number also compares with the 42 evaluations per soap necessary to find a clear relation between sensory characteristics, liking and image attributes (Moskowitz, 1998).

b) Odorants preparation

As with the two descriptive panels, the untrained consumer panel evaluated the 22 pre-selected odorants. Samples were prepared using a protocol similar to the one used for descriptive panels: a perfumer's strip was dipped into the fragrance bottle, then the blotter was air-dried for 1 minute, folded, and introduced into the evaluation container. All containers had no identifying features other than the 3-digit code used to identify each sample. Samples were then held for 16 to 24 hours prior to evaluation to allow the fragrance to reach equilibrium.

The type of container used in the consumer evaluation part of the study slightly differed from the glass jars used in the descriptive analysis portion of the study. Whereas the two trained panels evaluated fragrances prepared in a 4-oz screw-top glass jars, 4-oz white squeezable plastic bottles with flip-caps were used with the consumer panel, because of the cost, extensive preparation, and clean-up that using glass containers for the untrained panel would have entailed. Squeezable plastic bottles are extensively used in the fragrance industry for consumer testing. Prior testing had shown that the fragrance notes had stabilized by 8 to 24 hrs after preparation. Additionally, a descriptive panel had determined that no plastic note contaminated the fragrances when testing occurred within 24 hrs of sample preparation (S. Warrenburg, personal communication, 2003).

c) Evaluation material

All written consumer evaluation materials are presented in Appendix 3.

Measurement of individual differences (Appendix 3A)

Respondents were asked to complete a questionnaire requesting demographic information – age, gender, frequency of fragrance usage – and soliciting psychographic data – Saucier's Mini-Markers (Saucier, 1994) and Snyder's self-monitoring scale (Snyder and Gangestad, 1988).

The Mini-markers corresponded to a self-administered personality test and consisted of a list of 40 adjectives that evaluated the five dimensions of personality, as defined by the Five Factor Model (Goldberg, 1990). Each adjective was scored on a 9-point scale. Scores for extraversion-introversion, agreeableness, intellect, neuroticism and conscientiousness were then calculated.

The self-monitoring scale was a list of 18 true-false questions that assessed differences in the extent to which respondents could and did observe and control their expressive behavior and self-presentation. Self-monitoring has been found to be reliable (Snyder, 1974) and has been extensively used in such domains as the study of friendship, interpersonal behavior, romantic relationship (Snyder and Smith, 1986; Snyder and

Simpsons, 1984) or of the psychology of advertising (Snyder and DeBono, 1985; Snyder, 1990; Snyder and Attridge, 1995).

Survey on motivations, attitudes, and behaviors toward fragrance and survey on criteria for fragrance selection (Appendix 3B)

A survey on motivations, attitudes, beliefs toward fragrances, and about the importance of diverse criteria for fragrance selection was developed and revised prior to the study. Comments from a focus group were used to refine some of the original statements, and results from a pilot study allowed for reduction of the original survey to a set of 48 statements.

The first set of statements concerned respondents' beliefs and attitudes towards fragrance/cologne. Respondents were asked to indicate on a 5-point Likert scale (1 = disagree strongly to 5 = agree strongly) how much they agreed or disagreed with each of 34 statements such as 'I like to wear different fragrances when I am at home, at work or during an evening out'; 'The fragrance I wear makes me feel good about myself'; 'I wear fragrances because it reflects social status'…The second set of statements dealt with the importance of 14 criteria for fragrance selection. Respondents were asked to indicate, on a 4-point scale (1 = not important at all to 4 = very important), how important were the name of the fragrance, their liking of the fragrance, the price, the fact that other people like the fragrance, etc.

Fragrance evaluation (Appendix 3C)

Each fragrance was evaluated with regard to:

- Hedonics and overall intensity. Respondents were asked to rate how much they liked or disliked each scent on a 7-point scale. Additionally, using a Just-About-Right scale, they indicated their perception of the fragrance intensity.
- Sensory characteristics/descriptive properties. An adjective checklist consisting of nine sensory attributes adapted from studies on fragrance classification and

description (Jeltema and Southwick, 1986; Jellinek, 1990; Lawless, 1999) was used as evaluation material. Respondents had to indicate how much of a specific characteristic the scent had using a numerical scale from 0 = not at all to 5 = extremely. Descriptive attributes included citrusy, cool/minty, floral, fruity, green, herbal, spicy, sweet and woody. Prior to the study, these attributes were discussed in a focus group and were determined to be sufficient to accurately describe the fragrances and to differentiate among fragrances based on their sensory properties.

- Image associated with the fragrance. Fragrance descriptors such as feminine, fashionable, romantic, sensual, warm, energizing, relaxing, etc. also were rated by the respondents. A scale, similar to that used for measuring sensory attributes of the scents was used.

- Situational fit. Respondents were asked to rate the appropriateness of wearing the fragrance in different situations (every day at work, on a quiet weekend at home, in the evening at home or for an exciting evening out) or seasons.

- Personality associated with the fragrance. Respondents were asked to rate to what extent they agreed or disagreed with statements such as: "The person who would wear this fragrance would be anxious, tense" or "shy, withdrawn, reserved." Lists of adjectives qualifying the five factors of personality were derived from adjectivesd in the Big Five questionnaire (Saucier, 1994). The decision to use lists of adjectives instead of individual personality attributes was based on the results of a preliminary study, in which two questionnaires were compared:

  In the first version of the questionnaire, a list of adjectives was used for evaluation of the five dimensions of personality. Adjectives were chosen from 100 adjectives listed on the Big Five questionnaire (Goldberg, 1992; Saucier, 1994). For example, in order to evaluate conscientiousness, respondents had to give ratings for the two lists "conscientious, organized, practical" vs. "disorganized, sloppy, careless". Additionally, dimensions that were beyond the big five and supposed to be significant for this particular study, such as femininity-masculinity, sensuality and self-confidence also were assessed (Saucier and Goldberg, 1998; Paunonen and Jackson, 2000). A total of 20 adjective lists was used.

The second version of the questionnaire included the 40 adjectives from the Mini-Markers and accounted only for five personality factors. In that questionnaire, respondents had to rate eight individual attributes – organized, efficient, systematic, practical, disorganized, inefficient, sloppy and careless – to evaluate conscientiousness.

The two questionnaires led to similar conclusions concerning how different fragrances were associated with personality traits measured by the Five Factor Model. The first version of the questionnaire also provided relevant information about additional dimensions of personality (femininity and sensuality), while decreasing the load of the questionnaire for the respondents (according to respondents' evaluations of the sessions). It was thus decided to keep the first version of the questionnaire for later experiments.

d) Study design and procedure

Each respondent committed to come to three 1-hour sessions, scheduled one week apart. Prior to the test, respondents received a reminder letter, an informed consent statement approved by the Institutional Committee on Human Subjects at Kansas State University, a demographic questionnaire, and a survey on attitudes towards fragrances to complete at home and bring to the test session.

Each respondent evaluated seven to eight fragrances in a well-ventilated area on each day of the study. By the end of three sessions, each respondent had evaluated all 22 scents in the test. It was determined during a preliminary study – both by examining data consistency and by asking participants – that seven to eight evaluations per session constituted an adequate number and did not lead to fatigue and decreased concentration.

The order of fragrance presentation was randomized for each respondent following 22*22 Latin square designs (over the three test periods) therefore accounting for first-order effects and position (Appendix 3D). Throughout the test session, the respondents were reminded when they should start evaluating the next sample and were encouraged to wait at least one minute between sample evaluations to minimize the risk

of lingering fragrance influencing subsequent assessments and increased fatigue due to sniffing behavior.

e) Data processing and analysis

Analysis of respondent's personality variables

A score was calculated for each of the personality constructs evaluated. For the Mini-Markers, scores were then compared to normative values (Saucier, personal communication, 2004). Mean scores for each factor fell into the interval for the normative mean (± 2 standard deviation). For each construct, respondents data were then divided into three categories: high, medium and low based on the distribution of the scores (SAS code is presented in Appendix 3E).

Analysis of the survey variables

Initially, attitudes and beliefs statements and fragrance selection questions were analyzed separately using Factor Analysis with varimax rotation (SYSTAT 10.2, 2002). Factor scores were computed for each respondent. Additionally, frequency tables were generated for the total respondent base for all individual variables in the survey. Subsequently, in order to assess individual differences in attitudes and behaviors toward fragrance use and criteria for fragrance selection, two approaches were undertaken.

For the first approach, a traditional view was followed, assessing the influence of demographic variables and personality traits on each of the factors generated by the survey. An analysis of variance was performed on each factor score to test for the main effects of demographic characteristics (age and gender), fragrance usage, and personality traits (extraversion, agreeableness, conscientiousness, emotional stability, openness to experience, and self-monitoring).

In the second approach, clusters of respondents were first defined based on the similar responses to survey questions. Then, the demographic and psychological makeup of each of the generated clusters was evaluated and clusters were compared with each other. A cluster analysis based on the survey responses (excluding the statements 'Wearing a fragrance makes me feel more feminine', and 'Wearing a fragrance makes me

feel more masculine') using SAS Fastclus procedure (SAS, 1998; Johnson, 1998) allowed segregation of the sample population into five groups. A discriminant analysis (proc Discrim) in SAS was used in an attempt to classify respondents into the newly generated attitude clusters using their demographic and personality information. Additionally, frequency tables for age, gender, and fragrance usage by cluster were generated and a chi-square test allowed assessment of statistically significant differences among clusters for these factors. Lastly, data were analyzed by analysis of variance using the General Linear Model procedure (proc GLM) in SAS (1998). This procedure allowed assessment of significant differences in individual personality variables among clusters. The same procedure was performed on data on the attitude and motivational factors generated by the analysis of the survey variables. The SAS code for this analysis can be found in Appendix 3E.

Analysis of the fragrance variables

Individual variables for the total respondent base were analyzed using a Mixed model (SAS, 1998) in which fragrance and order of presentation were used as fixed effects. The fragrance by order of presentation interaction was also assessed. "Respondent" was included in the model as a random effect (see SAS code in Appendix 3F). Multivariate statistical techniques also were used to further analyze the data. These techniques were essentially used for data relationships and are presented in the next section.

5. Further data processing and analysis – evaluation of data relationships

a) Objective 1: Comparing results from panels differing in size and assessor's level of training for the description of complex odor stimuli

Data sets used:
* Descriptive data obtained from Panel 1 (trained, experienced) with the 1-min dry-down preparation method
* Descriptive data obtained from Panel 2 (trained, inexperienced)
* Descriptive data (sensory variables only) obtained from Panel 3 (untrained, inexperienced)

Descriptive data obtained from each of the three panels were analyzed separately. For each panel, a principal component analysis (PCA) using data averaged across replications for main fragrance categories for Panel 1 (highly trained panel with prior experience in the product category), panelists and replications for main fragrance categories for Panel 2 (highly trained panel with limited prior experience in the product category), and panelists only for Panel 3 (untrained naïve consumer panel) were obtained using the Unscrambler statistical software (Camo, 2004). Additionally, in order to compare results (obtained with panels similar in size) between the two descriptive panels and the consumer panel, the consumer panel was first divided into two panels, based on gender, and two subsets of 10 respondents each were randomly selected from all the men, and all the women in the study. A PCA was performed on these two data sets.

Additionally, two partial least squares regression analyses (PLSR) were performed using the Unscrambler (Camo, 2004). The first analysis attempted to relate data from Panel 1 (trained and experienced) to data from Panel 2 (trained and inexperienced). The second analysis related data from Panel 3 (untrained and inexperienced) to data from Panel 2 (trained and experienced). All variables were first normalized to eliminate differences associated with scaling.

b) Objective 2: Determining hedonic and sensory drivers of image and personality associations for fine fragrances

Data sets used:
* Descriptive data obtained from Panel 1 (trained, experienced) with the 1-min dry-down preparation method
* All data obtained from Panel 3 (untrained, inexperienced)

Individual variables from Panel 3 data were analyzed using a Mixed model (SAS, 1998) in which fragrance and order of presentation were treated as fixed effects. Sample by order of presentation was also included in the model. Respondent was included in the model as a random effect. Additionally, a Partial Least Square Regression (PLSR) method (Martens and Martens, 1986) was performed on both Panel 1 and Panel 3 data using the Unscrambler (Camo, 2003). Sensory dimensions defined by the trained panel (Panel 1) were used as predictors of liking obtained by respondents in Panel 3. A second PLSR method (Martens and Martens, 1986) also was performed on the data using the Unscrambler (Camo, 2003). This time, sensory dimensions defined by the trained panel (Panel 1) and hedonic ratings (obtained with Panel 3) were used as predictors of image and personality associations (rated by Panel 3). All variables included in this PLSR were first standardized to eliminate differences in scale types.

c) Objective 3: Assessing the effects of individual differences in liking for fragrances on inferences about the images and personality traits associated with specific fragrances

Data sets used:
* Descriptive data obtained from Panel 1 (trained, experienced) with the 1-min dry-down preparation method
* All data obtained from Panel 3 (untrained, inexperienced).

Respondents in Panel 3 were grouped into clusters based on their liking scores for the different fragrances included in the test, using cluster analysis (hierarchical clustering, Wards method with Euclidean distances). For each cluster, mean scores were computed for liking of the different fragrances included in the test. Liking data were analyzed using a Mixed model (SAS, 1998) in which fragrance, cluster, and order of presentation were main effects and treated as fixed effects. Cluster by fragrance and order by fragrance interactions also were treated as fixed effects. Respondent within a cluster was treated as a random effect. Because the fragrance by cluster interaction was statistically significant (alpha < 0.05), statistical differences in liking for different fragrances within each cluster were then reported. Details of the analysis by liking cluster can be found in Appendix 3F. Additionally, a PLSR analysis was performed on these data; the analysis attempted to predict cluster liking (obtained from Panel 3) for the fragrances included in the test using the fragrances' sensory characteristics as described by a highly trained panel (Panel 1).

Frequency tables were generated by cluster for the nominal variables related to individual differences (gender, age, and usage). A chi-square test was performed on data for each variable to assess whether clusters differed in their demographic make-up. Respondents' personality variables were analyzed using a General Linear Model (SAS, 1998), in which cluster was treated as a main effect. Duncan's means comparison test was performed to assess statistically significant differences in the psychological makeup of the clusters. Results from the survey on attitudes and behavior toward fragrances were analyzed using the same procedure.

For each cluster, mean scores for sensory variables were computed by fragrance, and so were mean scores for image variables, situational fit, and personality variables. Each variable was analyzed using a Mixed model (SAS, 1998) in which fragrance, liking cluster, and order of presentation were considered as main effects and treated as fixed effects. The cluster by fragrance and order by fragrance interactions also were treated as fixed effects. Respondent within a cluster was treated as a random effect. A Principal Component Analysis (PCA) was performed by cluster of respondents on the means for the various sensory variables to assess differences in fragrance perception among clusters. Additionally, PCA was performed by cluster of respondents on the means for all sensory, association, image and situation variables. Scores for liking and 'My type of fragrance' were not included in the PCA. All means were normalized to a 5-point scale prior to the PCA. The PCA was then run on the covariance matrix of the means.

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PART III.

SOME METHODOLOGICAL ISSUES DISCUSSED

CHAPTER I.

CHANGES IN SENSORY PROFILES OF FRAGRANCES AS A FUNCTION OF DRY-DOWN TIME DURING SAMPLE PREPARATION

ABSTRACT

Numerous sensory analysis procedures have been developed to generate precise and detailed descriptions of the sensory characteristics of many consumer goods. Initially developed for the food industry, descriptive techniques have been adapted recently to the evaluation of fine fragrances and have led to standardization of the descriptive evaluation of fragrances. However, little attention has been paid to the need for standard practices in the preparation of fragrance samples for evaluation. In the present study, 22 fragrances were profiled, using two preparation procedures. The procedures involved dipping a blotter in the fragrance, letting it air-dry for either 1 minute or 15 minutes and introducing it into a tightly closed container 20 hrs prior to evaluations. The profiles generated for the same fragrance under the two methods differed slightly. This may be related to evaporation rate of the fragrance components: for example, the longer the dry-down time during sample preparation the lower the overall intensity and powdery and green notes and the higher the spicy and musky characters. A 1-minute dry-down, which leads to higher yet not overwhelming fragrance intensities and reduced preparation load, could be preferred over a 15-minute dry-down, which results in more faint scents and is more labor intensive. Primarily, one needs to keep in mind that there is a need for using a consistent method of preparation between studies, especially when one intends to look at data relationships between independent data sets.

INTRODUCTION

The sensory analysis toolbox comprises numerous techniques, methods, and procedures that have been developed and refined over the years to help obtain precise and detailed descriptions of the aroma/odor, flavor, and texture of many consumer goods, including foods and beverages, personal care products, cosmetics, and fine fragrances. For a long time, the evaluation of fine fragrances has been conducted with consumers to assess hedonics, image associated with fragrances, effect of fragrances on mood and behavior (Jellinek, 1995; Baron, 1997; Schiffman and Sattely-Miller, 1995). In some cases, consumers have given sensory descriptions using consumer-friendly vocabulary, such as fresh, warm, light, or heavy and leading to consumer-oriented classifications of fragrances (Jellinek, 1990; Jellinek, 1992). This consumer oriented terminology is, however, highly subjective and often depends upon personal preferences and cultural differences. Müller (1992) states, for example, that the attribute 'fresh' is associated with lemon, lavender and green notes as well as light floral components in European regions, whereas in North America, sweet and powdery perfumes are considered as fresh.

Descriptions of the sensory properties of fragrances have traditionally been based most often on the evaluation of a few expert perfumers or "noses", often using highly technical vocabulary and chemical terminology to describe the scents. However, recent developments in the fragrance industry and in descriptive analysis techniques have increased the use of trained descriptive panels to accurately describe scents, whether fine fragrances, scented personal care products, or laundry detergent. The adaptation of already-existing descriptive techniques, such as the Spectrum Descriptive Method or the development of other procedures (Odor Profiling, Dravnieks ASTM 1982) has led to some standardization of the descriptive evaluation of fragrances.

However, little attention has been paid to the need for standardized practices in the preparation of fragrance samples. The literature on that matter is sparse and often lacks details. Samples might be delivered to descriptive panelists or naïve subjects through various systems. Plastic sniffer bottles (Livermore, 1995), fragrance inhalers (Satoh and Sugawara, 2003), perfumer's blotters on which the fragrance has been

previously sprayed (Jellinek, 1992), and scented necklaces (Graham et al., 1995) constitute only a few of the delivery methods that have been used so far in the study of scents and olfaction. In some instances, a dilution of the odorants in an unscented carrier, such as dipropylene glycol or diethyl phthalate, is delivered in an amber, wide mouth bottle with a screw cap (Jeltema and Southwick, 1986, Higuchi et al., 2004). In other instances, stimuli without prior dilution are presented on a perfumer's blotter wetted to 1 cm, then placed in a capped amber glass jar (Lawless, 1989). This last procedure appears to reduce sample preparation time, amount of fragrance needed per sample, risk of experimental error due to dilution, and potential modification of the fragrance character after dilution and, thus, seems appropriate for the descriptive evaluation of fine fragrances. This procedure often is used in industrial settings.

However, as stated by Müller (1992), "every perfume has its own rate of evaporation and develops its true character only after a certain period of time. A perfume is a complex mixture of substances with different degrees of volatility." This suggests that small differences or inconsistencies in fragrance profiles might occur if a strict sample preparation procedure is not followed. Changes in sensory quality are expected during the process of fragrance evaporation, i.e., in between the moment where the blotter is dipped into the fragrance and the moment when the volatile odorants are captured in the headspace of the closed container. The time elapsed between wetting the blotter and closing the container might affect the sensory properties of the fragrance during evaluation, and careful monitoring of this time interval is necessary to accurately measure the sensory properties of fragrances. The present study was conducted to compare the profiles of 22 fragrances obtained when the fragrances were prepared with two procedures differing in air-dry condition: the previously dipped blotter was allowed to air-dry for either 1 minute or 15 minutes before being put into a tightly closed container.

MATERIALS AND METHODS

A highly trained descriptive panel evaluated a total of 22 scents using two preparation techniques: in the first technique, the samples were allowed to air-dry for 15 minutes before being put into tightly closed containers, in the second technique, the air-dry condition lasted only 1 minute. Each fragrance was evaluated twice under each preparation condition. Sensory profiles obtained under the two techniques were generated and compared to evaluate the effect of the dry-down time on fragrance sensory properties.

Panelists

The panel consisted of seven panelists from Sensory Spectrum, Inc. All panelists were highly trained in the Spectrum™ method (Meilgard et al., 1999), and had extensive experience with descriptive sensory experience in evaluation of multiple consumer products, including odor evaluation of fine fragrances as well as personal care products.

Odorants

The samples studied were 22 scents divided into four categories, as shown in Table 1. A set of eight olfactory accords, representative of fragrance categories, were developed at International Flavors and Fragrances (Union Beach, New Jersey). Additionally, a set of six fine feminine fragrances was selected to be representative of a wide variety of fine feminine fragrances. Among the 22 samples in the study, two were shared fragrances marketed towards both men and women were selected and included in the study. Last, a set of six colognes was selected to be representative of a wide variety of fine masculine fragrances.

TABLE 1.

List of samples included in the study and their descriptions

Olfactory accords			
Code	*Description*	*Code*	*Description*
219	Citrus	318	Floral
492	Musky	196	Floral
621	Fruity sweet	910	Ozone aldehyde
412	Spicy woody (sandalwood)	549	Herbaceous
Feminine fragrances			
Code	*Description*	*Code*	*Description*
359	Woody oriental citrus fruity	715	Oriental classical
211	Floral fresh citrus fruity	316	Soft floral aldehydic
513	Woody oriental citrus	420	Floral oriental fresh citrus fruity
Shared fragrances			
Code	*Description*	*Code*	*Description*
122	Citrus fresh	861	Citrus fresh
Masculine fragrances			
Code	*Description*	*Code*	*Description*
237	Fougère fruity fresh	947	Fougère ozone crisp
638	Fougère citrus fresh	517	Water marine crisp
759	Woody oriental crisp	814	Mossy woods classical

(Source for the fine fragrance descriptions: Edwards, 2004)

Odorants preparation

Odorant preparation was performed using the exact same procedure for each dry-down interval (1 or 15 min): a perfumer strip was dipped into the fragrance bottle, then the blotter was air-dried for 15 minutes (method 1) or 1 minute (method 2), folded and introduced in the evaluation container. Each container was immediately tightly closed in a 4-oz screw-top glass jar. All containers had no identifying feature other than the 3-digit codes used to identify samples. The samples were then held for exactly 20 hours prior to

evaluation to allow for the fragrance to reach equilibrium. The first preparation method (15 minutes) was more demanding than the second one (1 minute) in the sense that it necessitated more careful monitoring of the time and did not allow the technician in charge of sample preparation to perform any other activity in between dipping the blotter and putting it into the evaluation container. Overall, preparation time was twice as much for method 1 than for method 2.

Orientation and lexicon development

Orientation and ballot development / refinement occurred over the course of three 2½ hr sessions. Each orientation session lasted 1 hr. Each panelist received a packet of information, in which several odor classes were defined. The main odor categories included citrus, fruity, aldehydic, ozonic/marine, sweet, spice, floral, green, wood, resin, pine, camphoraceous, mint, herbaceous, moss/chypre, leather/animal, musk, and other. This initial fragrance lexicon had been established during previous studies and was refined during orientation and throughout the evaluation: an odor organization chart was reviewed, discussed and modified by the panel. Issues relating to relationships between classes and potential overlapping of odor categories also were discussed. Additionally, references representative of each odor class were evaluated: panelists described the scents and discussed their impressions, generating further vocabulary. Perceptual and categorization differences were discussed and explained, and when necessary, additional references were presented.

Test design and sample evaluation

Twenty-two 45-min sessions were conducted and a total of four samples were evaluated per session. During the first 11 sessions, two replications were conducted following a randomized complete block design (RCB) using the first preparation method, i.e., with a 15-minute dry-down. During the last 11 sessions, a similar test design was followed using samples prepared with the second preparation method, i.e., with a 1-minute dry-down. The panel used the Spectrum™ descriptive analysis method

(Meilgaard et al., 1999). Intensity scores for each attribute were rated on the Spectrum™ universal 15-point numerical scale (from 0 = none to 15 = extremely strong, with 0.1-point increments), using consensus balloting.

Data analysis

Univariate techniques. A univariate analysis of variance was conducted on data generated by the panel. Data were analyzed using a randomized complete block design with method and fragrance as the main effect and replication as the blocking factor (SAS, 1998). Two-way interactions also were assessed.

Multivariate techniques. Two Cluster Analyses (CA) were run using data obtained with the two dry-down procedures to determine groups of products that were perceived as most similar to each other. Ward's method was used with Euclidean distances (SYSTAT, 2002). The first CA was performed on the original data, including intensity ratings and main fragrance categories scores (fruity, floral, citrus, animal…) only for all replications for all fragrances. The second CA was run with the mean values by dry-out method (2 replications per method) and included all attribute (fragrance main categories and subcategories) for all fragrances. Additionally, a Principal Component Analysis (PCA), in which only intensity ratings and main fragrance categories scores were included, was performed on the correlation matrix of the sample means by dry-down method.

RESULTS

Overall, results from the cluster analyses – conducted with overall intensity and main fragrance categories on all replications (Appendix 4A) and with all attributes by method (Appendix 4B) – showed that differences between fragrances were considerably more pronounced than differences resulting from the 2 methods of preparation for each fragrance. In most cases, Euclidean distances between replicates for the same fragrance and the same preparation method were smaller than Euclidean distances between observations resulting from the two preparation methods for the same fragrance. Thus, with the exception of a few samples, e.g., numbers 947 and 513, for which one of the

observations was quite different from the three other observations for the same fragrance, the profiles generated were consistent within a method. The two methods resulted in slightly different profiles for the same fragrance, but generally, differences in sensory characteristics observed between the two methods for the same fragrance were smaller than differences between fragrances for the same method.

The PCA results also supported these findings. The first six principal components (PC) accounted for 74.6% of the total variability of the data (24.1%, 14.7%, 12.5%, 8.4%, 7.6% and 7.3%, respectively). The resulting sensory maps are presented below (Figures 1, 2, and 3,). On the sensory maps, although sample profiles obtained with the two methods are found at slightly different locations, the observations for the same fragrance tend to be closely grouped on all six dimensions represented. This shows that the similarity of the profiles is greater between dry-down methods than between fragrance samples. The combination of the results from the cluster analysis (Figure 1) and the PCA (Figures 2, 3, and 4) allowed determination of the presence of nine clusters of fragrances. None of the pairs of profile (obtained for the same fragrance after 1-min or 15-min dry-down) belonged to different clusters, suggesting again the similarity of the profiles obtained with both methods. Table 2 lists the major sensory characteristics of the fragrances associated with the nine clusters. Further information about the relative location of these clusters on the sensory maps and the profiles of the fragrances in these clusters is presented in Figures 1, 2, and 3 and in Appendix 4C.

Direct analysis of the profiles generated with the two methods (Appendix 4C) and results from univariate analysis confirmed that few qualitative differences were found between the profiles obtained with the two preparation methods. For all fragrances, the comparison of the profiles generated with the two methods revealed that, for most attributes, no difference in character was found. When a sensory characteristic was found with an intensity of at least 1.0 with one method, it also was generally noticed with the other method. A few exceptions were observed, however: e.g., sample #359 was perceived as floral with 1-min dry-down (3.3 on a 15-point scale) but not with 15-min dry down (0.0). However, this difference was not strongly reflected on the six sensory dimensions, and resulted only in slight changes in the location of that sample on the sensory maps.

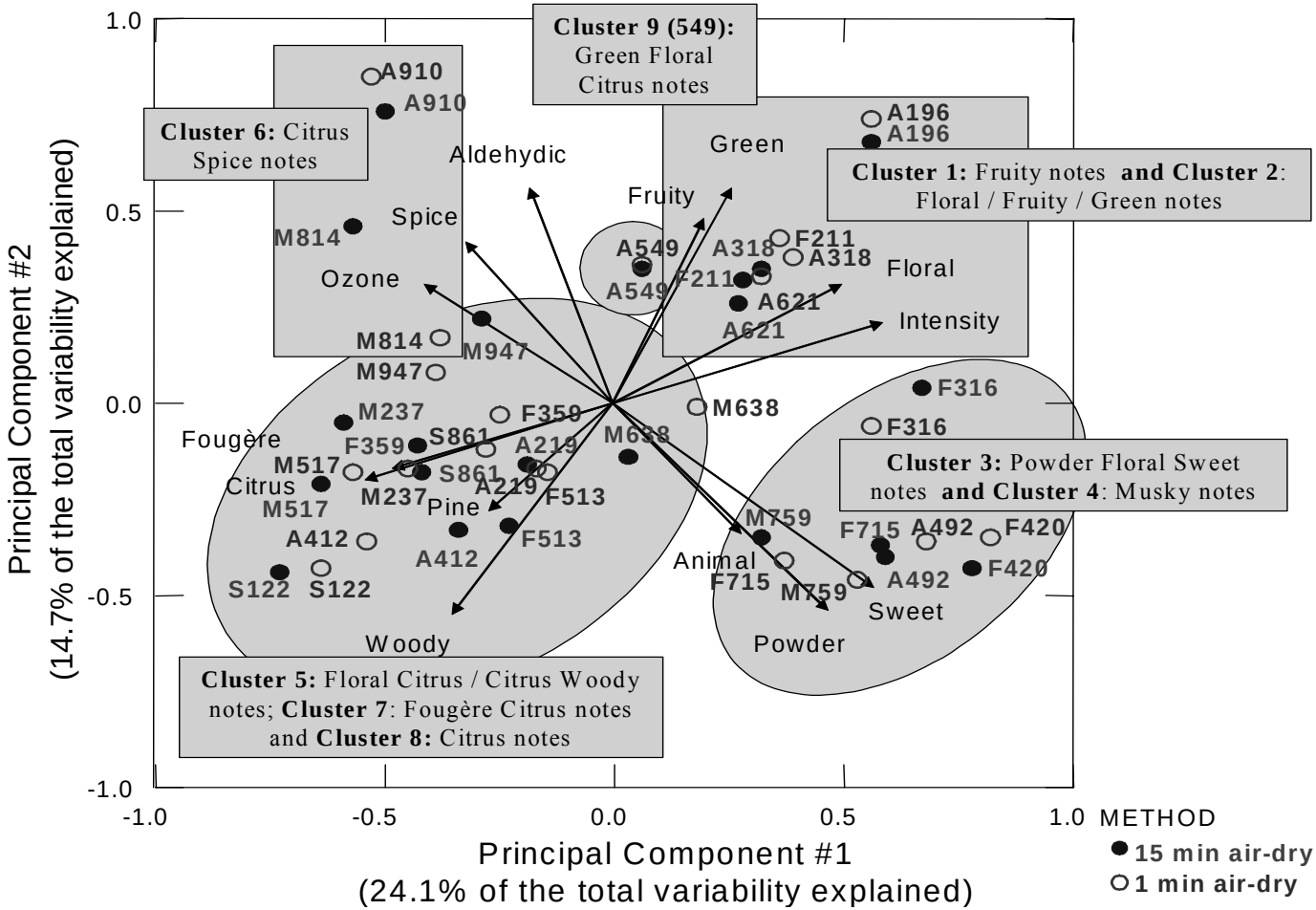

FIGURE 1. Map of the two first principal components including all main fragrance categories and overall intensity scores. The 3-digit codes represent the 22 fragrances. A, M, F and S stand for Accord, Masculine, Feminine, and Shared fragrances respectively. Fragrances are grouped based on cluster analysis results.

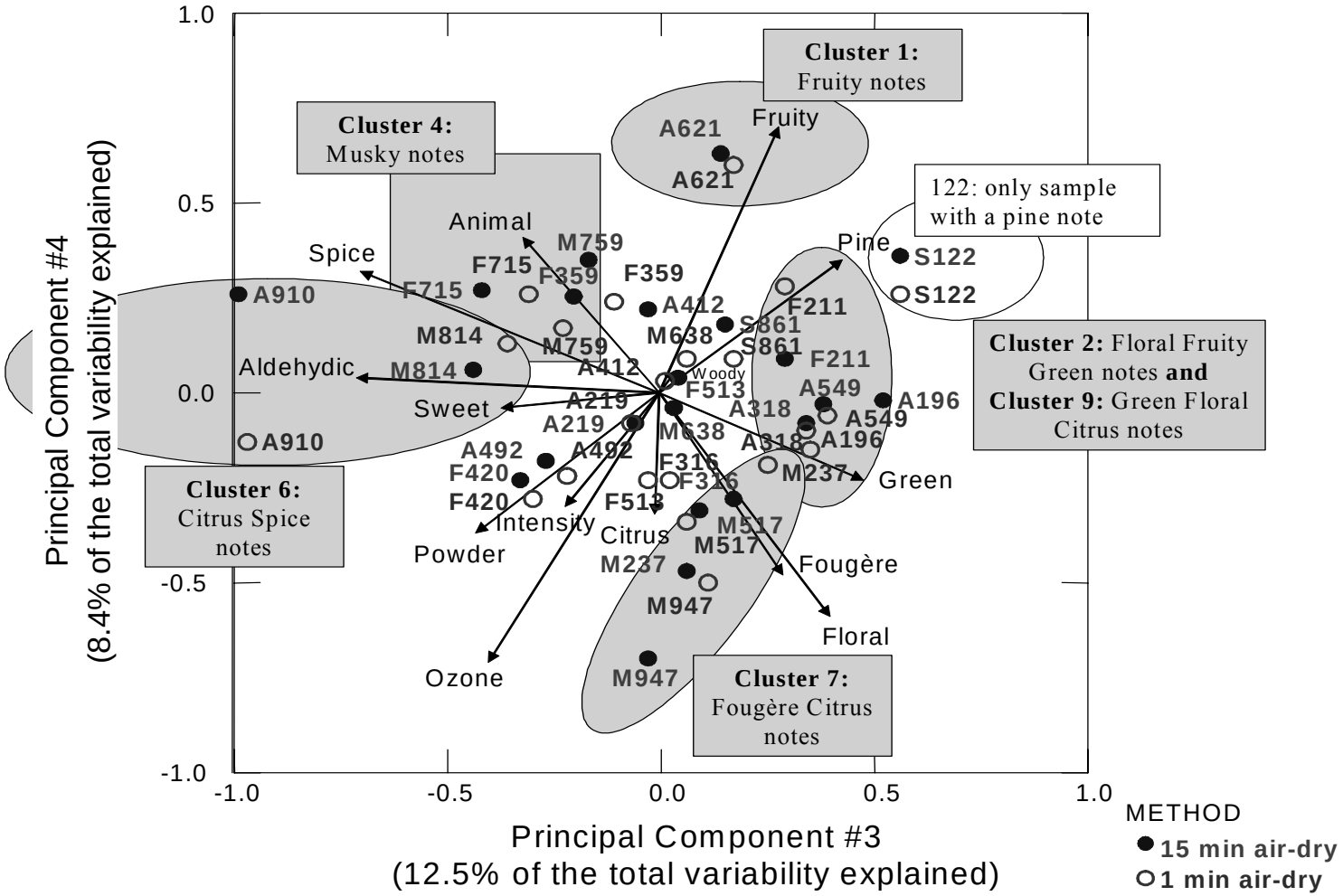

FIGURE 2. Map of the third and fourth principal components including all main fragrance categories and overall intensity scores. The 3-digit codes represent the 22 fragrances. A, M, F and S stand for Accord, Masculine, Feminine, and Shared fragrances respectively. Fragrances are grouped based on cluster analysis results.

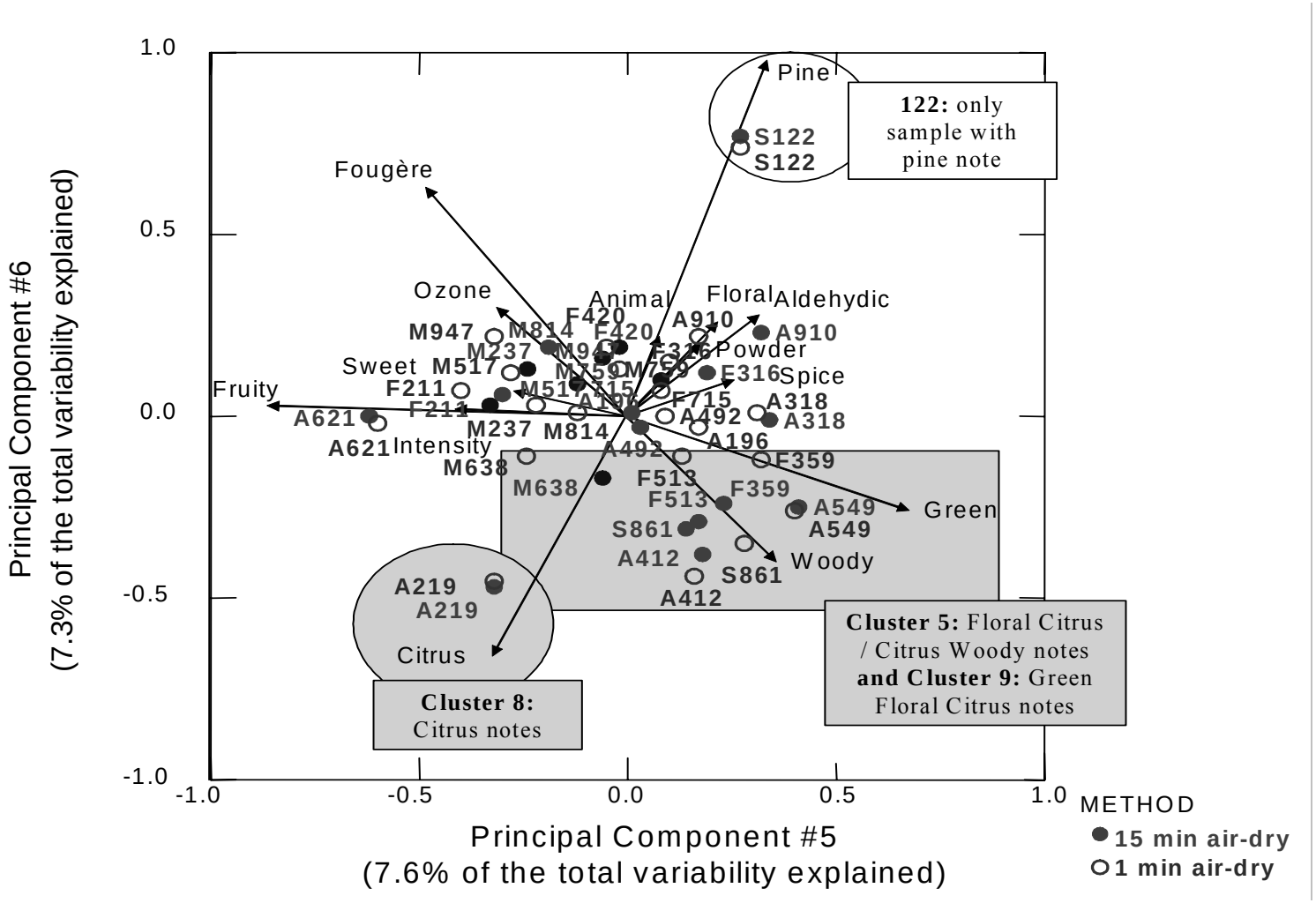

FIGURE 3. Map of the fifth and sixth principal components including all main fragrance categories and overall intensity scores. The 3-digit codes represent the 22 fragrances. A, M, F and S stand for Accord, Masculine, Feminine, and Shared fragrances respectively. Fragrances are grouped based on cluster analysis results.

TABLE 2.
The nine clusters of fragrances and their main sensory characteristics

Cluster	Fragrances	Category	Description
1	621	Fruity Accord	Fruity, slightly Sweet
2	196; 211; and 318	Feminine Fragrances Floral Accords	Floral, Fruity and / or Green
3	316; 420; and 492	Feminine Fragrances Powdery Accord	Powdery Floral Sweet
4	715; and 759	Feminine / Masculine Fragrances	Musky and Powdery
5	412; 861; 122; 513; 359; and 638	Feminine / Masculine / Shared Fragrances Woody Citrus Accord	Floral Citrus and Woody Citrus
6	910; and 814	Masculine Fragrance Aldehyde Accord	Spicy Citrus with Aldehyde/Ozone or Fougère notes
7	517; 237; and 947	Masculine Fragrances	Fougere Citrus, with Floral, Woody and Ozonic notes
8	219	Citrus Accords	Citrus, slightly Sweet
9	549	Green Accord	Green Floral Citrus

In a similar fashion, the powdery character was observed at an intensity of 1.0, 1.2, 1.8 and 4.3 with the 1-min dry-down preparation method for sample numbers 517, 814, 861 and 759, whereas this attribute was not perceived for any of the same samples after a 15-min dry-down preparation method. When evaluated after 1-min dry-down preparation method, these samples tended to have higher scores on PC1 and slightly lower scores on PC2 (Figure 1). However, here again, the change in the powdery note between the two methods only accounted for a small part of the total variability between samples.

Although differences in the intensities of most sensory attributes were observed, results from univariate statistical analysis showed only marginally significant differences between the two dry-down methods for most. Some trends were observed, however. The overall fragrance intensity was significantly higher when the blotter was put into the evaluation container after a 1-min dry-down, compared with a 15-min dry-down ($p = 0.0017$). No consistent trends were found for floral and citrus main categories, but a closer analysis of the subclasses revealed that, for the floral attributes, the rose, muguet and carnation characters were higher and the white flower and hyacinth characters lower (if present) with method 2 (1-min dry-down) than with method 1 (15-min dry-down). Similarly, for the citrus note, the orange and lime notes tended to be slightly more prominent when the dry-down time was increased, whereas bergamot, lemon, and grapefruit notes were more potent after a shorter dry-down. Additionally, spicy notes (such as black spices and anise) and animal notes (such as musk) were perceived as being of higher intensity when the dry-down period was 15 minutes. On the other hand, fruity notes (with the exception of green apple and berry), powder character (except for the floral, powdery sweet fragrances including samples 420, 492 and 316), woody and green notes were higher when the dry-down time was reduced to 1 minute. These differences in character intensities between the two methods, however, did not result in large differences in overall profile, as shown by the close location of the samples under methods 1 and 2 on all dimensions of the sensory map.

DISCUSSION

Differences in sensory profiles obtained using the two dry-down methods and their link to fragrance composition and evaporation rate of the fragrance components.

A fine fragrance is a layered construction, with different effects developing over time from one stage of dry-down to another. The top notes constitute the first phase of a perfume's evaporation "life" and are mostly responsible for the initial fragrance impression. It consists of the most volatile molecules, although notes from heart and foundation might also play a role in the first fragrance phase. The "heart", also known as cœur, body, or middle note, constitutes the second phase of fragrance evaporation and unfolds a few moments after application, when the top notes have faded away. It develops over a few hours and consists of molecules with moderate volatility and tenacity. Last, the bottom notes or foundation are the most lasting portion of the fragrance. These notes create the clinging impression that is left behind after the fragrance's volatile components fade. Composed of ingredients with low volatility, the bottom notes are responsible for the longevity and tenacity of the fragrance (Laszlo and Rivière, 1997; Müller, 1992). Figure 4 represents the architecture of fragrances, including the sensory characteristics most associated with top, middle and bottom notes.

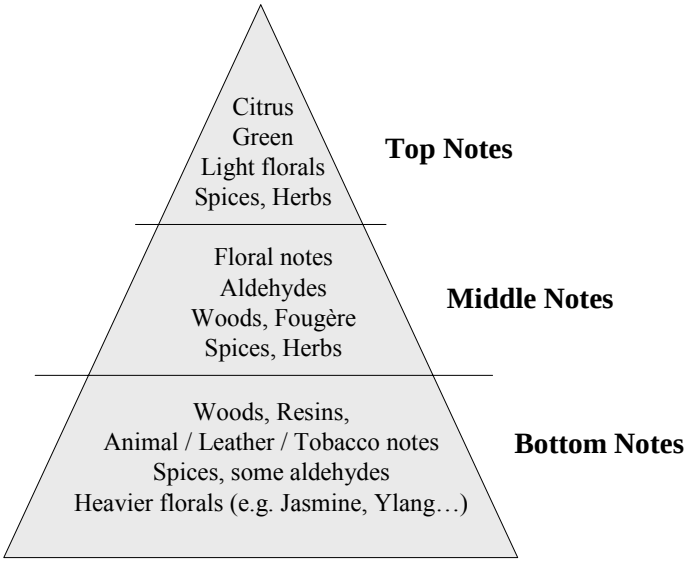

FIGURE 4. fragrance architecture: top, middle and bottom notes (Source: Bork et al., 1991)

Results from the present study show that some of the characters, such as white flower, hyacinth, lime, orange, anise, musky, and some fruit notes are enhanced when dry-down time increases whereas others, e.g. bergamot, lemon, rose, muguet, and green are fading (Cf. Profiles in Appendix 4C). This phenomenon is due to differing rates of evaporation for each of the fragrance ingredients: heavier florals such as hyacinth and white flower tend to be more pervasive and constitute base notes that are more noticeable when the light top notes, such as rose or muguet, have evaporated. Similarly, animal, spices and berry notes often are used as constituents of the fragrance base and dominate the scent once lighter green, citrus, and other fruity notes have faded away. Generalizations based on components' evaporation rates are, however, difficult, since each fragrance is a complex system in which the interaction of the components plays a large role in the building of a harmonious olfactory sensation that unfolds through the top, middle and base notes without losing cohesion. Müller (1992) stated that "part of the art of fragrance composition is the successful building-in of fragrance retarders, the so-called fixatives, in such a way that the heavier, least-volatile and more stable substances hold back the lighter components." Depending on the type of base notes and the strength of their fixative power, lighter notes might still be perceived as intense after a 15-min evaporation time, whereas the same top notes would no longer be perceptible in combination with other fragrance components.

Comparing the two preparation methods – Suggestions for further studies

Although it seems difficult to consistently predict how a fragrance will evolve over time, the present study showed that some significant differences occurred in the perception of each of the fragrances included in the test. A 1-minute dry-down produced higher yet not overwhelming fragrance intensities, which ranged from 6.5 to 12.7 on a 15-point scale with an average of 9.2. In comparison, a range from 5.9 to 12.0 (average = 8.8) was observed with the 15-min dry-down. Moreover, the 1-minute dry-down method reduced the preparation load, and could therefore be preferred over a 15-minute dry-down, which resulted in more faint scents and was more labor intensive.

The fragrances included in the test were initially chosen to represent the wide range of marketed fragrances. This might explain the fact that the sensory maps showed consistency between the two evaluation methods: the differences observed among fragrances were greater than the differences observed within a fragrance under the two preparation methods. These results suggest that consistency in preparation method is preferred but might not be as critical, when the study objective consists in a categorization task across many fragrance categories. Such a conclusion might not hold, however, if one desires to explore a specific fragrance category. Further studies need to be conducted in order to further investigate this aspect.

Last, one needs to keep in mind that there is a strong need to use a consistent method of preparation within a study, especially when one desires to examine relationships between independent data sets, for example, when comparing descriptive and consumer data. For example, if one desires to predict consumer acceptability of fragrances, slight perceptual differences might generate vastly different results. If the descriptive panel does not evaluate samples that are prepared similarly to the samples evaluated by the consumer panel, prediction of acceptability for the fragrances might be erroneous and prevent sound business decisions.

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CHAPTER II.

MEASURING ATTITUDES TOWARD FRAGRANCES:

A SURVEY

ABSTRACT

A total of 318 respondents answered a survey on their attitudes toward fragrances and on the criteria influencing their choice for fine personal fragrances. Seven factors were defined that best explained attitudes and behavior towards fragrances. These factors were further grouped under two categories. Motivations for fragrance use encompassed inner-directed motives, perceived emotional benefits, social motives and attraction motives. Behavioral aspects of fragrance use included the use of unique vs. multiple fragrances depending upon activities and schedule, preference for subtle vs. noticeable fragrances and acquisition of fragrance as a gift vs. as a personal choice. Additionally, criteria influencing fragrance choice were divided into personal appreciation of the scent, fragrance lastingness and personality fit, others' appreciation of the fragrance, cost-related issues and external cues (e.g., fragrance name, package…). Results of the factor analysis mimicked those of a preliminary study, emphasizing the consistency and reliability of the instrument. Additionally, the defined dimensions of attitude and behavior were comparable to dimensions discussed in the literature and obtained with other evaluation methods. This constitutes some evidence of concurrent validity, and therefore, of construct validity of the instrument. Possible applications of the instrument as a research, marketing, and communication tool are discussed.

INTRODUCTION

As I was browsing recently through a fashion magazine, I found myself overwhelmed by the extent of fragrance advertising. Looking a little bit more closely both at fragrance ads and at names of fragrances launched in 2004, I was amazed by the diversity in the way fragrances are marketed. Fragrances are marketed not only to men or women, emphasizing either femininity or masculinity, they also are marketed to provide benefits such as mood enhancement, feelings or sensory properties. The new aromatherapy line of products developed by Lancôme suggests mood benefits, for example, while such fragrances as In Love Again (Yves Saint Laurent), and Loving (Revelations Perfume and Cosmetics), two fragrances that were launched in 2004, focus on feelings. Fleur de Sephora, Cherry Blossom Glittering, Vetiver Frozen or Sandalwood Eau de Toilette are only a few of the fragrances launched in 2004 that focus on sensory properties. Recurrent themes in advertising and fragrance naming also include attraction and sensuality, activities and social situations (summer, sporty, evening fragrances, as well as ads showing family bonds, gatherings of friends…), dreams, travel, and fantasy, or targeted aspects of attitudes, behaviors, and personality. It appears that all these new launches and ads seek to appeal to different target markets. Marketers not only focus on various socio-demographic segments of the population; they also target some specific aspects of motivations and behaviors.

A few studies have attempted to understand motivations and behaviors associated with fragrances. In 1951 (revised in 1997), Paul Jellinek developed a theory dealing with the psychological bases of perfumery. Central in his theory was the notion that "modern perfumery seeks to create or reinforce sexual attraction". Recent research moderated this thesis, and suggested more complex patterns of motivations for fragrance use.

In an investigation conducted in Germany with 222 students (58% women; 42% men), Steiner (1997) explored the semantic space relating to scents and their effects. When asked about the potential effects of scents, respondents freely generated 1172 associations. More than 50% of the responses were assigned to the category 'specific activation' which encompassed attraction, repulsion and sexuality, suggesting that a great deal of attention was given to the ability of odors to promote or inhibit social contacts.

Additionally, respondents frequently mentioned the effect of scents on their subjective states (20.7%), i.e., scents affect moods and feelings. Another 18% of responses were assigned to the category 'general activation', opposing calming and relaxing to arousing and stimulating effects of scents (Steiner, 1997).

In a survey conducted in 1992 among 317 female college students in the US (Mademoiselle, 1993), 73% of the respondents gave the reason for using perfume 'to feel good about myself', 73% because it is part of their daily routine. Attractiveness to others (of both sexes) and attractiveness to the opposite sex were chosen by only 48% and 35% of the students, respectively, as a reason to wear fragrance. Results from focus groups and personal interviews (Bain, 1997; Graham, 2000; Byrne-Quinn, 1988; Contest-Census Institute, 1989) also suggested, as stated by Jellinek (1997), that there are "a multitude of objectives and motives aiming in part at the users themselves, in part at specific other persons and in part at the people around in general". Bain (1997) suggested that people tended to respond to patterns of motivations regarding fragrance use. Those patterns may change with time and vary greatly in the population.

Behaviors concerning fragrance use are also evolving over time. Not so long ago, the feminine fragrances (more floral) were clearly separated from the masculine fragrances (more woody and fougère-like). With the emergence of unisex fragrances, shifts in behaviors have been observed. At the same time, numerous fragrance companies have developed a summer line for their original fragrance, which reflects the need for lighter scents during warm days and warmer scents during cold days. Shifts in behaviors also can be observed in the number of fragrances owned. It is not rare, nowadays, to use different fragrances when at home, at work or on an exciting evening out.

Lastly, criteria influencing fragrance choice might also vary greatly among individuals and can evolve over time. As suggested by Snyder (1990), some people tend to pay closer attention to the fragrance notes, while others might be more influenced in their choice of fragrance by the image associated with the fragrance through advertising or packaging, for example.

The present study was conducted to develop a measurement tool that would accurately measure attitudes toward fragrances, motivations for fragrance use and factors influencing fragrance selection. Such a survey might provide a very important tool for

research and communication and help in the development of new marketing strategies. Furthermore, results from this study might throw more light on the reasons why people wear fragrances, how they use fine personal fragrances and what factors they take into account while selecting their fragrances.

MATERIALS AND METHODS

Subjects

A total of 318 respondents completed the study. Respondents were screened prior to the study and disqualified if they reported any fragrance discomfort, anosmia or any other condition that might have affected their sense of smell. Subjects also had to wear fragrances at least twice a week to qualify for the study. Respondents were recruited in two locations (Manhattan, Kansas, and Union Beach, New Jersey), selected based on their demographic information and equally divided into six categories accounting for age (18-25 yrs; 26-40 yrs; 41-55 yrs) and gender.

Survey development

A survey on attitudes and beliefs toward fragrances was first developed based on personal interviews, discussion with professionals in the fragrance industry, literature review and analysis of current advertising strategies for fragrances. Comments from a focus group were used to refine some of the original survey statements. Additionally, results from a pilot study (with 112 consumers) allowed for the reduction of the survey to a set of 48 statements.

Beliefs, attitudes and motivations survey

The first set of statements concerned respondents' beliefs and attitudes toward fragrance/cologne. Respondents were asked to indicate on a five-point Likert scale (1 = disagree strongly to 5 = agree strongly) how much they agreed or disagreed with 34 statements such as 'I like to wear different fragrances when I am at home, at work or

during an evening out'; 'The fragrance I wear makes me feel good about myself'; 'I wear fragrances because it reflects social status', etc.

Fragrance selection survey

The second set of statements related to importance of 14 criteria for fragrance selection. Respondents were asked to indicate on a 4-point scale (1 = not important at all to 4 = very important) how important were the name of the fragrance, their liking of the fragrance, the price, the fact that other people liked the fragrance, etc.

Data processing and analysis

Analysis of the survey variables.

Attitudes and beliefs statements and fragrance selection questions were analyzed separately using Factor Analysis with varimax rotation (SYSTAT® 10.2, 2002).

Attitudes and behavior for the general population.

Frequency tables were generated for the total respondent base for all individual variables in the survey.

RESULTS

Dimensions of beliefs, attitudes, and motivations for fragrance use.

Factor analysis of the beliefs, attitudes and motivations survey variables gave similar, but slightly more clear-cut factor solutions than those found during a preliminary study (n = 112), therefore emphasizing the reliability of the instrument.

The factor analysis conducted on the attitudes and beliefs variables resulted in a seven-factor solution. The seven factors explained approximately 56.4% of the total variability in the data. Table 1 presents the seven factors as well as the loadings for each individual statement on each factor, and provides a possible name for each factor.

TABLE 1.

Factor loadings for each of the statements on attitudes toward fragrances

	Factor 1	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**	**Factor 6**	**Factor 7**
	Inner-directed motives	Emotional benefits	Social motives	Attraction motives	Unique vs. multiple fragrances	Subtle vs. noticeable fragrances	Gift vs. personal choice
Explained variability (%)	8.6%	16.0%	8.8%	4.8%	6.8%	6.2%	5.2%
Wearing a fragrance is part of my daily routine	**0.71**	0.17	0.14	-0.14	0.21	-0.16	-0.05
Wearing a fragrance makes me feel fresh and clean	**0.64**	0.21	0.11	0.31	0.02	-0.10	0.03
I wear a fragrance because I like to smell good	**0.62**	0.18	-0.13	0.28	0.00	-0.11	0.19
I only wear fragrance on special occasions	**-0.68**	-0.08	0.03	0.16	-0.05	0.13	0.09
I wear fragrances for my own satisfaction	0.41	0.29	-0.25	-0.14	0.14	-0.04	-0.18
Fragrances enhance my self-esteem	0.08	**0.79**	0.24	-0.03	0.04	-0.02	0.00
When I wear a fragrance, I feel more confident about myself	0.10	**0.78**	0.07	0.16	0.02	-0.12	-0.04
Wearing a fragrance makes me feel more attractive	0.12	**0.74**	-0.04	0.18	0.01	-0.09	0.15
When I wear a fragrance, I am in a better mood	0.21	**0.64**	0.11	-0.03	0.12	0.01	-0.22
Wearing a fragrance enhances my individuality	0.14	**0.59**	0.16	0.04	0.33	-0.08	-0.21

Note: Factor loadings are between -1 and 1. A factor loading higher than 0.5 or lower than -0.5 (in bold) represents a high correlation between the statement and the corresponding factor.

TABLE 1 (Cont.)

	Factor 1	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**	**Factor 6**	**Factor 7**
	Inner-directed motives	Emotional benefits	Social motives	Attraction motives	Unique vs. multiple fragrances	Subtle vs. noticeable fragrances	Gift vs. personal choice
Explained variability (%)	8.6%	16.0%	8.8%	4.8%	6.8%	6.2%	5.2%
The fragrance I wear enhances my personality	0.03	**0.58**	0.13	-0.05	0.24	-0.20	-0.25
When I wear a fragrance, it makes me feel more professional	0.23	**0.57**	0.21	0.24	-0.14	0.03	0.04
The fragrance I wear makes me feel good about myself	0.26	**0.56**	-0.22	0.05	0.16	-0.12	-0.25
Wearing a fragrance satisfies my need for fantasy	-0.17	**0.53**	0.16	-0.08	0.37	-0.28	-0.05
My fragrance completes my outfit	0.32	**0.50**	0.19	-0.04	0.25	-0.04	-0.14
I wear a fragrance because it is more socially acceptable	0.10	0.11	**0.77**	0.13	-0.05	0.11	-0.06
I wear fragrance/cologne because everybody else does	0.07	0.03	**0.67**	-0.03	-0.05	0.09	0.30
I wear fragrances to better fit into social settings	-0.06	0.34	**0.64**	0.24	0.09	-0.06	-0.01
I wear fragrance because it reflects my status	0.03	0.28	**0.63**	0.11	0.23	-0.13	-0.28
I don't care much about how the fragrance smells as long as people around me like it	-0.36	0.05	**0.56**	0.03	-0.08	-0.10	0.21

Note: Factor loadings are between -1 and 1. A factor loading higher than 0.5 or lower than -0.5 (in bold) represents a high correlation between the statement and the corresponding factor.

TABLE 1 (Cont.)

	Factor 1	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**	**Factor 6**	**Factor 7**
	Inner-directed motives	Emotional benefits	Social motives	Attraction motives	Unique vs. multiple fragrances	Subtle vs. noticeable fragrances	Gift vs. personal choice
Explained variability (%)	8.6%	16.0%	8.8%	4.8%	6.8%	6.2%	5.2%
I wear fragrances to please my spouse/significant other	0.01	0.01	0.22	**0.62**	0.07	0.01	-0.02
I wear fragrance/cologne because I want to appeal to the opposite sex	-0.09	0.35	0.09	**0.57**	0.02	-0.27	0.18
I wear different fragrances depending on the season	0.08	0.12	0.07	-0.23	**0.76**	-0.05	0.04
I choose the fragrance I am going to wear based on my schedule and activities	0.09	0.12	0.05	0.29	**0.64**	0.17	-0.18
I like to wear different fragrances when I am at home, at work or during an evening out	0.21	0.11	-0.19	0.24	**0.59**	-0.05	-0.11
I don't like to wear fragrances that everybody notices	-0.12	-0.17	0.12	-0.07	-0.03	**0.71**	0.00
I prefer subtle fragrances	-0.17	0.16	-0.23	0.02	0.19	**0.65**	0.21
I like other people to notice my fragrance	0.17	0.43	-0.10	0.29	0.04	**-0.60**	-0.01
I usually receive a lot of compliments about my fragrance	0.31	0.27	-0.04	-0.13	0.29	**-0.47**	0.05
I wear my current fragrance / cologne because I received it as a gift	-0.05	-0.17	0.11	0.10	0.06	-0.04	**0.71**
I don’t care much about the fragrance I wear as long as it smells good	0.02	-0.09	0.02	-0.03	-0.24	0.15	**0.65**

Note: Factor loadings are between -1 and 1. A factor loading higher than 0.5 or lower than -0.5 (in bold) represents a high correlation between the statement and the corresponding factor.

The seven factors for beliefs, attitudes and motivations can be further grouped into two categories:

Factors related to perceived fragrance benefits.

Factors 1, 2, 3 and 4 explained 8.6%, 16.0%, 8.8%, and 4.8% of the total variability, respectively, and corresponded to benefits associated with fragrances and motives for wearing fragrances. Within this group of factors, Factors 1 and 2 formed inner-directed motives and benefits, while Factors 3 and 4 constituted outer-directed motives for fragrance use.

Inner-directed motives. A fragrance may be worn for the wearer's own satisfaction and used simply as a mean to smell good, fresh and clean (Factor 1). This first aspect of the benefits associated with fragrances is part of what Bain (1997) refers to as the "inner-directed dimension" of fragrance choice. Respondents with high scores on Factor 1 use a fragrance mostly to please themselves. They are very likely to consider wearing a fragrance as part of their daily routine. On the other hand, respondents with low scores on that factor, tend to wear fragrances only in specific situations.

Emotional benefits. A fragrance can provide emotional benefits by enhancing mood, self-esteem and confidence (Factor 2). Respondents with high scores on that dimension consider fragrances as a mean to enhance their mood and confidence. They focus on emotional benefits such as enhancing positive mood states, self-image, confidence, and self-esteem. Additionally, they use fragrances as a mean to express their own personality and individuality. Graham (1993) described this dimension of attitudes towards fragrances as the "self-perception motive".

Social motives. A fragrance also may provide social benefits and be perceived as a tool for social acceptability (Factor 3). This is consistent with the "social dimension" described by Bain (1997) and Graham's "others' perception motive" (Graham, 1993) for fragrance and cosmetics selection. Motivations in that case are driven mostly by the desire to fit into a social setting. Respondents with high scores on Factor 3 are concerned about pleasing others in general, and choose to wear a fragrance that they believe would

be liked by most. They perceive fragrances as a mean to meet the social norm (I wear fragrance because it is more socially acceptable, because everyone else does); they believe fragrances reflect status. This fragrance benefit has been previously described by Disdet (1994), who stated that perfume "must be in complete agreement with what one wants to express". In a social setting, a fragrance may be used as a tool by the wearer to increase perceived self-efficacy in social interactions. By wearing a fragrance, one might become more confident in one's abilities to engage in interpersonal communication, to seek acceptance in a group one aspires to be a part of, or to maintain or even strengthen one's position among peers.

Attraction motives. A fragrance can provide attractiveness benefits and therefore be used as a tool for enhancing interpersonal attraction (Factor 4). In that case, the message that one wishes to convey by wearing a fragrance is directed toward a specific person or gender. This is known as the "interpersonal attraction motive" (Graham, 1993) or the "interpersonal dimension" of fragrance choice (Bain, 1997). This dimension is largely related to the desire to be sexually attractive. In that case, perfumes are used to enhance the body and to inform others about qualities and personality aspects that are likely to be attractive to them.

Factors related to fragrance usage.

Factors 5, 6, and 7 explained 6.8%, 6.2% and 5.2% of the total variability of the data, respectively, and corresponded to fragrance usage / habits and situations in which fragrances are used. To some extent, Factor 1 can also be associated to that group of factors since it contrasts daily vs. occasional usage of fragrances.

Unique vs. multiple fragrances. Factor 5 opposes respondents who tend to wear different fragrances on different occasions to those respondents who show more fragrance loyalty, i.e., those who wear the same fragrance no matter the time of the year, social occasion or situation.

Subtle vs. noticeable fragrances. Factor 6 relates to fragrance awareness and opposes respondents who prefer subtle fragrances to respondents who enjoy more noticeable

scents, i.e., those fragrances that might increase other people's awareness of the fragrance and possibly generate compliments.

Personal choice vs. gift. Last, Factor 7 relates to fragrance source. Respondents with high scores on that factor are likely to have received their current fragrances as a gift and to not care as much about specific sensory properties or any other intrinsic characteristic of the fragrance they wear, as long as it smells good.

Dimensions of the fragrance selection survey

Factor analysis conducted on the fragrance attributes potentially influencing fragrance choice resulted in a five-factor solution. The five factors explained approximately 62.7% of the total variability in the data. Table 2 presents these five factors and the loadings for each individual characteristic on each of the factors. Factor 1 measures the influence of the wearer's own appreciation of the fragrance's sensory characteristics. Factor 2 groups the fact that the fragrance fits the wearer's personality and the lastingness of the fragrance and shares sexiness with Factor 3. The third factor relates to other's appreciation of the fragrance, i.e. whether the fragrance is liked by acquaintances, friends or a significant other, and is sexy. The fourth factor is related to cost issues. Last, the fifth factor can be interpreted as a measure of the influence of external cues, such as brand, advertising and fragrance presentation, on fragrance choice.

General findings for the Total Respondent Base

Frequency tables for each individual motivational and behavioral variable for fragrance use, and the importance of various criteria for fragrance selection are presented in Tables 3, 4, and 5, respectively. In general, most respondents used fragrances for their own satisfaction, and considered smelling good, fresh, and clean as the primary reason for wearing a fragrance. Other inner-directed emotional benefits, along with interpersonal attraction motives also were highly motivating factors for fragrance use. Only a few respondents mentioned the potential use of fragrance as a tool for social acceptability and/or status enhancement.

TABLE 2.
Factor loadings for each of the fragrance characteristics that might influence fragrance choice

	Factor 1	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**
	Own appreciation of the fragrance	Fits personality and lastingness	Other's appreciation of the fragrance	Cost	Fragrance's external cues
Explained variability(%)	9.8%	11.0%	11.7%	12.3%	17.9%
The fragrance smell	**0.80**	0.07	0.07	0.12	-0.06
Your liking of the fragrance	**0.82**	0.05	-0.04	-0.09	0.02
It fits your personality	0.11	**0.76**	0.19	-0.11	0.03
The lastingness of the scent	0.03	**0.73**	-0.15	0.11	0.07
Its sexiness	-0.01	**0.57**	**0.56**	-0.11	0.14
Your spouse/significant other likes it	0.06	-0.12	**0.76**	0.01	-0.06
Your belief that other people will like it	-0.01	0.18	**0.63**	0.08	0.21
Its price	0.04	-0.03	0.00	**0.90**	0.03
It was on sale	-0.02	0.01	0.01	**0.89**	0.04
Its brand name	0.01	-0.09	0.17	0.03	**0.79**
The name of the fragrance	0.01	0.00	0.10	-0.05	**0.74**
Advertising	-0.17	0.18	-0.01	0.15	**0.74**
The attractiveness of the packaging	0.07	0.13	-0.03	0.04	**0.65**
Its fashionableness	-0.05	0.00	0.49	-0.15	**0.55**

Note: Factor loadings are between -1 and 1. A factor loading higher than 0.5 or lower than -0.5 (in bold) represents a high correlation between the statement and the corresponding factor.

TABLE 3.

Frequency distribution (percentage) for each statement referring to motivation for fragrance use (n=318)

	Disagree Strongly	Disagree Moderately	Neither/Nor	Agree Moderately	Agree Strongly
Inner-directed motives					
Wearing a fragrance is part of my daily routine	5%	7%	16%	36%	36%
Wearing a fragrance makes me feel fresh and clean	3%	1%	9%	46%	41%
I wear a fragrance because I like to smell good	1%	0%	2%	40%	57%
I wear fragrances for my own satisfaction	2%	4%	8%	45%	41%
I only wear fragrance on special occasions (-)	53%	27%	12%	4%	4%
Emotional benefits					
Fragrances enhance my self-esteem	14%	13%	32%	31%	9%
When I wear a fragrance, I feel more confident about myself	7%	7%	24%	50%	13%
Wearing a fragrance makes me feel more attractive	6%	5%	26%	47%	16%
When I wear a fragrance, I am in a better mood	5%	9%	38%	37%	11%
Wearing a fragrance enhances my individuality	12%	16%	26%	34%	11%
The fragrance I wear enhances my personality	9%	10%	33%	33%	15%
When I wear a fragrance, it makes me feel more professional	6%	10%	32%	44%	8%
The fragrance I wear makes me feel good about myself	2%	3%	12%	42%	42%
Wearing a fragrance satisfies my need for fantasy	36%	20%	30%	11%	4%
My fragrance completes my outfit	17%	13%	25%	33%	12%
Social motives					
I wear a fragrance because it is more socially acceptable	35%	22%	28%	12%	3%
I wear fragrance/cologne because everybody else does	55%	24%	16%	4%	1%
I wear fragrances to better fit in social settings	23%	22%	31%	20%	4%
I wear fragrance because it reflects my status	36%	22%	31%	8%	3%
I don't care much about how the fragrance smells as long as people around me like it	48%	27%	17%	5%	2%
Attraction motives					
I wear fragrance/cologne because I want to appeal to the opposite sex	9%	8%	20%	43%	20%
I wear fragrances to please my spouse/significant other	11%	10%	17%	38%	25%

Note: Statements followed by (-) are negatively loaded on the factor they are associated with, e.g. the statement 'I only wear fragrances on special occasions is negatively loaded on the factor named inner-directed motives.

TABLE 4.

Frequency distribution (percentage) for each statement referring to fragrance usage (n=318)

	Disagree Strongly	Disagree Moderately	Neither/Nor	Agree Moderately	Agree Strongly
Unique vs. multiple fragrances					
I wear different fragrances depending on the season	25%	20%	20%	25%	10%
I choose the fragrance I am going to wear based on my schedule and activities	20%	20%	24%	25%	11%
I like to wear different fragrances when I am at home, at work or during an evening out	12%	13%	8%	37%	30%
Subtle vs. noticeable fragrances					
I don't like to wear fragrances that everybody notices	24%	28%	27%	13%	7%
I prefer subtle fragrances	9%	14%	33%	28%	16%
I like other people to notice my fragrance (-)	2%	8%	22%	42%	26%
I usually receive a lot of compliments about my fragrance (-)	7%	12%	28%	37%	16%
Personal choice vs. gift					
I wear my current fragrance/cologne because I received it as a gift	40%	18%	13%	17%	13%
I don’t care much about the fragrance I wear as long as it smells good	13%	25%	18%	30%	14%
I really pay attention to how the fragrance smells when selecting a fragrance	2%	1%	6%	22%	69%

Note: Statements followed by (-) are negatively loaded on the factor they are associated with.

TABLE 5.

Frequency distribution (percentage) for the importance of different criteria for fragrance choice(n=318)

	Not important at all	Not very important	Somewhat important	Very important
Own appreciation of the fragrance				
Importance of the respondent's own liking of the fragrance	0%	1%	5%	93%
Importance of the smell of the fragrance	0%	0%	9%	91%
Personality fit and fragrance lastingness				
Importance of the fragrance fitting the respondents' personality	3%	4%	40%	53%
Importance of the lastingness of the fragrance	8%	13%	33%	46%
Other's appreciation of the fragrance				
Importance of the spouse liking the fragrance	5%	9%	39%	48%
Importance that others like the fragrance	20%	23%	40%	17%
Importance of the fragrance's sexiness	11%	21%	42%	26%
Cost				
Importance of the price of the fragrance	27%	26%	34%	13%
Importance of the fragrance being on sale	9%	24%	43%	25%
Fragrance's external cues				
Importance of brand name	34%	39%	23%	4%
Importance of the name of the fragrance	42%	32%	24%	3%
Importance of advertising	52%	40%	8%	0%
Importance of packaging	51%	34%	14%	1%
Importance of the fragrance being fashionable	36%	31%	27%	6%

Most respondents tended to wear fragrances on a daily basis as opposed to wearing fragrances only on specific occasions. This is not surprising considering that the respondents in the present study were initially screened as fragrance users, i.e., they used fragrance at least twice a week. Other than this preexisting condition, no general trend could be observed for patterns of usage. Overall, half of the population was more likely to wear a unique fragrance across many situations; the other half was likely to use different fragrances on different occasions. One-third of the respondents mentioned receiving their fragrance as a gift. Of course, gifts may be based on previous selection by the wearer or may reflect known preference of the person receiving the gift, but it also might be opposed to carefully choosing a fragrance. Slightly more than half of the respondents preferred noticeable fragrances to subtle fragrances.

Last, the most important criterion for selecting a fragrance was the respondent's own appreciation of the fragrance, followed by personality fit and long-lastingness of the scent, as well as other's appreciation of the fragrance. Cost was of lesser importance. Interestingly, fragrance external cues were considered as rather unimportant, with only 8% and 15% of the respondents judging advertising and packaging as at least somewhat important, respectively. If such external characteristics as brand name, fragrance name, or advertising and packaging are not considered by respondents as very important in the final selection process, where the actual scent may be critical, it clearly can be argued that these factors often constitute the first cues encountered when purchasing a fragrance. In a marketplace where new products appear on a regular basis, advertising and packaging can be very influential in the selection process, with respect to reducing the variety of fragrances from which to choose when selecting a new fragrance.

DISCUSSION

Reliability and validity of the survey

A total of 318 respondents completed a survey concerning their attitudes toward fragrance and the criteria influencing their choice of fine personal fragrances.

Seven factors were found that best explained attitudes and behavior concerning fragrance use. These factors were further grouped under two categories. Motivations for fragrance use encompassed inner-directed motives, perceived emotional benefits, social motives and attraction motives. Behavioral aspects of fragrance use included the use of unique vs. multiple fragrances depending upon activities and schedule, preference for subtle vs. noticeable fragrances and acquisition of fragrance as a gift vs. as a personal choice. Additionally, criteria influencing fragrance choice were divided into personal appreciation of the scent, fragrance lastingness and personality fit, others' appreciation of the fragrance, cost-related issues and external cues (e.g., fragrance name, package, etc.). Results of the present survey were consistent with those of a preliminary study, which suggests that the instrument and methodology is consistent and reliable (Data presented in Appendix 6). Additionally, the dimensions of attitude and behavior defined were comparable to dimensions discussed in various literature and obtained with other evaluation methods, such as focus groups (Byrne-Quinn, 1988), or individual interviews (Bain, 1997; Graham, 2000), providing some evidence of concurrent validity and, therefore, construct validity of the instrument.

Insights into motivations, behavior and criteria for fragrance selection

Results from the present study provided insights on attitudes and behavior toward fragrances and their purchase. The choice of a fragrance is largely influenced by the wish to enhance self-satisfaction, mood and self-esteem or to send information about oneself, whether to appeal to a potential significant other or, to some extent, to better fit into a social setting. Perfumes not only evoke a hedonic experience, they also are used to please oneself, enhance mood or provide other emotional benefits to the wearer.

Additionally, the survey provided information about behavioral aspects of fragrance choices. Mixed patterns were apparent as to where and how the respondents were likely to wear fragrance. Results opposed behaviors such as wearing fragrance as part of regular grooming to wearing fragrance as a treat or only in specific situations; wearing a unique fragrance across all situations as opposed to choosing to wear different scents as a function of schedule and activity. Results also opposed respondents who

carefully chose their fragrance based on their sensory characteristics to respondents who did not pay as much attention to the fragrance's sensory properties and often received their fragrance as a gift.

Last, the survey provided information about the importance of various criteria in fragrance selection. Obviously and consistently, a fragrance had to be liked by the wearer. Additional criteria such as personality fit, fragrance persistence, others' appreciation of the fragrance, and cost were considered more or less important by each individual. Last, external cues were considered as not very important by most when selecting a fragrance. However, external cues are at the interface of the wearer and the actual fragrance and constitute the first cues to be encountered by a potential wearer when selecting a fragrance. Therefore, they probably have a large influence on early decision processes simply because they increase awareness towards the product.

Potential applications of the survey

A tool for further research. Bain (1997) proposes that the interpersonal, inner-directed and social motives for fragrance use may not be equally pronounced within any one individual but that most people appear to act on a mixed pattern of motivations. Identically, results from the present study suggest that similar conclusions might be drawn regarding behaviors and patterns of fragrance use as well as criteria for fragrance selection. The present survey might therefore be used in the fragrance industry to better understand this aspect, for example as a mean to relate patterns of motivation to individual differences. Furthermore, patterns pertaining to fragrance use and to criteria for fragrance selection might also be observed among respondents and depend upon individual differences.

Combined with hedonic and sensory evaluation of fragrances, the survey might also be used to define consumer segments based on attitudes and relate those attitudes with liking for specific fragrance or packaging sensory characteristics.

Over time, the present survey might help understand shifts in attitudes and behaviors and therefore provide information useful to marketers to promote new fragrance benefits and to better meet consumers' expectations.

A tool for new marketing and advertising strategies. Current marketing research strategies focus on concept development and target audience, which might be defined by socio-demographics or attitudinal criteria. The present survey might be used in that framework either as a selection tool – for targeting a specific type of consumer based on their attitudes, behaviors, and selection criteria, or as an informational tool – to provide additional insights about the attitudes, motivations and behaviors of the target audience when defined by socio-demographic criteria.

In a reverse engineering process, it might be used to see how a newly developed fragrance might appeal to people with specific attitudes and therefore be used to accurately market the fragrance.

A tool for consumer guidance and education. The survey developed may be used as a tool for fragrance sales specialists to assess motivations for wearing a fragrance and better target the needs of their customers. Additionally, when buying a gift for someone, asking about beliefs and attitudes of the person for whom the fragrance is intended, along with demographic information and sensory characteristics that the person enjoys might help select fragrances that will match the expectations of the wearer.

CONCLUSION

A survey was developed and validated to measure attitudes and behaviors towards fragrance use as well as to assess the importance of diverse criteria in the selection process of fine personal fragrances. The survey constitutes a tool not only for further research relating for example attitudes and behaviors to individual differences, but also to develop successful marketing and advertising strategies.

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PART IV.

SOME SPECIFIC FINDINGS

DISCUSSED

CHAPTER I.

COMPARING RESULTS FROM PANELS DIFFERING IN SIZE AND LEVEL OF TRAINING IN DESCRIBING COMPLEX ODOR STIMULI

ABSTRACT

Three independent panels, differing in the number of evaluators and the degree of training and experience in fragrance descriptive analysis, evaluated a total of 22 scents. Each test was conducted independently, using the same set of products. Descriptive profiles generated by the three panels were compared and contrasted. Results suggested that the more extensive the training and experience in the product category, the less overlap between groups of fragrances and the higher the consistency with the classification of these same fragrances by the fragrance industry. When performing descriptive tasks, an untrained panel should be of considerably greater size than a trained panel to obtain the same discriminating power across products and thereby compensate for the lack of training. However, provided that the untrained panel is large enough ($n > 150$), both trained and untrained panels grouped the fragrances in a rather similar way, leading to comparable sensory maps, although each panel used the terminology differently. Highly trained descriptive panels can therefore be used to provide descriptions of fragrances that are representative of the sensory perceptions of the larger population of consumers. Trained panels may represent a cost effective way of providing representative sensory profiles.

INTRODUCTION

Within the field of sensory evaluation, descriptive analysis data, generated by highly trained descriptive assessors, often has been used to provide objective, accurate and detailed sensory profiles of products and / or product categories. Such profiles provide information on the perceived sensory attributes of the product (e.g., appearance, flavor, fragrance, texture) and their intensities. These data can be further used to model and predict more subjective product qualities (e.g., acceptance, preference, image), often determined by consumers. It has long been believed that the validity and reliability of descriptive analysis depended upon panel training to standardize evaluation practices among the panelists. Numerous studies have shown that training enhanced sensitivity and consistency of panel results when identifying and quantifying attributes (Chambers et al., 1981; Guerrero et al., 1997; Rainy, 1986; Roberts & Vickers, 1994). Additionally, studies comparing sensory profiles generated by two independently trained panels showed that the panels yielded similar results, whether they used similar or different sets of products within the same product category and/or similar or different descriptive analysis procedures (Martin et al., 2000; Risvik et al.,1992; Heymann,1994; Chambers and Smith,1993; Lotong et al., 2002). Such studies emphasized the reliability, consistency and reproducibility of sensory data generated by highly trained panels.

Although it has been commonly accepted that trained sensory experts describe products more accurately and use more specific descriptors than untrained consumers when evaluating the sensory profile of a product, this fact has been challenged over the past decade. Moskowitz (1996) stated that, although sensory profiles generated by experts and consumers may differ in the terminology used, both "sets of profiles can be related to each other, or at least approximated, so that given one profile the researcher can estimate the other".

Recent studies have demonstrated that sensory profiles obtained with untrained consumer panels were consensual and reproducible (Husson et al., 2001). Additionally, Husson and Pagès (2003) found that profiles generated by an untrained panel (n=29) matched those provided by two trained panels (n=11 and n=15). One issue associated with descriptive evaluation concerns training in various studies, since "trained" has no

established definition. Results from multiple studies have shown some disagreements on the relevance of trained sensory panels vs. untrained consumer panels, and the question of whether sensory profiles generated by consumers provide actionable results for product development and improvement remains open. The present study was conducted to determine whether data derived for 22 olfactory accords and fine fragrances by panels differing in size, level of training, and experience in descriptive analysis for the product category were comparable.

DETAILED MATERIALS AND METHODS

Three independent panels, differing in the number of evaluators and the degree of training / experience in fragrance descriptive analysis, evaluated a total of 22 scents. Each test was conducted independently, using similar sets of products. Additionally, the three panels differed in the process of lexicon / ballot development: during the study, the ballot was entirely developed, partially developed or provided without discussion to the panelists. Moreover, the two trained panels used references, whereas the untrained consumer panel was not provided with any references.

Panels

Panel 1: Highly trained panel with extensive experience in the product category.

Panel 1 consisted of seven panelists from Sensory Spectrum, Inc. All panelists were highly trained in the Spectrum method, and had a extended sensory evaluation experience in evaluation of multiple consumer products, including odor evaluation of fine fragrances as well as odor of personal care products.

Panel 2: Highly trained panel without prior experience in the product category.

Panel 2 consisted of seven highly trained panelists from the Sensory Analysis Center at Kansas State University (Manhattan, KS). These panelists had completed 120 hrs of training in all aspects of sensory techniques, and a minimum of 1000 hrs of

general sensory testing on a wide variety of consumer products. However, the panelists had very limited experience in profiling fine personal fragrances.

Panel 1 and Panel 2 were both highly trained in techniques of sensory analysis and used reference standards. However, different individuals using different training systems trained each panel, thus, ensuring the independence of the two panels.

Panel 3: Untrained consumer panel with no experience in descriptive evaluation.

Because gender differences in olfactory abilities have been shown previously, with women generally performing better than men for the perception, recognition, and naming of odor characteristics (Doty *et al.*, 1985; Vroon, 1997), Panel 3 was separated into two groups of untrained consumers based on gender. Group A consisted of 156 women and Group B consisted of 158 men. All were from the Kansas and New Jersey areas. They neither had training in sensory analysis techniques nor experience in profiling fragrances. None worked for a fragrance company, personal care business, or marketing research firm. Panelists ranged from 18 to 55 years of age and used fine personal fragrances at least twice a week.

Odorants

The samples studied were 22 scents divided into four categories, as shown in Table 1. A set of eight olfactory accords, representative of different fragrance categories, were developed at International Flavors and Fragrances (Union Beach, New Jersey). Additionally, six fine commercially available feminine fragrances were selected as representative of a wide variety of fine feminine fragrances. Of the 22 samples in the study, two shared fragrances marketed to both men and women were selected and included in the study. Last, a set of six colognes was selected to be representative of a wide variety of fine masculine fragrances.

TABLE 1.
List of samples included in the study and their descriptions

Olfactory accords			
Code	*Description*	*Code*	*Description*
219	Citrus	318	Floral
492	Musky	196	Floral
621	Fruity sweet	910	Ozone aldehyde
412	Spicy woody (sandalwood)	549	Herbaceous
Feminine fragrances			
Code	*Description*	*Code*	*Description*
359	Woody oriental citrus fruity	715	Oriental classical
211	Floral fresh citrus fruity	316	Soft floral aldehydic
513	Woody oriental citrus	420	Floral oriental fresh citrus fruity
Shared fragrances			
Code	*Description*	*Code*	*Description*
122	Citrus fresh	861	Citrus fresh
Masculine fragrances			
Code	*Description*	*Code*	*Description*
237	Fougère fruity fresh	947	Fougère ozone crisp
638	Fougère citrus fresh	517	Water marine crisp
759	Woody oriental crisp	814	Mossy woods classical

(Source for the fine fragrance descriptions: Edwards, 2004)

Odorant preparation

For all three panels, odorant preparation was performed using the same procedure: a perfumer strip was dipped into the fragrance bottle. The blotter was then air-dried for 1 minute, folded, and introduced into the evaluation container. Careful handling of the

fragrance bottles ensured that no cross-contamination of the samples occurred. Each sample container was tightly closed immediately. The containers had no identifying feature other than the 3-digit code used to identify a given sample. Samples were then held for 16 to 24 hours prior to evaluation to allow for the fragrance to reach equilibrium in the enclosed airspace.

The type of sample container used with the three panels varied slightly. For the two trained panels, containers were 4-oz screw-top glass jars. Due to the extensive preparation that using such containers for the untrained panel would have required, 4-oz white squeezable plastic bottles with flip-cap were used with the consumer panel. Such containers are commonly used in the fragrance industry for consumer testing. Prior testing had shown that the fragrance notes stabilized between 8 and 24 hrs after preparation. Additionally, a descriptive panel had determined that no plastic notes contaminated the fragrances when testing happened 24 hrs or less following sample preparation.

Orientation and lexicon development

Panel 1: Highly trained panel with extensive experience in the product category.

Orientation and ballot development/refinement occurred over the course of three sessions of 2 ½ hr each. Each panelist received a packet of information, in which several odor classes were defined. The odor categories included citrus, fruity, aldehydic, ozone marine, sweet, spice, floral, green, wood, resin, pine, camphoraceous, mint, herbaceous, moss/chypre, leather/animal, musk, and other. This initial fragrance lexicon was established during previous studies and was refined during orientation and throughout the evaluation: the odor organization chart was reviewed, discussed and modified by the panel. Issues relating to relationships between classes and potential overlapping of odor categories also were discussed. Additionally, references representative of each odor class were evaluated: panelists described the scents and discussed their impressions, generating further terms. Perceptual and categorization differences were discussed and explained, and when necessary, additional references were presented.

Panel 2: Highly trained panel without prior experience in the product category.

A lexicon was developed based on a literature search (Bork et al., 1991; Comité Français du Parfum, 1998; Edwards, 2004) and references for each fragrance category were identified prior to the study. Each panelist received a packet of information containing a description of the fragrance classes and reference identification. In addition, four reference kits were shared among panelists. The panel went through six 1.5-hr orientation sessions during which all fragrance categories (citrus, fruity-non citrus, sweet, spicy, floral, aldehydic, ozone marine, green, woody, resin-pine, camphor-mint, herbaceous, moss/chypre, and leather-musk) were discussed. Attributes, definitions, and references were discussed and refined following procedures for lexicon development (Caul, 1957; Civille and Lyon, 1996; Heisserer and Chambers, 1993; Lotong et al., 2000). During the six sessions, the panelists also smelled the fragrances in the test, and, by the end of orientation, all fragrances that were to be included in the test had been sampled at least once. At the end of the last orientation session, a ballot had been developed for use during the rest of the study.

Panel 3: Untrained consumer panel with no experience in descriptive evaluation.

Because of the nature of Panel 3, no orientation session was scheduled. A ballot was defined for fragrance evaluation, including hedonic ratings, as well as descriptive terms and image / association statements. For the sensory characteristics, an adjective checklist consisting of nine sensory attributes was used. The nine descriptors resembled closely previously developed lists of fragrance categories (Civille and Lawless, 1986; Jeltema and Southwick, 1986; Jellinek, 1990; Lawless, 1999). Panelists were asked to rate the fragrances for the attributes: herbal, floral, citrusy, fruity, green, woody, minty, sweet and spicy on a scale from 0 (not at all) to 5 (extremely).

Test design and sample evaluation

Panel 1: Highly trained panel with extensive experience in the product category.

Eleven 45-min sessions were conducted: four samples were evaluated per session, following a randomized design for two replications, with a replication of all fragrances

being completed before the second replication was started. The panel used the Spectrum™ descriptive analysis method (Meilgaard et al., 1999). Intensity scores for each attribute were rated on the Spectrum™ universal 15-point numerical scale (from 0 = none to 15 = extremely strong, with 0.1-point increments), using consensus balloting.

Panel 2: Highly trained panel without prior experience in the product category.

A total of 15 sessions lasting either 1.5 hr or 2 hr were scheduled. The panel used a modified Flavor Profile Method (Caul, 1957) adapted to odors only to evaluate the 22 fragrances. Three replications were conducted, following a randomized block design design, with replication as the blocking structure. A replication was completed before another began. Individual ratings were obtained: an intensity score was given to each fragrance category (citrus, floral, herbaceous…) using a 15-point numerical scale (from 0 = none to 15 = extremely strong, with 0.5-point increments). Within a category, each subcategory was rated using a 3-point categorical scale, with 0 meaning 'not present', 1 meaning 'present in small quantity' and 2 meaning 'most present'.

Panel 3: Untrained consumer panel with no experience in descriptive evaluation.

Each respondent in Panel 3 committed to evaluate seven to eight fragrances per session over the course of three sessions. Each session lasted 1 hr. Testing occurred in a well ventilated area. It was determined during a preliminary study – both by examining data consistency and by asking participants – that seven to eight evaluations per 1-hr session constituted an adequate number and did not lead to panelist fatigue or a reduction in concentration. The order of fragrance presentation was randomized for each respondent following 22*22 Latin square designs. Samples were presented monadically with at least 1 min of resting time between samples to minimize the risk of lingering fragrance influencing subsequent assessments and increased olfactory fatigue. By the end of the 3 sessions, each respondent had evaluated all 22 odorants in the study once.

Data analysis

Data for each panel were analyzed separately. For each panel, a principal component analysis (PCA) using data averaged across replications for main fragrance categories

(Panel 1), panelists and replications for main fragrance categories (Panel 2), and panelists only (Panel 3) was performed using the Unscrambler statistical software (Camo, 2004). Additionally, in order to compare results obtained with similar panel size between the two descriptive panels and the consumer panel, two subsets of 10 respondents each were randomly selected from Panel 3A and Panel 3B. A PCA was performed on these two data sets.

Additionally, two partial least square regression analyses (PLS2) were performed using the Unscrambler (Camo, 2004). The first one attempted to relate data from Panel 1 to data provided by Panel 2, the second related data from Panel 3 to data from Panel 2. All variables were first standardized and centered to eliminate differences associated with scaling.

RESULTS

Comparison of the lexicons used by the three panels

The lexicons developed by Panel 1 (trained with experience) and 2 (trained without experience) are presented in Appendix 1A and Appendix 2A. Interestingly, the two descriptive ballots did not differ much. Most main categories were similar and were further divided into rather similar subcategories. For example, the two panels identified floral, citrus, aldehydic, fruity, spicy, sweet, woody, green, and ozone marine as main fragrance categories. The herbaceous category defined by Panel 2 grouped herbaceous floral such as lavender notes and dried herbs and was therefore comparable to the fougère category defined by Panel 1 and subdivided into lavender and moss subcategories. Similarly, the animal category defined by Panel 1 was identified as a leather-musk category by Panel 2. Slight differences in terminology could, however, be observed: Panel 2 combined the two categories pine and resinous into a resin-pine main category, whereas Panel 1 kept them as two separate categories. Additionally, the camphor mint category present in the terminology developed by Panel 2 did not have a counterpart for

Panel 1. Such similarity in lexicons from different panels also was noted by Lotong et al. (2002) for the descriptive evaluation of orange juice.

Although the terminology determined for the untrained panel covered most of the main categories defined by the trained panels, some aspects of fragrance evaluation, such as aldehydic, ozone marine or animal/musk did not figure in the list of attributes evaluated by untrained consumers. Some potentially consumer-friendly terms such as musky, and ocean-like could be included in further studies when trying to compare sensory perceptions of consumers and experts. However, concepts such as aldehydic might be difficult to grasp and untrained individuals might find them hard to evaluate.

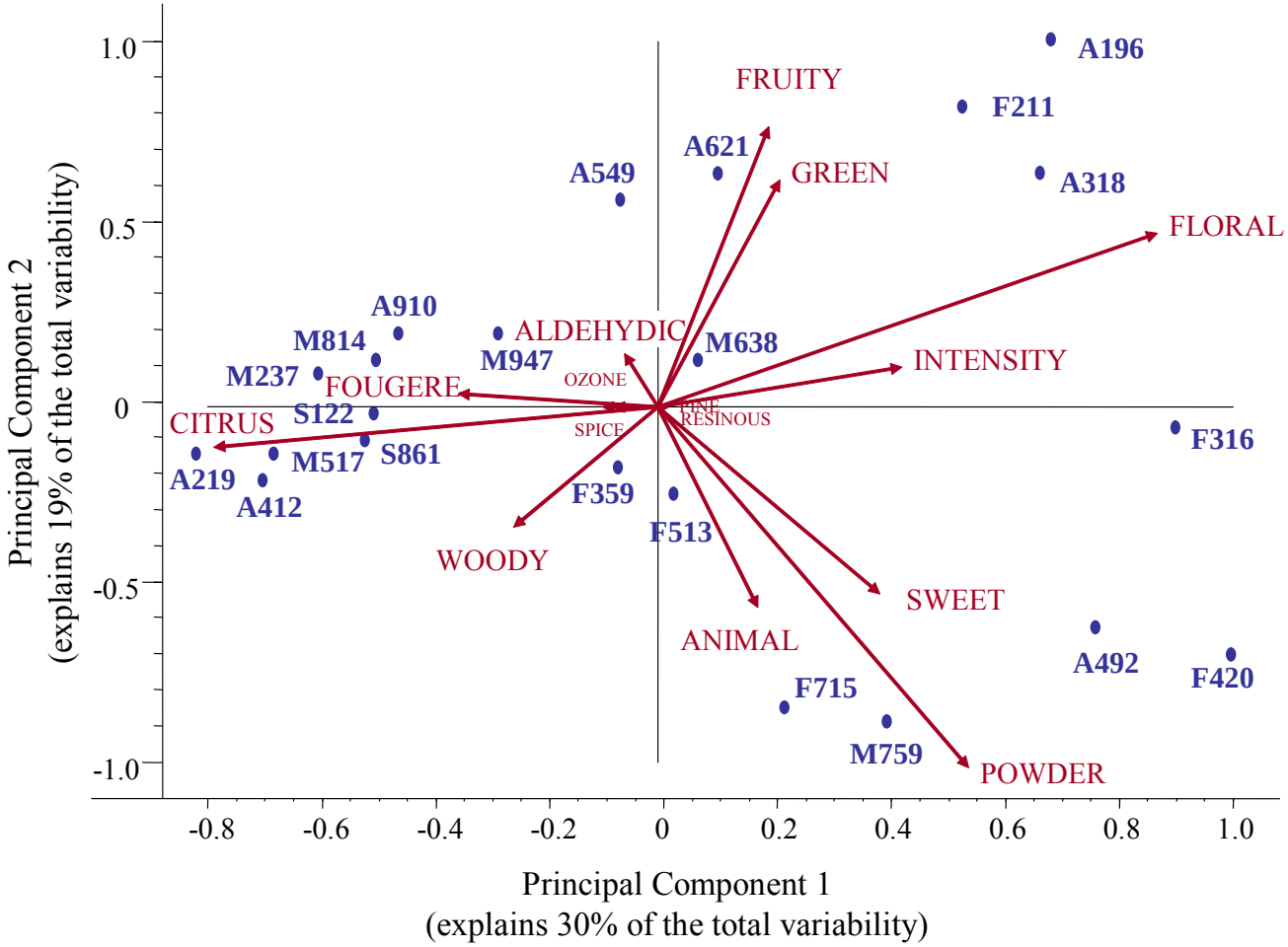
Beyond identifying and defining main fragrance categories, the two trained panels further detailed each of the categories. Within a main category, the two panels also seemed to have reached consensus. For example, the citrus category was further divided into lime, lemon, bergamot, grapefruit and orange subcategories. Panel 1 also added tangerine and Panel 2 added peel. Identically, the flower category was subdivided into the rose, white flower, muguet, violet and other floral (hyacinth, carnation…) subcategories by both panels, with Panel 2 also identifying sweet and spicy floral as two additional subcategories. The level of detail of the terminology developed by the two panels was also similar, although some categories had slightly more detail for one panel than the other, e.g., Panel 1 detailed the green category to a greater extent than Panel 2, whereas Panel 2 identified more woody-nutty subcategories than Panel 1.

Comparison of the sensory characteristics of the fragrances described by the three panels

Individual sensory profiles by panel are presented in Appendix 5.

Panel 1: Highly trained panel with extensive experience in the product category.

Principal component analysis of Panel 1 data indicated that the first four principal components (PC) explained 70% of the total variability of the data (Figures 1 and 2). With the exception of samples 759 and 638, all masculine fragrances obtained lower scores on PC1 than did the feminine fragrances. In general, masculine fragrances were



All samples are identified by a letter and a 3-digit code.

A = olfactory accord
F = feminine fragrance
M= masculine cologne
S = shared fragrance

FIGURE 1.
Map of the first and second principal components obtained using data from Panel 1.
(Trained, with experience, n = 7)

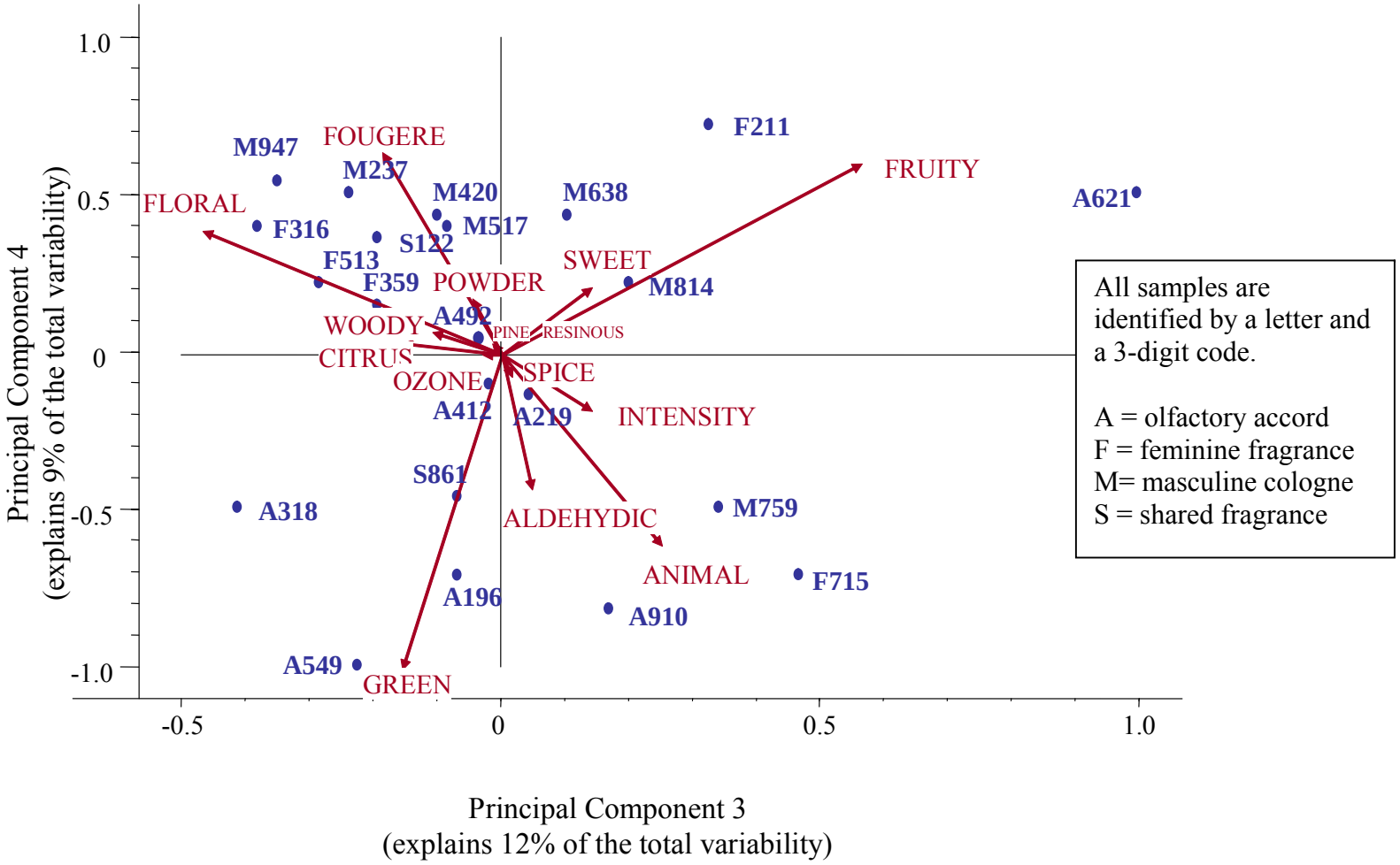


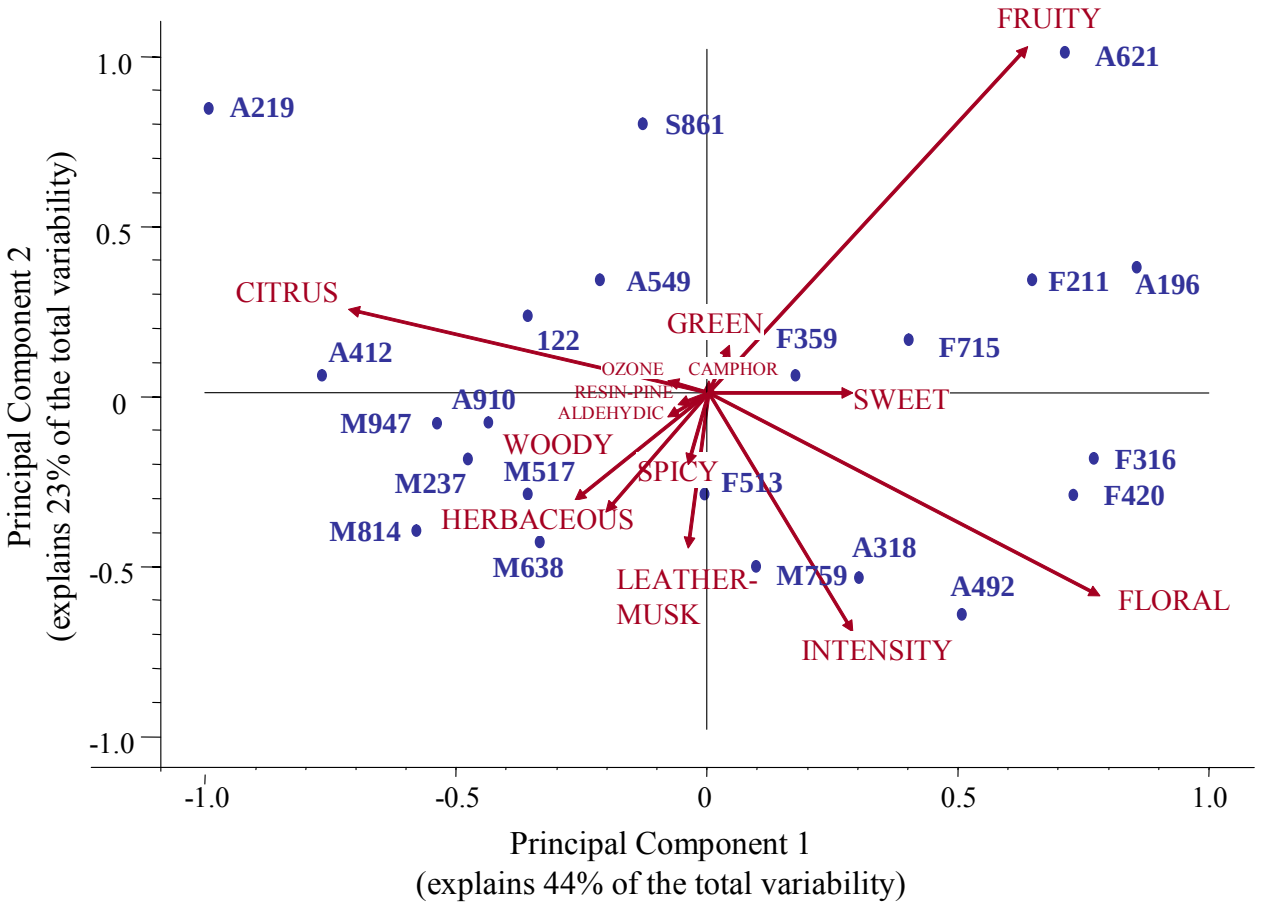
FIGURE 2.
Map of the third and fourth principal components obtained using data from Panel 1.
(Trained, with experience, n = 7)

associated with citrus, woody, and fougère notes, whereas feminine fragrances were higher in fruity, floral, and sweet notes overall. Additionally, groups of fragrances differentiated along PC2. Fragrance 211 was a floral-fruity fragrance and grouped together on the upper right hand corner of the map with fruity and floral olfactory accords. Fragrances 316 and 420 had lower ratings on PC2 and high ratings on PC1 and combined high floral, sweet, and powdery notes. Fragrance 715 was most similar to the masculine fragrance 759 and grouped with the musky accord (492). These samples had very low scores on PC2 and medium to high scores on PC1. They were characterized by sweet, powdery, animal notes characteristic of the oriental fragrance family. Feminine fragrances 359 and 513 had medium to low scores on both PC1 and PC2. These fragrances combined light floral and citrus notes with woody powdery scents. The two shared fragrances (122 and 861) grouped with masculine fragrance 517 close to the citrus and spicy woody olfactory accords (219 and 412). These five samples were characterized by high citrus notes, some fougère (except for 861) and some woody and powder notes. Last, all other masculine fragrances grouped together on the medium-high left panel of the map and were associated with citrus and fougère notes, except for 638, which combined more fruity and citrus notes. The fragrance groupings along these two dimensions of the sensory space were consistent with the descriptions provided in Table 1, resulting from the perfume classification developed by Edwards (2004). Principal Component 3 and PC4 explained an additional 12% and 9% of the total variability of the data, respectively. Principal Component 3 opposed fruity and floral notes, and PC4 contrasted fougère, fruity, and floral notes with animal, aldehydic, and green sensory attributes. Interestingly, on the map prepared from these two components (Figure 2), most fine fragrances grouped in the upper-left-hand-corner, with the exception of fragrances 861, 759 and 715. Most olfactory accords tended to differentiate from fine fragrances on these two dimensions: sample 621 is highly fruity, 910 is highly aldehydic, 549 and 196 very green, and 318 highly floral. Among the fine fragrances, 861 had a high green note, 715 and 759 had the highest animal notes among all the fragrances tested. Olfactory accords 219, 412 and 492 grouped in the middle of the map, but differentiated from fine fragrance on later dimensions of the sensory space: 219 had high citrus notes and had the lowest ratings on PC5 (8% of the variability); 412 had the highest

scores on PC5 and lowest on PC6 (7% of the variability) and tracked with woody notes. Last, 492 had also one of the lowest ratings on PC6, which is strongly negatively correlated to powdery notes (map not shown). These last four components (PC3, 4, 5 and 6) might thus be associated to some degree with a measure of fragrance balance, i.e., the degree to which the perception of individual olfactory notes appear blended and present at equal intensities.

Panel 2: Highly trained panel without prior experience in the product category.

Principal component analysis of Panel 2 data indicated that the first three principal components explained 77% of the total variability of the data. The corresponding sensory maps are presented in Figures 3 and 4. Principal Component 1 explained 44% of the variance and contrasted fruity and floral notes and, to some extent overall intensity and sweet with citrus, woody and herbaceous tones. Results were similar to those of Panel 1, with feminine fragrances grouped together and associated with higher ratings on PC1, whereas masculine colognes (with the exception of fragrance 759) consistently had lower ratings on that PC, and shared fragrances were midrange. Principal Component 2 (23% of the variance) was positively loaded with fruity and negatively loaded with floral, overall intensity, leather/musk, herbaceous, and woody notes. Similar to Panel 1, the sensory map of PC1 and PC2, allowed for further identification of groups of fragrances. PC3 explained an additional 10% of the total variability of the data, and opposed ozone and aldehydic characteristics to citrus, fruity, and herbaceous notes and overall intensity. This last PC also provided relevant information concerning the classification of fragrances, and allowed for better discrimination among the groups of fragrances. Interestingly, Panel 2's fragrance groupings were comparable to those of Panel 1 and resembled the classification provided in Table 1. Fragrance 211 was perceived as floral, fruity, and sweet and was grouped together with fruity and floral-green olfactory accords (621 and 196). Fragrances 316 and 420 had lower ratings on PC2 and high ratings on PC1, and combined high floral, sweet, woody, and slightly musky notes. Fragrance 715 was perceived by Panel 2 compared with Panel 1 as less similar to the masculine fragrance 759, yet the two fragrances positioned in similar locations on the



All samples are identified by a letter and a 3-digit code.

A = olfactory accord
F = feminine fragrance
M= masculine cologne
S = shared fragrance

FIGURE 3.
Map of the first and second principal components obtained using data from Panel 2.
(Trained, no experience, n = 7)

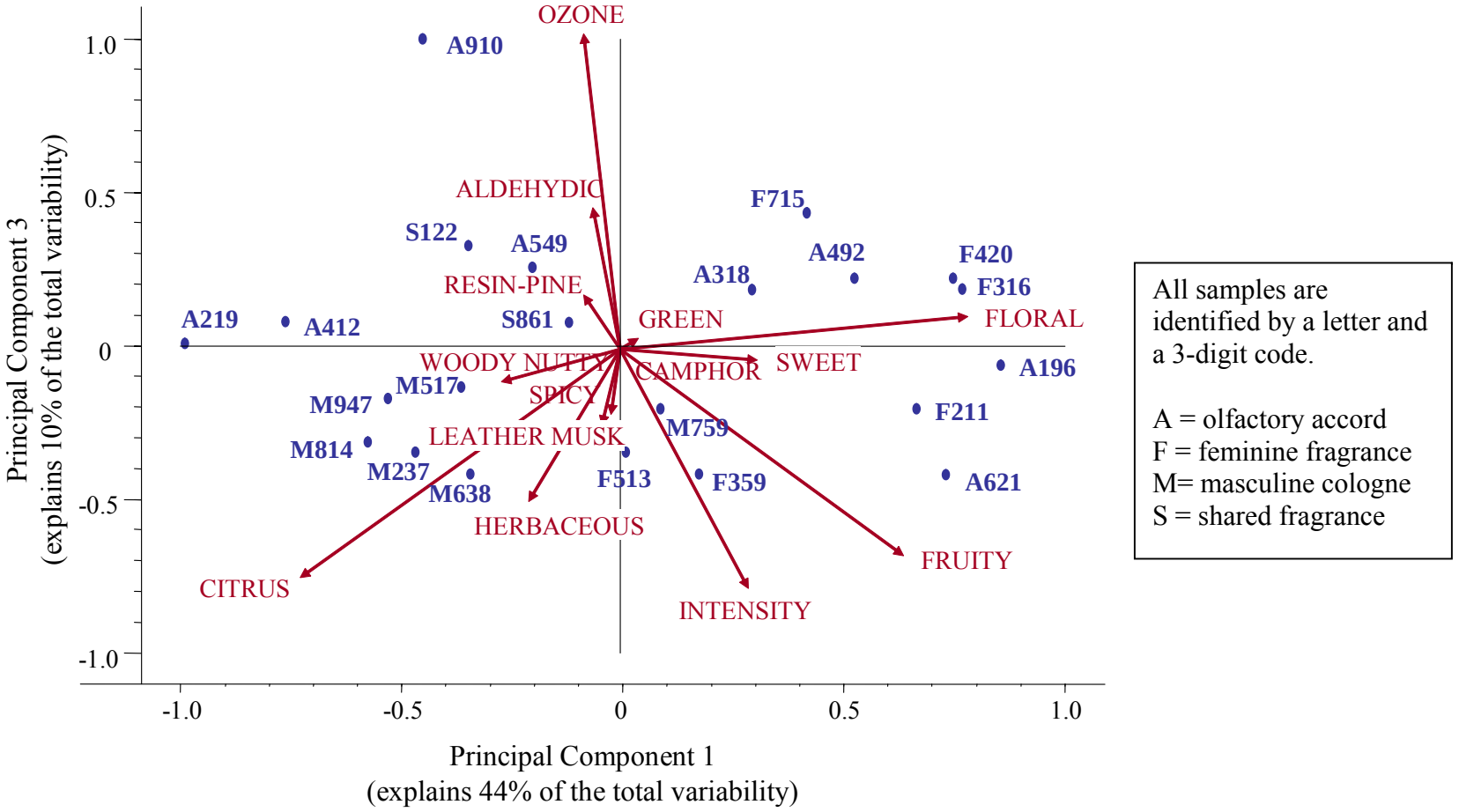


FIGURE 4.
Map of the first and third principal components obtained using data from Panel 2.
(Trained, no experience, n = 7)

two sensory maps (Figures 3 and 4) and were associated with musky and floral accords (492 and 318). Samples 715 and 759 were further characterized by medium floral notes combined with sweet, musky, and somewhat spicy undertones. Feminine fragrances 359 and 513 also grouped together and were associated with light floral, citrus, and herbaceous notes with light spice. The two shared fragrances (122 and 861) grouped with masculine fragrance 517 and the herbal accord (549) close to the citrus and spicy woody olfactory accords (219 and 412). Samples 122, 861 and 517 were characterized by high citrus, low floral, medium herbaceous, and light green and ozonic notes. Last, all other masculine fragrances grouped together and were associated with high citrus and fougère notes, combined with woody undertones and very low floral notes. Panel 2 also discriminated between fine fragrances and olfactory accords in a manner comparable to the findings of Panel 1. Accords 219, 412, 621, and 910 were already discriminated from the fine fragrances in the three first principal components, and 219, 910, 318, 412, 621 and 492 were further differentiated from fine fragrances on PC4 (9% of the variability) and PC5 (7% of the variability) (data not shown).

Panel 3: Untrained consumer panel with no experience in descriptive evaluation.

Principal component analysis of Panel 3A (n = 156 untrained women) data indicated that the two first principal components explained 91% of the total variability of the data. The sensory map for these data is presented in Figure 5. Principal Component 1 explained 67% of the variability and contrasted citrus, fruity, sweet, and floral notes with woody and spicy tones. Principal Component 2 (24% of the variance) was positively loaded with floral and sweet attributes and negatively loaded with citrus, woody, and spicy notes.

Principal component analysis of Panel 3B (n = 158 untrained men) data indicated that the first two principal components explained 89% of the total variability of the data. The sensory map for these data is presented in Figure 6. Principal Component 1 explained 74% of the variability and was positively loaded with fruity and citrus notes. Principal Component 2 (15% of the variance) contrasted floral, sweet, and herbal notes with notes with cool-minty, spicy, and citrusy tones. Both figures showed similar

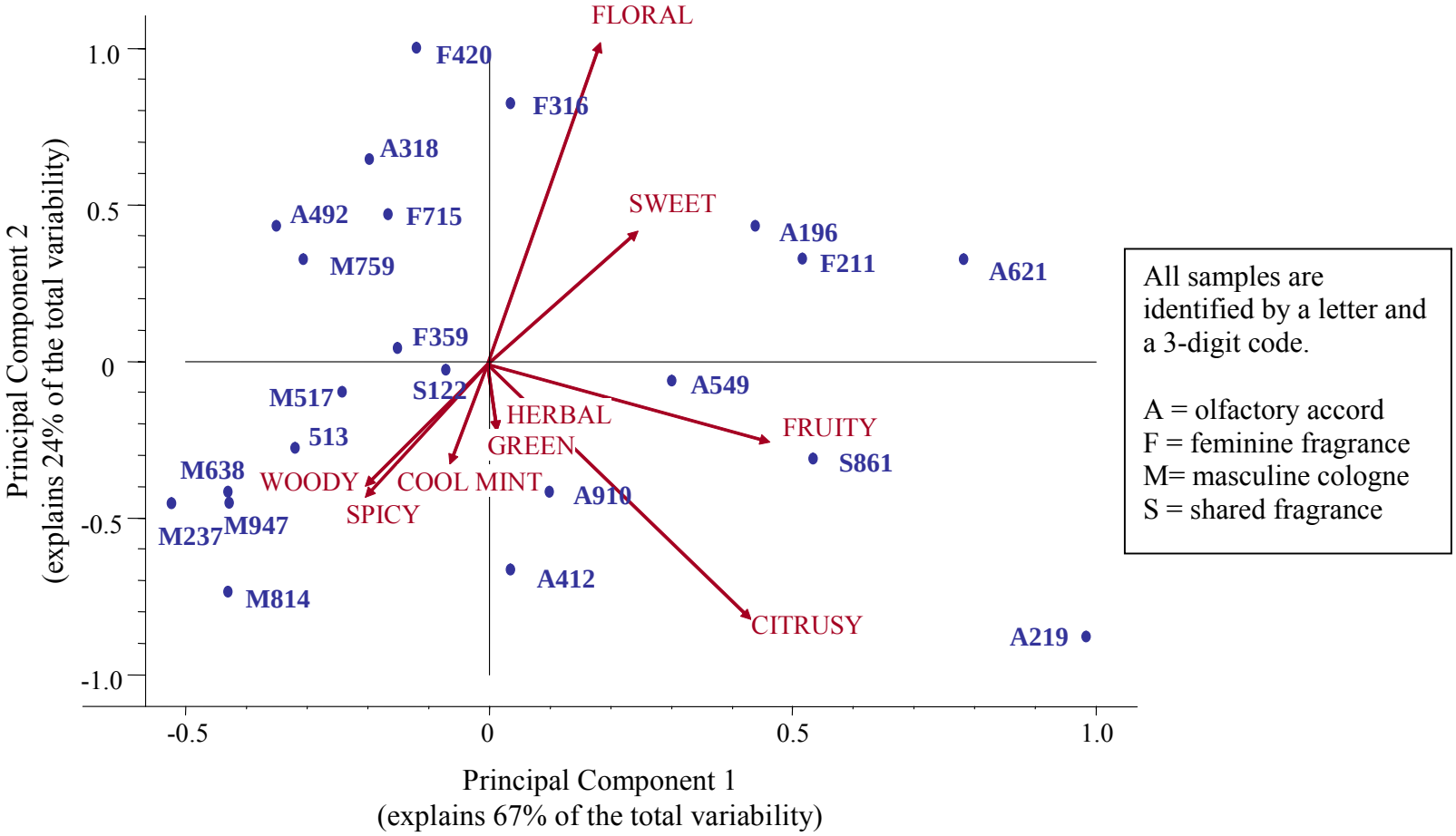


FIGURE 5.
Map of the first and second principal components obtained using data from Panel 3A.
(Untrained women, n = 156)

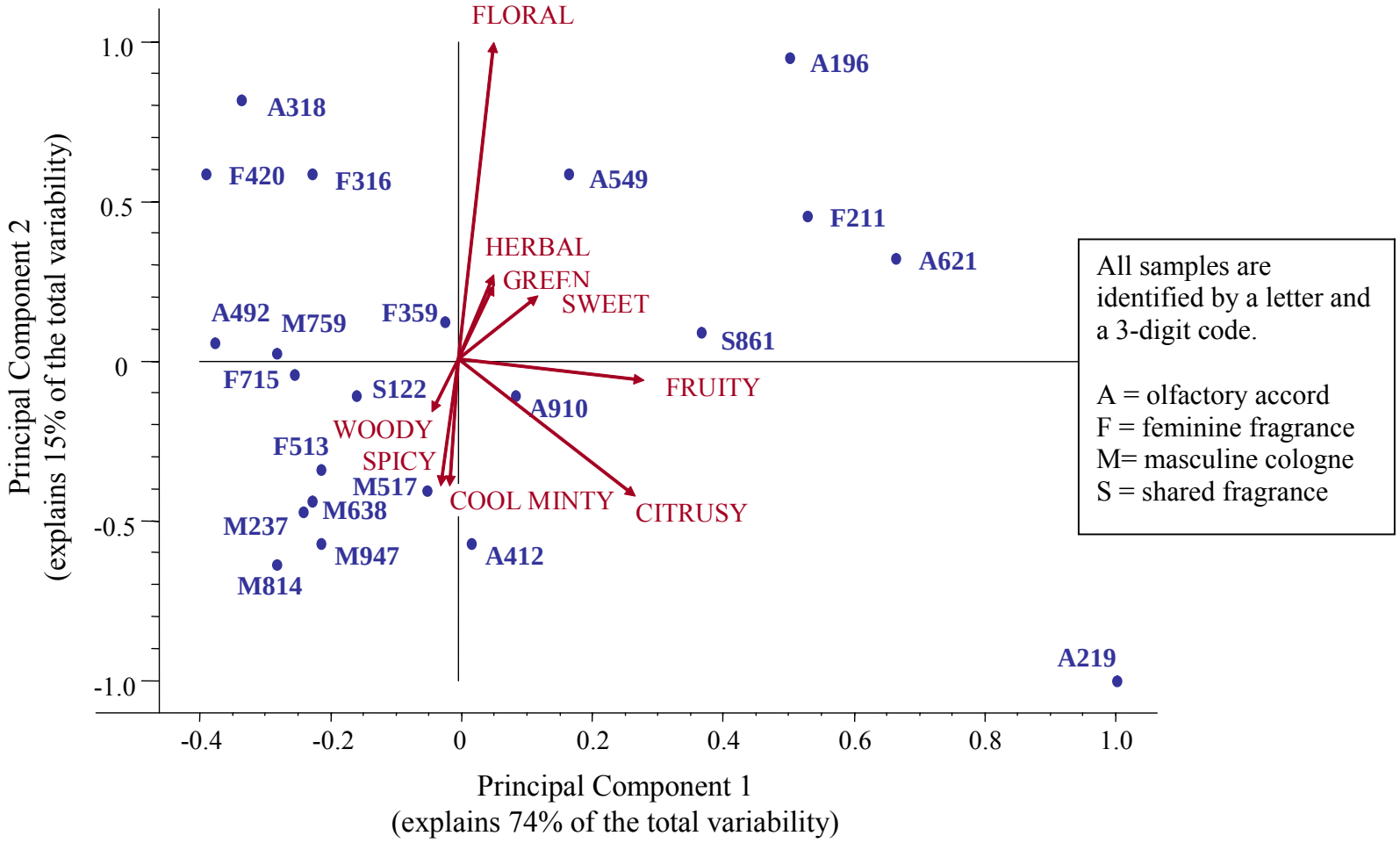


FIGURE 6.
Map of the first and second principal components obtained using data from Panel 3B.
(Untrained men, n = 158)

groupings of fragrances, independent of the gender of the panelists. These groupings were consistent with those generated by the two trained panels, although the data from the subsets A and B of the untrained panel showed more overlap between groups of fragrances. For example, important overlap occurred between feminine fragrances (359 and 513) and shared/masculine fragrances (517, and 122, 861), which were further apart and perceived as fruitier when evaluated by trained panels. Overall, however, the clustering of fragrances from panels 3A and 3B was very similar to that of the trained descriptive panels, especially considering the fact that the descriptive vocabulary provided to the untrained consumer panel did not cover some aspects of the fragrances' sensory properties, such as aldehydic or animal/musky.

Principal component analyses of randomly selected subsets of Panels 3A and 3B also yielded interesting findings. Data from the subset of Panel 3A generated a sensory map in which the two first principal components explained 84% of the total variability of the data (Figure 7). Principal Component 1 explained 54% of the variability and was positively loaded with citrusy and fruity notes. Principal Component 2 (30% of the variance) was positively loaded with floral and sweet attributes and negatively loaded with cool mint, spicy, woody, and green notes. Similarly, PCA performed on the data from a randomly selected subset of Panel 3B indicated that the first two principal components explained 76% of the total variability of the data (Figure 8). Principal Component 1 explained 59% of the variability and was positively loaded with fruity and citrus notes. Principal Component 2 (15% of the variance) contrasted floral, sweet, and herbal notes with notes with cool-minty, spicy, and citrusy tones.

Interestingly, these two maps yielded dissimilar categorizations from those of the whole panels 3A and 3B. A general grouping of samples 621, 196 and 211 into the fruity floral category, as well as an identification of outliers such as 219 characterized by very high citrus notes, was consistent with the results from whole panel. However, further categorization of fragrances into feminine vs. masculine fragrances was only slightly achieved, and a great deal of overlap occurred between these two categories. No similar subgroups of fragrances, such as those obtained using data from the untrained consumer panels or from the two trained descriptive panels were found.

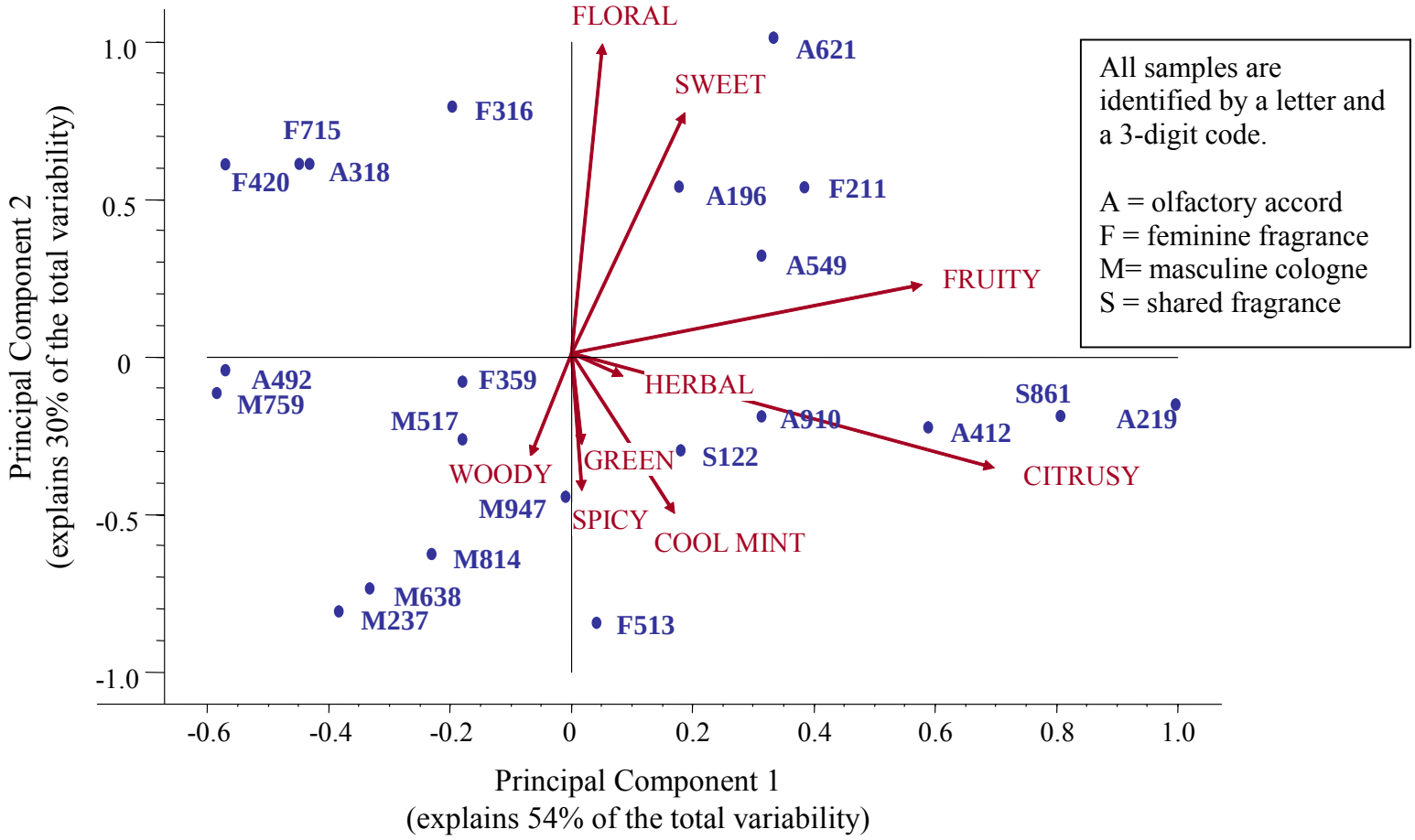


FIGURE 7.
Map of the first and second principal components obtained using data from Panel 3A.
(Untrained women, n = 10)

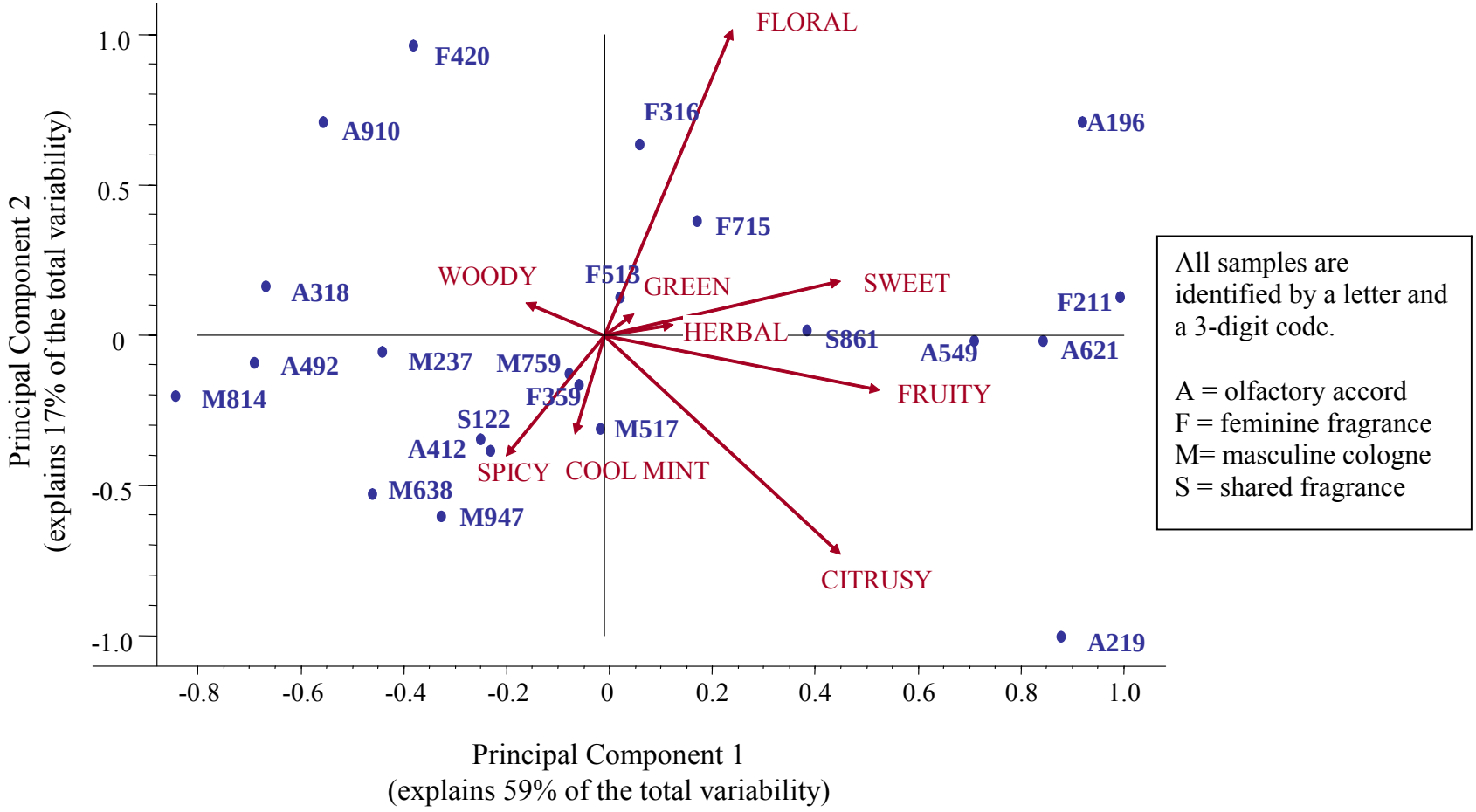


FIGURE 8.
Map of the first and second principal components obtained using data from Panel 3B.
(Untrained men, n = 10)

Comparison of the use of the terminology between trained and untrained panels

Panel 1(trained, experienced) vs. Panel 2 (trained, inexperienced).

Results from PLS regression indicated very strong agreement between the results obtained from the two trained descriptive panels (Figures 9 and 10). The analysis indicated that the first four PLS factors explained approximately 56% of the data from Panel 1 and 53% of the data obtained from Panel 2. Each of the PLS factors explained similar amount of the variability for the two panel, corroborating the extent of agreement between the two panels. Additionally, overall, loadings for the descriptive terms from Panel 1 were similar to those for the corresponding terms from Panel 2. This indicated agreement in the way the two panels used the terminology that they had developed initially.

Panel 2 (trained, inexperienced) vs. Panel 3 (untrained, inexperienced).

Results from the PLS indicated some agreement between the results obtained from panels 2 and 3 (Figure 11). The analysis indicated that the first two PLS factors explained a total of 70% of the variability of the data generated by Panel 3 and 44% of the variability of the data generated by Panel 2. Only a small amount of the variability in the descriptive data provided by the trained panel is necessary to explain most of the variability of the data obtained with the untrained panel. This indicates that the untrained panel did not differentiate among fragrances as skillfully as the trained panel. Additionally, overall, loadings for the descriptive terms from Panel 2 were only slightly correlated with those for the corresponding terms from Panel 3. This indicated a lack of agreement in the way the two panels used the terminology.

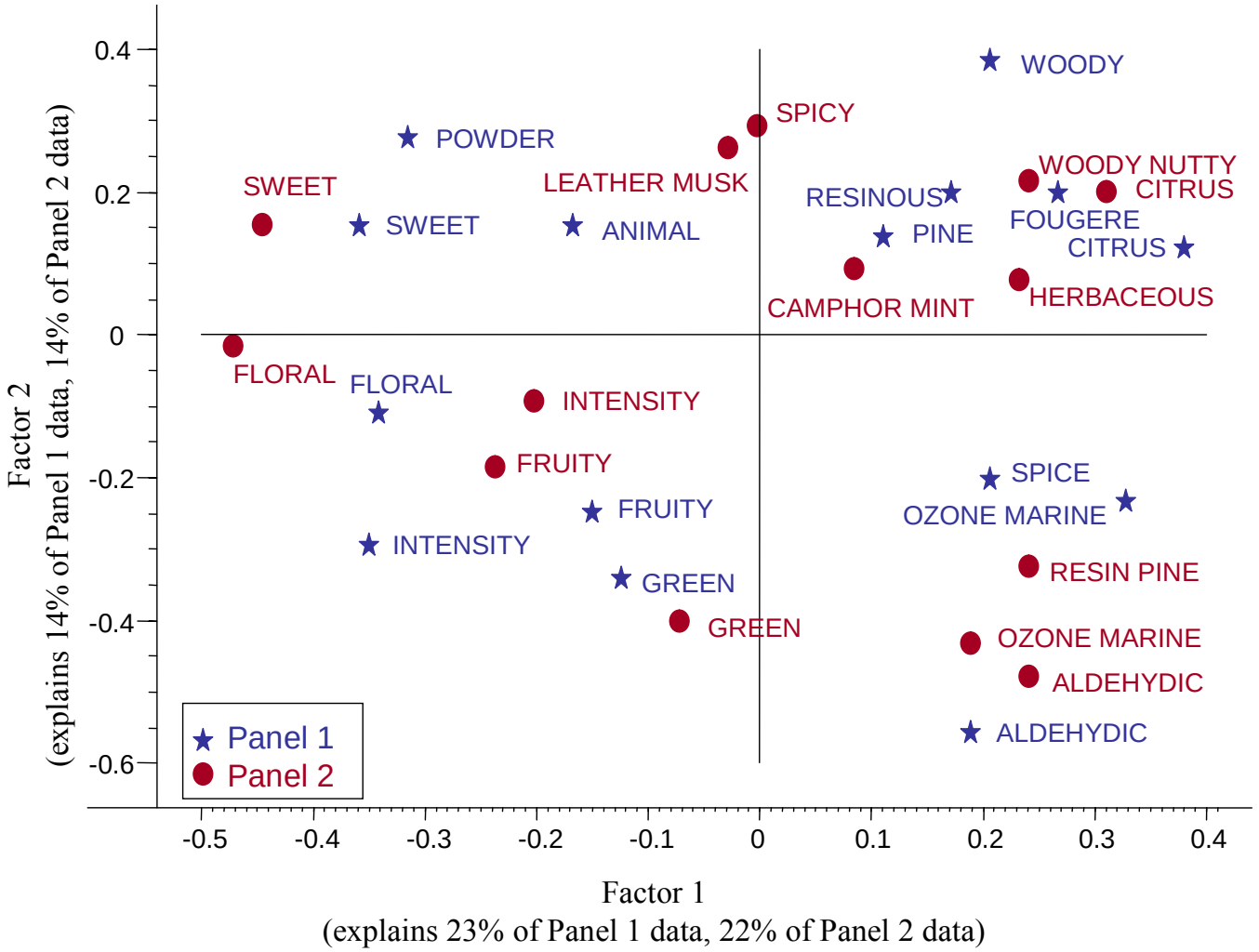


FIGURE 9.

Map of the first and second factors obtained with the PLS regression relating data from Panel 1 (Trained, with experience, n = 7) to data from Panel 2 (Trained, no experience, n = 7)

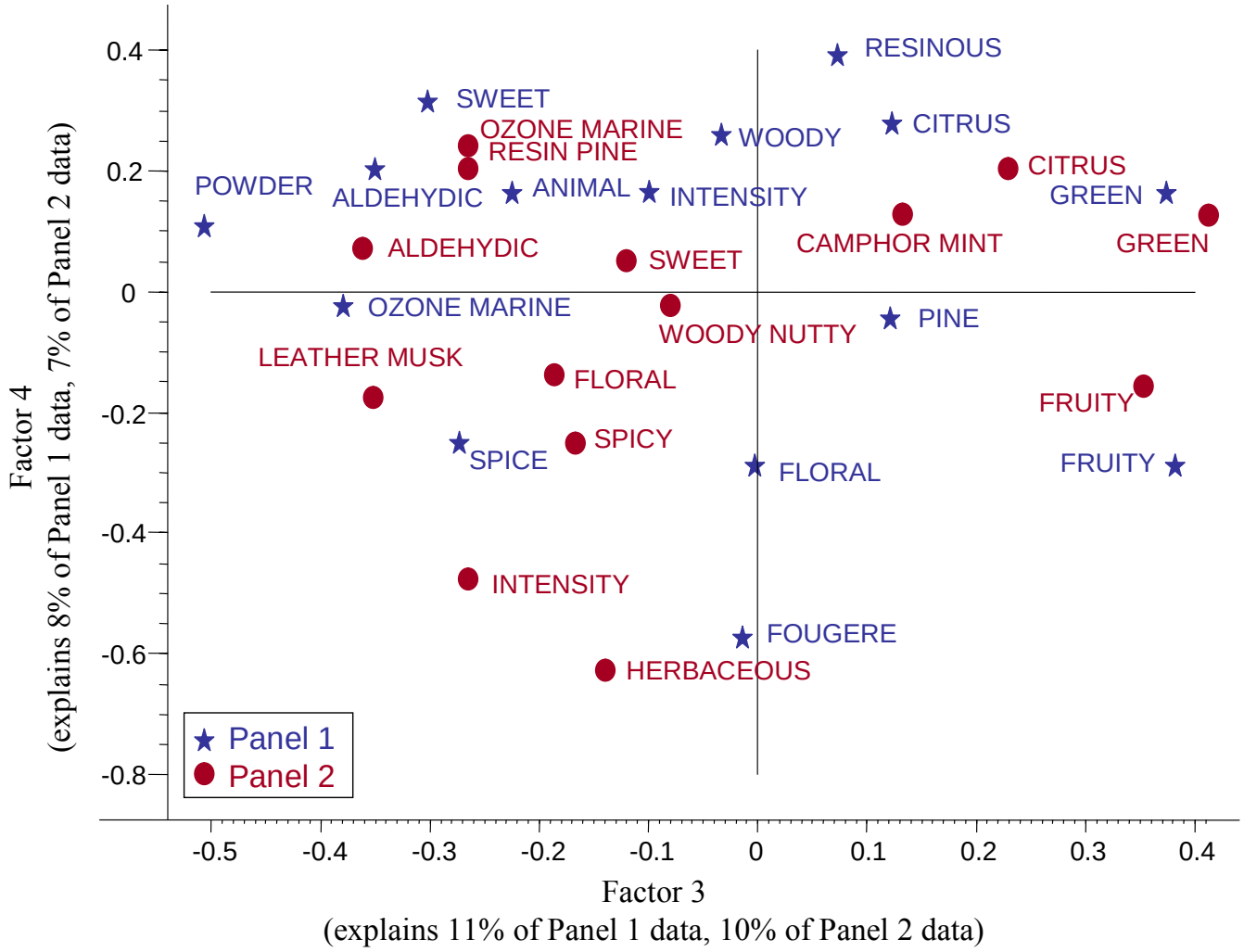


FIGURE 10.

Map of the third and fourth factors obtained with the PLS regression relating data from Panel 1 (Trained, with experience, n = 7) to data from Panel 2 (Trained, no experience, n = 7)

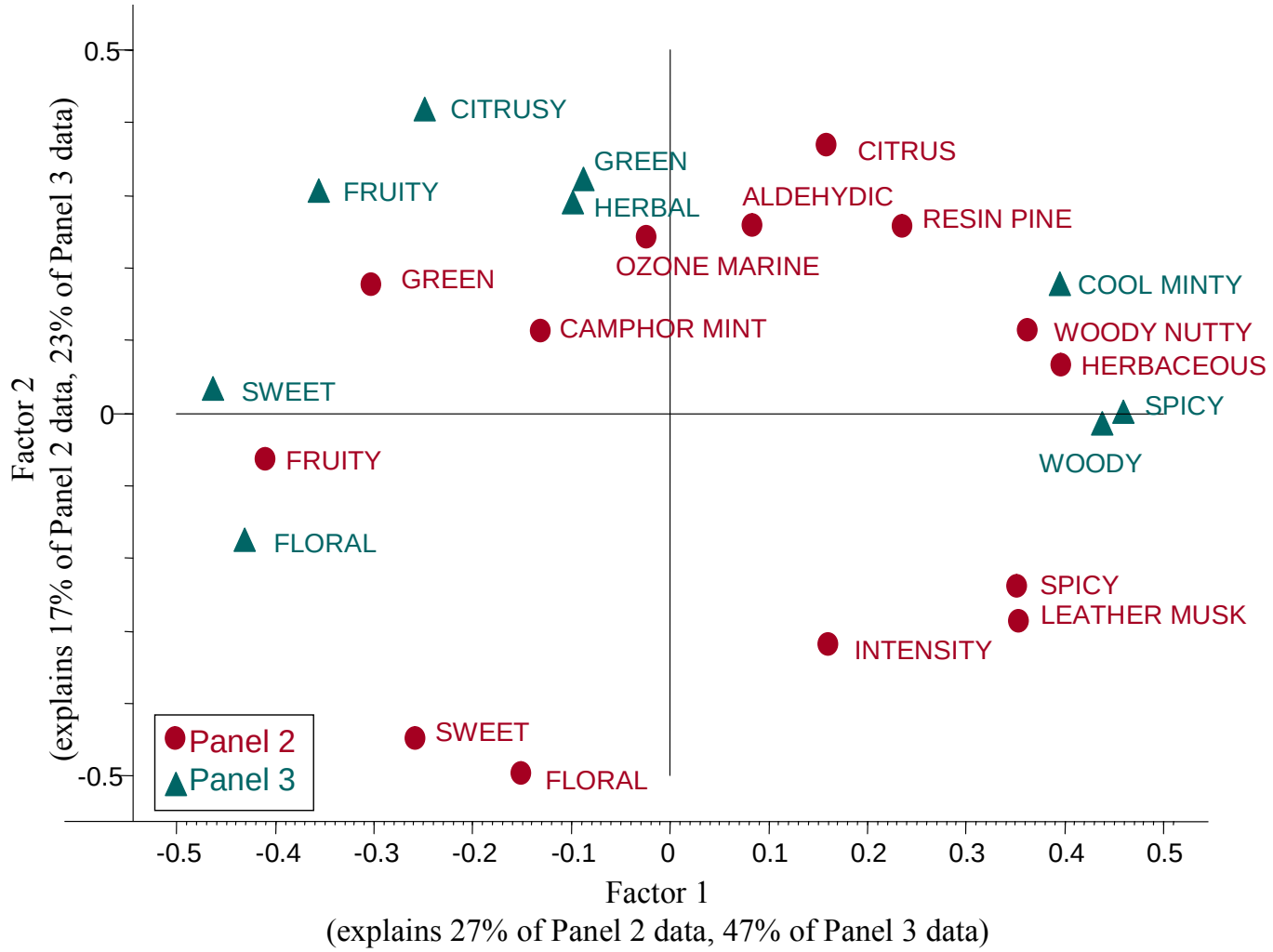


FIGURE 11.

Map of the first and second factors obtained with the PLS regression relating data from Panel 2 (Trained, no experience, n = 7) to data from Panel 3 (Untrained, n = 314)

DISCUSSION

The terminologies independently developed by the two trained panels were similar both in the identification of key sensory attributes for the description of fragrances and in the level of detail needed for an appropriate lexicon. The terminology provided to the untrained panel was less detailed and did not cover some of the main aspects of fragrance evaluation. Main categories such as aldehydic, powder, or animal were not represented in this lexicon. Although this might constitute a limitation of this study in terms of fully comparing the accuracy of sensory profiles generated by trained and untrained panelists, it is important to note that, even if some of the terms were omitted for the consumer panel, the grouping of fragrances was rather similar with all three panels.

Overall, the number of principal components needed to explain at least 70% of the data variability increased with panelist training. All four subsets of the group of untrained consumer panelists used two principal components, whereas trained panelists needed at least three principal components to express the same percentage of the variability of the data. This suggests that trained descriptive panels differentiated between fragrances based on more underlying sensory dimensions than did the untrained consumer panel. Additionally, when the profiles generated by all panels were examined closely, Panel 1 tended to generate more specific ratings, and discriminated more across categories, whereas the ratings generated by Panel 2 more often were spread across several categories. Panel 3's ratings were less specific and discriminating. For example, sample 219 was defined as citrus (orange mostly, with tangerine and slight lime notes) and sweet caramelized. Panel 2 characterized the same sample as citrusy (orange and lemon mostly, with peely and lime undertones), sweet (fruity sweet, mostly), with some floral, fruity and ozonic notes. Panel 3 gave intensities greater than 1 on a 5-point scale for most attributes with citrus, fruity and sweet obtaining the highest ratings, followed by floral, herbal and cool-minty. Although these differences might result from slightly different levels of training, they might also result from the evaluation technique used: Panel 1 used a consensus method for sample rating and averages were computed across two

replications only, while Panels 2 and 3 used individual measurements and averages for these panels were computed across replications and panelists (Panel 2) and panelists (Panel 3), thus resulting in somewhat fuzzier fragrance profiles.

Interestingly, some aspects of fragrance categorization were commonly found in all panels. Independent of size and level of training, sample 219 was consistently identified as an outlier defined by very high citrus notes. All panels identified samples 196, 621, and 211 as a cluster of fragrances, characterized by fruity, floral, and sweet notes, with some underlying green undertones, and all panels associated 621 with the highest fruity notes and consistently gave a high score to the green character of sample 196.

Further grouping and characterization of fragrances tended to be fuzzier, however, and depended highly upon panel size and training. Results from panel 3 suggest that a random subset of 10 untrained consumers yielded dissimilar grouping of fragrances to that provided by a highly trained panel, whereas a more numerous untrained panel ($n>150$) performed similar to a trained panel and categorized fragrances accordingly. This suggests that, when performing descriptive tasks, an untrained panel needs to be of considerably greater size than a trained panel, to obtain the same discriminative power across products. Identically, the comparison among the three panels showed that the more extensive the training and the experience in the product category, the less overlap among fragrance groups and the greater the consistency with fragrance industry classifications. Therefore, training increased the ability of panelists to describe the sensory properties of products accurately, and to discriminate consistently among products. However, by increasing the untrained panel size, one can compensate to some degree for a lack of training. Figure 12 illustrates the effect of panel size and level of training on a panel's ability to discriminate among products.

Untrained panelists: the distribution is diffuse, untrained panelists do not discriminate very well. The number of panelists should be increased in order to preserve the ability to discriminate between products.
N = 100 has been shown to be an adequate number of participants to reliably provide good discriminative ability

Trained panelists, i.e., panelists that have had at least 200 hours of training, are believed to be better discriminators than consumers. The number of panelists necessary to observe actual differences between products is thus less important. A group of 7-12 panelists has been generally accepted as an adequate number.

Experts: if the training and experience increases, then the distribution is even narrower and 5 persons may be able to discriminate among products. However, this is rarely accepted because the amount of training is very high and individual differences may have an impact on the results.

Specialist: As the level of expertise increases, the discriminative abilities are at their highest. In the field of fragrances, this can be achieved by the perfumer, also known as the 'Nose'.

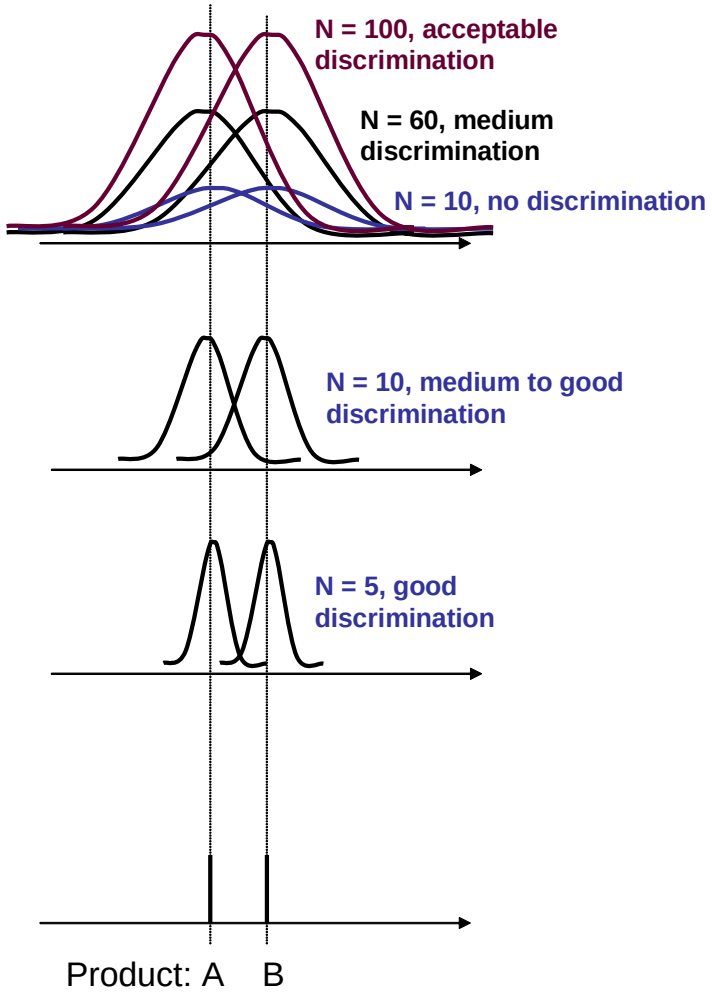


FIGURE 12.
Influence of panel size and level of training on a panel's ability to discriminate between products A and B.

Additionally, results from the untrained panel suggested that, compared to the effect of size and training, gender differences were minimal. Although previous studies have shown differences in olfactory abilities between genders, with women generally performing better than men for the perception, recognition and naming of odor characteristics (Doty *et al.*, 1985; Vroon, 1997), our results showed that men and women tended to perform similarly on discrimination and categorization tasks for fragrances when provided with a descriptive lexicon. This might suggest that the differences in abilities of men and women to accurately describe scents might be a result of language dissimilarities as opposed to perceptual processes. Although the present study did not assess the ability of untrained panelists to describe sensory properties of fragrances in more details, the additional information provided by trained panels about the sensory properties of the fragrances can help further discriminate between fragrances within a group.

Lastly, results from the PLS regression analyses suggested that trained descriptive panels tended to differentiate fragrances on very similar sensory dimensions and to use descriptive terminology in a rather similar way. On the contrary, the untrained panel used the terminology in a different way than did the trained panels, although the untrained panel tended to group fragrances in a manner similar to that of the trained panels. This might be explained by the fact that the untrained panel was not provided with any definitions and/or references that explained descriptive terms and, therefore, had to use their own prior experiences as references.

CONCLUSION

The patterns of scent descriptions of olfactory accords and fine fragrances obtained by two highly trained panels were similar for most products, even though the panels used different descriptive analysis methods and varied in experience with the product category. These patterns also were comparable to those of an untrained panel, when the size of the panel was important enough. These results demonstrated that descriptive analysis using highly trained panels can result in objective, reliable, and consistent information and that this information closely approximates consumer

perceptions of products. This information is of great interest, especially with regard to the product category being tested. In fact, the field of fine fragrances has relied primarily on descriptions and classifications derived from the knowledge of perfumers and from their discussions with colleagues and associates. However, as stated by Thiboud (1991), "perfumes are intended for people who have nothing to do with this profession. Therefore the perfumer must keep the consumer in mind, i.e., the consumer olfactory perception." The present study therefore provides important evidence that trained panels might not only generate accurate descriptions that correlate well with classifications from perfumers (Edwards, 2004) but that also may be representative of the perceptions of consumers.

Additionally, highly trained sensory panels may provide researchers with reproducible, comprehensive, and thorough sensory profiles. With an untrained panel, such a level of detail in describing the scent properties could only be achieved by a very expensive and time-consuming process. Moreover, the use of detailed and objective terminology, with definitions and references, allows for better understanding of the actual properties of the scent. The profiles generated by trained panelists, if used for product improvement, might provide more actionable results than profiles provided by consumers, whose sensory descriptions must be interpreted very carefully, since consumers tend to use descriptive terminology quite differently than a descriptive panel and do not provide sound definition for the terms employed. The results of the present study thus favor the use of highly trained sensory panels when detailed profiles are needed, especially when studying relationships between sensory properties and other dimensions of perception, such as hedonic ratings and image associations. Detailed sensory profiles provided by highly trained panelists will then offer additional insights and further explanations as to why one product might be associated with a specific image or preferred over another product.

By developing their own terminology, sensory panels might describe products in a very detailed and specific way, uncover sensory dimensions that might not be defined otherwise, and provide reproducible and actionable results. Since these could very well drive more subjective associations and perceptions, such as acceptance, preference, and images, it seems important to use results from both trained descriptive panels and untrained consumers when one need to relate subjective ratings, e.g. hedonics, to

objective sensory dimensions. Therefore, trained and untrained panels should not be used interchangeably and the use of various types of panels must be weighed against the scientific and business needs.

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CHAPTER II.

INDIVIDUAL DIFFERENCES IN ATTITUDES AND BEHAVIOR TOWARD FRAGRANCES

ABSTRACT

A total of 318 respondents answered a survey on their attitudes toward fragrance and on the criteria influencing their choice for fine personal fragrance. The respondents also provided demographic information and completed two personality tests: the Mini-markers set (Saucier, 1994) and the self-monitoring scale (Snyder, 1974). The survey results were factor analyzed and dimensions of attitudes towards fragrance were defined. In an initial approach, a traditional view was followed, assessing the influence of demographic and personality variables on each of the factors generated by the survey. Age and gender had most influence on attitudes and behaviors. To a lesser extent, geographical area, frequency of fragrance usage, and personality also had some impact on attitudes, beliefs, and motivations for fragrance use. In another approach, five clusters of respondents were first defined based on their patterns of motivations and behaviors toward fragrance. The clusters not only differed in attitudes and behaviors, but also in their demographic and psychological makeup. The two methods were then compared and contrasted.

INTRODUCTION

The personal fragrance industry, with a US$22.4 billion global market, is a fast growing sector (estimated growth: 30% since 1997) within the household and personal care products industry. In opposition to the global trend, sales of women's fragrances and men's colognes have been decreasing in the United States over the past few years. The fragrance industry is reacting however, and, despite continuing consumer hesitance to spend, new products are developed increasingly with the goal of complementing consumer lifestyles. A clear-cut separation between fragrances for men, women, and teens continues to be observed, and the market for fragrances has become more and more segmented as a result. New ideas and concepts appear or are recycled to meet consumers' expectations, appeal to a wide diversity of fragrance wearers, and provide them with the emotional, social, and/or attractiveness benefits they desire. Fragrances that incorporate gourmand notes such as ginger, chocolate, or vanilla, combined with floral and warm undertones, are thought to provide a feeling of comfort. Light citrus fragrances advertise a mood enhancing energized feeling. Line extensions of already existing fragrances also constitute a new trend in the feminine fragrance market, with declinations of the same scent having heavier notes for evening or winter, and lighter notes for summer or day wear. Eau de toilette, perfume, body wash, soap, and other cosmetics, jewelry, and accessories represent only a few of the possible items that are now present in some fragrance lines, providing a more complete identity for the fragrance itself, while reinforcing the specific identity of the wearer.

In this constantly evolving market, introducing new scents becomes a struggle and a good understanding of consumers' needs and wants is critical for successful promotion of newly developed products. Current marketing research strategies focus on concept development and target audience, which might be defined by socio-demographics or attitudinal criteria. The survey presented in Part III chapter II of the present dissertation could be used in that framework either as a selection tool – for targeting a specific type of consumer based on their attitudes, behaviors, and selection criteria – or as an

informational tool – to provide additional insights about the attitudes, motivations and behaviors of the target audience when defined by socio-demographic criteria.

The present study focuses on fragrance choice and beliefs and attitudes toward fragrances. The effect of individual demographic and personality variables on attitudes toward fragrances is first discussed, providing an *a priori* hypothesis. A consumer segmentation approach with no *a priori* hypothesis is then discussed. The two methods are compared and contrasted, and marketing and advertising implications for the fragrance industry are discussed.

MATERIALS AND METHODS

Subjects

A total of 318 respondents completed the study. Respondents were screened prior to the study and disqualified if they reported any fragrance discomfort, anosmia or any other condition that might have affected their sense of smell. Subjects also had to wear fragrance at least twice a week in order to qualify for the study. Respondents were recruited in two locations (Manhattan, Kansas and Union Beach, New Jersey), selected based on their demographic information and equally divided into six age by gender categories (men 18-25 yrs; women 18-25 yrs; men 26-40 yrs; women 26-40 yrs; men 41-55 yrs; and women 41-55 yrs).

Evaluation Material

Measurement of individual differences:

Respondents were asked to answer a questionnaire consisting of demographic information – age, gender, frequency of fragrance usage – and of psychographics – Saucier's Mini-markers (Saucier, 1994) and self-monitoring scale (Snyder, 1974).

- The Mini-markers questionnaire corresponds to a self-administered personality test and consists of a list of 40 adjectives that evaluate the five dimensions of personality, as defined by the Five Factor Model (Goldberg, 1990). Each

adjective is evaluated on a 9-point scale. Scores for extraversion-introversion, agreeableness, intellect, emotional stability, and conscientiousness are then computed.

- Snyder's self-monitoring scale corresponds to a set of 18 true-false statements evaluating the personality trait of self-monitoring. An overall score is then computed.

Measurement of beliefs and attitudes towards fragrances:

A survey on attitudes and beliefs toward fragrances was developed and revised prior to the study. Comments from a focus group were used to refine some of the original statements, and results from a pilot study allowed for the distillation of the survey questions to a set of 48 statements.

The first set of statements concerned respondents' beliefs and attitudes toward fragrance/cologne. Respondents were asked to indicate on a five-point Likert scale (1 = disagree strongly to 5 = agree strongly) how much they agreed or disagreed with 34 statements such as 'I like to wear different fragrances when I am at home, at work or during an evening out'; 'the fragrance I wear makes me feel good about myself'; 'I wear fragrance because it reflects social status', etc.

Each statement was grouped under one of the seven factors (Factor Analysis computed with SYSTAT Version 10.2) that best explained attitudes and behavior toward fragrance. Factors were further grouped under two categories. Motivations for fragrance use encompassed inner-directed motives, perceived emotional benefits, social motives, and attraction motives. Behavioral aspects of fragrance use included the use of unique vs. multiple fragrances depending upon activities and schedule, preference for subtle vs. noticeable fragrances, and acquisition of fragrance as a gift vs. as a personal choice.

The second set of statements related to importance of 14 criteria for fragrance selection. Respondents were asked to indicate on a four-point scale (1 = not important at all to 4 = very important) how important were the name of the fragrance, their liking of the fragrance, the price, the fact that other people like the fragrance, etc. Additionally, criteria influencing fragrance choice were divided into five factors: personal appreciation

of the scent, fragrance lastingness and personality fit, other's appreciation of the fragrance, cost-related issues, and external cues (e.g. fragrance name, package…).

Factor scores were computed for each respondent.

Data processing and analysis

Analysis of respondent's personality variables

A score was calculated for the each of the personality constructs evaluated. For the Mini-markers, scores were then compared with normative values (Saucier, personal communication, 2004). Mean scores for each factor fell into the interval for the normative mean ± 2 standard deviations.

For each construct, the group of respondents was then divided into three categories: high, medium and low based on the distribution of the scores.

Attitudes and behavior for the general population and by subgroup of respondents

Total respondent base. Means and frequency tables were generated for the total respondent base for all individual variables in the survey. Mean scores for each of the factors also were computed.

Effect of individual differences on attitudes and behaviors

Rationale. In the first approach, a traditional view was followed, assessing the influence of demographic and personality variables on each of the factors generated by the survey.

Statistical analysis. An analysis of variance was performed on each factor score to test for the main effects of demographic characteristics (age and gender), geographic characteristics (location), usage, and personality variables (extraversion, agreeableness, conscientiousness, emotional stability, openness to experience, and self-monitoring).

Consumer segments for attitudes and behaviors towards fragrances and their socio-demographic and psychological make-up

Rationale. In a second approach, clusters of respondents were first defined based on the similarity of their responses to the survey questions. Then, the demographic and

psychological makeup of each of the clusters generated were evaluated and clusters were compared with each other.

Statistical analysis. First, a cluster analysis based on the survey responses (excluding the statements 'wearing a fragrance makes me feel more feminine', and 'wearing a fragrance makes me feel more masculine') using SAS Fastclus procedure (SAS, 1998; Johnson, 1998) allowed determination of five groups of consumers. An analysis of variance using the General Linear Model procedure (proc GLM) in SAS allowed assessing differences in fragrance attitude, beliefs, motivations, and behaviors among clusters.

RESULTS

The choice of a fragrance is largely influenced by the wish to enhance self-satisfaction, mood, and self-esteem, or to send information about oneself, whether to better fit into a social setting or to appeal to a potential significant other. Perfumes not only evoke an hedonic experience, they might also be used to please or provide emotional benefits to the wearer. Bain (1997) proposed that the interpersonal, inner-directed, and social motives for fragrance use may not be equally pronounced within any one individual, but that most people appear to act on a mixed pattern of motivations. Results of the present study supported this suggestion, and related patterns of motivations to individual differences. Furthermore, patterns pertaining to fragrance use and to criteria for fragrance selection also were observed among respondents and depended upon individual differences.

General comments on the total respondent base

Frequency tables for each individual variable concerning motivations for fragrance use, fragrance usage, and importance of various criteria for fragrance selection are presented in Tables 1, 2, and 3, respectively.

TABLE 1.

Frequency distribution for each statement referring to motivations for fragrance use for the total respondent base (n = 318)

	Disagree Strongly	Disagree Moderately	Neither/Nor	Agree Moderately	Agree Strongly
Inner-directed motives					
I wear fragrance/cologne because I want to appeal to the opposite sex	9%	8%	20%	43%	20%
I wear fragrances to please my spouse/significant other	11%	10%	17%	38%	25%
Emotional benefits					
Fragrances enhance my self-esteem	14%	13%	32%	31%	9%
When I wear a fragrance, I feel more confident about myself	7%	7%	24%	50%	13%
Wearing a fragrance makes me feel more attractive	6%	5%	26%	47%	16%
When I wear a fragrance, I am in a better mood	5%	9%	38%	37%	11%
Wearing a fragrance enhances my individuality	12%	16%	26%	34%	11%
The fragrance I wear enhances my personality	9%	10%	33%	33%	15%
When I wear a fragrance, it makes me feel more professional	6%	10%	32%	44%	8%
The fragrance I wear makes me feel good about myself	2%	3%	12%	42%	42%
Wearing a fragrance satisfies my need for fantasy	36%	20%	30%	11%	4%
My fragrance completes my outfit	17%	13%	25%	33%	12%
Social motives					
I wear a fragrance because it is more socially acceptable	35%	22%	28%	12%	3%
I wear fragrance/cologne because everybody else does	55%	24%	16%	4%	1%
I wear fragrances to better fit in social settings	23%	22%	31%	20%	4%
I wear fragrance because it reflects my status	36%	22%	31%	8%	3%
I don't care much about how the fragrance smells as long as people around me like it	48%	27%	17%	5%	2%
Attraction motives					
Wearing a fragrance is part of my daily routine	5%	7%	16%	36%	36%
Wearing a fragrance makes me feel fresh and clean	3%	1%	9%	46%	41%
I wear a fragrance because I like to smell good	1%	0%	2%	40%	57%
I wear fragrances for my own satisfaction	2%	4%	8%	45%	41%
I only wear fragrance on special occasions (-)	53%	27%	12%	4%	4%

TABLE 2.

Frequency distribution for each statement referring to fragrance usage for the total respondent base (n = 318)

	Disagree Strongly	Disagree Moderately	Neither/ Nor	Agree Moderately	Agree Strongly
Unique vs. multiple fragrances					
I wear different fragrances depending on the season	25%	20%	20%	25%	10%
I choose the fragrance I am going to wear based on my schedule and activities	20%	20%	24%	25%	11%
I like to wear different fragrances when I am at home, at work or during an evening out	12%	13%	8%	37%	30%
Subtle vs. noticeable fragrances					
I don't like to wear fragrances that everybody notices	24%	28%	27%	13%	7%
I prefer subtle fragrances	9%	14%	33%	28%	16%
I like other people to notice my fragrance (-)	2%	8%	22%	42%	26%
I usually receive a lot of compliments about my fragrance (-)	7%	12%	28%	37%	16%
Personal choice vs. gift					
I wear my current fragrance/cologne because I received it as a gift	40%	18%	13%	17%	13%
I don’t care much about the fragrance I wear as long as it smells good	13%	25%	18%	30%	14%
I really pay attention to how the fragrance smells when selecting a fragrance	2%	1%	6%	22%	69%

TABLE 3.
Frequency distribution for criteria for fragrance choice for the total respondent base (n = 318)

	Not important at all	Not very important	Somewhat important	Very important
Own appreciation of the fragrance				
Importance of the respondent's own liking of the fragrance	0%	1%	5%	93%
Importance of the smell of the fragrance	0%	0%	9%	91%
Personality fit and fragrance lastingness				
Importance of the fragrance fitting the respondent's personality	3%	4%	40%	53%
Importance of the lastingness of the fragrance	8%	13%	33%	46%
Other's appreciation of the fragrance				
Importance of the spouse liking the fragrance	5%	9%	39%	48%
Importance that others like the fragrance	20%	23%	40%	17%
Importance of the fragrance's sexiness	11%	21%	42%	26%
Cost				
Importance of the price of the fragrance	27%	26%	34%	13%
Importance of the fragrance being on sale	9%	24%	43%	25%
Fragrance's external cues				
Importance of brand name	34%	39%	23%	4%
Importance of the name of the fragrance	42%	32%	24%	3%
Importance of advertising	52%	40%	8%	0%
Importance of the packaging	51%	34%	14%	1%
Importance of the fragrance being fashionable	36%	31%	27%	6%

In general, most respondents used fragrances for their own satisfaction, and considered smelling good, fresh, and clean as the primary reasons for wearing a fragrance. Other inner-directed emotional benefits, along with interpersonal attraction motives, were also highly motivating factors for fragrance use. Only a few respondents mentioned the potential use of fragrance as a tool for social acceptability and/or status enhancement.

Most respondents tended to wear fragrance on a daily basis, as opposed to wearing fragrance only on specific occasions. This is not surprising considering that the respondents in the present study were initially screened as fragrance users, i.e., they wore fragrance at least twice a week. Other than the preexisting condition, no general trend could be observed for patterns of usage. Overall, half of the subject population was more likely to wear a unique fragrance across many situations; the other half was likely to use different fragrances on different occasions. One-third of the respondents mentioned receiving their fragrance as a gift, as opposed to carefully choosing their fragrance. Slightly more than half of the respondents preferred noticeable fragrances over subtle fragrances.

Last, the most important criterion for selecting a fragrance was the respondent's own appreciation of the fragrance, followed by personality fit and long-lastingness of the scent, as well as others' appreciation of the fragrance. Cost and external cues were of less importance.

Effect of individual differences on attitudes and behaviors toward fragrance

Effects of individual differences on attitudes and behaviors toward fragrances are presented in Table 4, and effects of individual differences on fragrance selection criteria are provided in table 5. When individual differences were considered, it appeared that most of the variability of the data can be related to demographic characteristics.

TABLE 4.

Effect of demographic and psychological criteria on the dimensions of beliefs, attitudes and motivations for fragrance use

		Factor 1 Inner-directed motives	Factor 2 Emotional benefits	Factor 3 Social motives	Factor 4 Attraction motives	Factor 5 Unique vs multiple	Factor 6 Subtle vs. noticeable	Factor 7 Gift vs. Personal choice
Gender								
	Women (n=158)	0.23	0.13 a	-0.27 b	-0.32 b	0.21 a	-0.07	0.07
	Men (n=160)	-0.22	-0.13 b	0.27 a	0.32 a	-0.21 b	0.07	-0.07
	p-value	*0.21*	***0.01***	***<.01***	***<.01***	***<.01***	*0.18*	***0.04***
	*LSD**	--	*0.21*	*0.21*	*0.21*	*0.20*	--	*0.21*
Age								
	18-25 (n=111)	-0.11	-0.27 b	0.00	0.19 a	-0.20 b	-0.18 b	0.38 a
	26-40 (n=94)	-0.10	0.16 a	0.02	-0.23 b	0.14 a	0.08 a	0.03 b
	41-55 (113)	0.19	0.13 a	-0.02	0.01 ab	0.07 a	0.11 a	-0.40 c
	p-value	*0.43*	***<.01***	*0.51*	*0.06*	***0.03***	*0.08*	***<.01***
	*LSD**	--	*0.26*	--	*0.26*	*0.25*	*0.26*	*0.26*
Usage								
	4* or less (n=111)	-0.67 b	-0.09	-0.10	0.25 a	-0.20	0.27 a	0.00
	5* or more (n=207)	0.36 a	0.05	0.05	-0.13 b	0.11	-0.14 b	0.00
	p-value	***<.01***	*0.81*	***0.02***	***0.02***	*0.26*	***<.01***	*0.92*
	*LSD**	*0.20*	--	*0.20*	*0.22*	--	*0.22*	--
Location								
	Kansas (n=173)	-0.03	-0.02	0.02	-0.07	-0.25 b	0.19 a	0.10
	New Jersey (n=145)	0.04	0.02	-0.03	0.09	0.29 a	-0.22 b	-0.12
	p-value	*0.70*	*0.77*	*0.27*	*0.10*	***<.01***	***<.01***	*0.21*
	*LSD**	--	--	--	--	*0.20*	*0.21*	--
Self-monitoring								
	High (n=105)	-0.06	-0.01	0.21 a	0.18	-0.02	-0.15	0.20
	Medium (n=92)	-0.02	0.13	-0.06 b	-0.01	0.07	0.02	-0.02
	Low (n=121)	0.07	-0.08	-0.13 b	-0.14	-0.03	0.12	-0.16
	p-value	*0.55*	*0.16*	*0.10*	*0.62*	*0.41*	*0.11*	*0.13*
	*LSD**	--	--	*0.26*	--	--	--	--

*LSD: Least significant difference reported at the 0.05 level when $p \leq 0.05$; reported at the 0.1 level when $p \leq 0.1$

Means within the same column (by demographic or psychological variable) and associated with the same letter are not significantly different from each other (alpha = 0.05)

TABLE 4. (Cont.)

		Factor 1 Inner-directed motives	Factor 2 Emotional benefits	Factor 3 Social motives	Factor 4 Attraction motives	Factor 5 Unique vs multiple	Factor 6 Subtle vs. noticeable	Factor 7 Gift vs. Personal choice
Extraversion								
	High (n=106)	0.06	-0.05	-0.06	0.09	0.09 a	0.09	-0.10
	Medium (n=107)	-0.01	0.03	-0.07	-0.17	0.11 a	-0.09	0.08
	Low (n=105)	-0.06	0.02	0.12	0.07	-0.20 b	-0.01	0.02
	p-value	*0.29*	*0.82*	*0.63*	*0.21*	***0.01***	*0.39*	*0.14*
	*LSD**	--	--	--	--	*0.25*	--	--
Agreeableness								
	High (n=113)	0.21	-0.03	-0.24	-0.13	0.09	0.06	-0.14
	Medium (n=100)	-0.11	0.03	0.00	0.11	-0.05	-0.07	0.20
	Low (n=105)	-0.12	0.01	0.26	0.03	-0.05	0.00	-0.04
	p-value	*0.44*	*0.47*	*0.14*	*0.68*	*0.48*	*0.62*	*0.22*
	*LSD**	--	--	--	--	--	--	--
Conscientiousness								
	High (n=115)	0.25 a	-0.07	-0.10 b	0.00	-0.02	0.06	0.00
	Medium (n=100)	-0.10 b	0.03	-0.20 b	0.04	0.06	0.01	-0.03
	Low (n=103)	-0.18 b	0.05	0.31 a	-0.04	-0.04	-0.07	0.03
	p-value	***0.02***	*0.46*	***0.01***	*0.23*	*0.30*	*0.99*	*0.76*
	*LSD**	*0.23*	--	*0.25*	--	--	--	--
Emotional Stability								
	High (n=111)	-0.14 b	-0.18	-0.08	-0.06	0.01	0.10	0.04
	Medium (n=103)	0.07 a	0.03	0.06	0.02	-0.01	-0.01	0.01
	Low (n=104)	0.08 a	0.16	0.02	0.04	0.00	-0.10	-0.05
	p-value	***0.01***	*0.19*	*0.73*	*0.39*	*0.70*	*0.61*	*0.57*
	*LSD**	*0.20*	--	--	--	--	--	--
Openness to experience								
	High (n=103)	0.01	0.08 a	-0.05 ab	0.03	0.09 a	0.08	-0.02
	Medium (n=118)	0.01	0.05 a	0.12 a	0.01	0.07 a	0.04	0.04
	Low (n=97)	-0.02	-0.14 b	-0.09 b	-0.03	-0.18 b	-0.13	-0.03
	p-value	*0.90*	*0.08*	*0.10*	*0.81*	***0.03***	*0.23*	*0.79*
	*LSD**	--	*0.20*	*0.20*	--	*0.25*	--	--

*LSD: Least significant difference reported at the 0.05 level when $p \leq 0.05$; reported at the 0.1 level when $p \leq 0.1$. Means within the same column (by demographic or psychological variable) and associated with the same letter are not significantly different from each other (alpha = 0.05)

TABLE 5.

Effect of demographic and psychological criteria on the dimensions of criteria for fragrance selection

		Own liking	Fits personality and lastingness	Others' Liking	Cost	External cues
Gender						
	Women (n=158)	0.15 a	0.25 a	-0.25 b	0.07	-0.01
	Men (n=160)	-0.16 b	-0.25 b	0.26 a	-0.07	0.01
	p-value	***0.04***	***<.01***	***<.01***	*0.20*	*0.98*
	*LSD**	*0.22*	*0.21*	*0.21*	--	--
Age						
	18-25 (n=111)	-0.04	-0.15	0.16	0.17 a	0.11
	26-40 (n=94)	-0.08	0.02	0.02	-0.07 b	-0.05
	41-55 (113)	0.10	0.13	-0.16	-0.10 b	-0.06
	p-value	*0.51*	*0.13*	*0.46*	*0.09*	*0.41*
	*LSD**	--	--	--	*0.23*	--
Usage						
	4* or less (n=111)	-0.16	-0.32 b	0.17	-0.02	-0.05
	5* or more (n=207)	0.09	0.17 a	-0.09	0.01	0.03
	p-value	*0.21*	***0.01***	*0.29*	*0.77*	*0.49*
	*LSD**	--	*0.22*	--	--	--
Location						
	Kansas (n=173)	-0.06	-0.17 b	0.04	0.11 a	-0.01
	New Jersey (n=145)	0.08	0.21 a	-0.05	-0.13 b	0.01
	p-value	*0.28*	***<.01***	*0.75*	*0.07*	*0.89*
	*LSD**	--	*0.21*	--	*0.20*	--
Self-monitoring						
	High (n=105)	-0.01	-0.04	0.34 a	-0.06	0.08 a
	Medium (n=92)	-0.07	0.08	-0.13 b	0.06	0.18 a
	Low (n=121)	0.06	-0.03	-0.19 b	0.00	-0.21 b
	p-value	*0.87*	*0.39*	***0.04***	*0.78*	*0.06*
	*LSD**	--	--	*0.26*	--	*0.25*

*LSD: Least significant difference reported at the 0.05 level when $p \leq 0.05$; reported at the 0.1 level when $p \leq 0.1$. Means within the same column (by demographic or psychological variable) and associated with the same letter are not significantly different from each other (alpha = 0.05)

TABLE 5. (Cont.)

	Own liking	Fits personality and lastingness	Other's Liking	Cost	External cues
Extraversion					
High (n=106)	0.12	-0.12	0.13	-0.16	0.11
Medium (n=107)	-0.06	0.12	-0.08	0.06	-0.13
Low (n=105)	-0.06	0.00	-0.04	0.10	0.02
p-value	*0.53*	*0.18*	*0.83*	*0.20*	*0.19*
*LSD**	--	--	--	--	--
Agreeableness					
High (n=113)	0.16	0.04	-0.18 b	-0.06	0.02
Medium (n=100)	0.04	-0.09	0.30 a	-0.03	-0.06
Low (n=105)	-0.21	0.04	-0.08 b	0.10	0.03
p-value	*0.40*	*0.53*	***0.02***	*0.53*	*0.26*
*LSD**	--	--	*0.26*	--	--
Conscientiousness					
High (n=115)	0.06	-0.06	-0.02	-0.01	-0.10
Medium (n=100)	0.05	-0.02	0.12	-0.01	0.01
Low (n=103)	-0.11	0.09	-0.10	0.02	0.10
p-value	*0.87*	*0.31*	*0.23*	*0.98*	*0.48*
*LSD**	--	--	--	--	--
Emotional Stability					
High (n=111)	0.02	-0.20	0.03	0.01	-0.13
Medium (n=103)	0.10	0.05	0.02	-0.02	-0.04
Low (n=104)	-0.11	0.16	-0.05	0.02	0.17
p-value	*0.55*	*0.24*	*0.95*	*0.80*	*0.12*
*LSD**	--	--	--	--	--
Openness to experience					
High (n=103)	0.11	0.13 a	-0.01	0.01	-0.09
Medium (n=118)	-0.05	-0.01 ab	0.09	-0.05	0.11
Low (n=97)	-0.05	-0.13 b	-0.09	0.04	-0.04
p-value	*0.63*	***0.02***	*0.52*	*0.84*	*0.16*
*LSD**	--	*0.25*	--	--	--

*LSD: Least significant difference reported at the 0.05 level when $p \leq 0.05$; reported at the 0.1 level when $p \leq 0.1$. Means within the same column (by demographic or psychological variable) and associated with the same letter are not significantly different from each other (alpha = 0.05)

Results suggested that gender was among the biggest sources of variation, in the sense that it influenced most aspects of attitudes towards fragrances, motivations for fragrance use, and importance of criteria that influenced fragrance selection. Consistent with prior research, motivations for using fragrance greatly differed between the sexes (New York Times Magazine, 1995; Bain, 1997; Graham, 2000). If the primary motivation for both genders was to smell good, fresh, and clean while wearing a fragrance, overall, men were more motivated by the potential social benefits of fragrances and tend to use fragrances as a tool for interpersonal attraction. Men were more likely to consider the opportunity for romance as one of the most important factors in selecting a fragrance. They also relied more than women on the appreciation of others for the fragrance when purchasing cologne. Most often, men owned one type of cologne, which they were likely to have received as a gift, and wore it across most situations. On the contrary, women seemed to be more motivated by emotional benefits that they associated to fragrances. They considered the sense of smell to be primarily a key to self-satisfaction rather than a tool to attract others. Women believed in the power of fragrances to enhance self-esteem, positive mood, self-confidence, and personality. Women chose fragrances more carefully than men overall, paying more attention to the sensory characteristics of the fragrances and making sure that the fragrance they purchased not only was long-lasting, but also fit their own personality. Women were more likely to wear different fragrances, depending on their schedule and activities. Findings related to motivations for fragrance use mimic those found in 1995 (New York Times Magazine, 1995), suggesting that the influence of gender on motivations for fragrance use have not changed much in the last decade.

Similarly, different age groups were associated with different patterns of motivations for fragrance use and differed in the way they used fragrances. Younger respondents (18 to 25 yrs) were less likely to associate emotional benefits with fragrances. Respondents 26 to 40 yrs of age were slightly less likely than younger (18 to 25 yrs) and older (41 to 55 yrs) respondents to consider fragrances as a tool for attraction. Age strongly affected usage, with younger respondents often using one fragrance across many situations, preferring stronger fragrances, and being less directly involved in the

choice of their fragrance – 18 to 25-year-olds received their fragrance as a gift more often than 26 to 55-year-olds). Criteria for fragrance choice was only marginally affected by age, with older respondents being only slightly less affected by cost-related issues than respondents in the younger group. These results are consistent with those reported in a study conducted in Germany in 1989 by the Contest-Census Institut in Germany. It was found that women 30-40 yrs of age used fragrances to enhance 'a positive feeling' in such way that they could 'influence others as well as themselves in this direction of feeling without revealing their purpose'. On the other hand, women 18-25 yrs of age used fragrances 'to feel good in a social sense'. By her scent aura, the young woman was able to 'express her personality', 'define her social position', and 'demonstrate how she wanted to be seen'.

Compared with age and gender, frequency of fragrance usage and geographic location only slightly affected respondents' motivations and practices. More frequent fragrance users preferred more noticeable and long-lasting fragrances, for which they received compliments. Wearing fragrance was considered part of their daily routine, and they chose their fragrance based on whether or not it fit their personality. Compared with less frequent fragrance users, those who used fragrance more often used it more often as a tool for social acceptability and less often as a tool for interpersonal attraction. Although location did not affect any motives for fragrance use, it had some impact on patterns of fragrance usage. Compared with respondents in New Jersey, respondents in Kansas were more likely to wear a unique fragrance across situations and to favor more subtle fragrances. Kansans also gave more importance to cost-related issues and less importance to scent lastingness and personality fit when choosing a fragrance.

Beyond demographic characteristics, personality also impacts motivations for fragrance usage. Conscientiousness was strongly related to inner-directed motives and social motives, self-monitoring to outer-directed motives, i.e., interpersonal attraction and social benefits. To a lesser extent, emotional stability and openness to experience also influenced motivations for wearing a fragrance.

Interestingly, self-monitoring did not have a statistically significant effect on Factor 5 (unique vs. multiple fragrances) or Factor 6 (subtle vs. noticeable fragrances), contradicting Snyder's findings (1990), where respondents were typed into two categories: high self-monitors (who strategically chose different fragrances to help them display different images for different social situations) and low self-monitors (who chose scents on the basis of their own personal reactions to the fragrances, rather than because of consideration of image and were therefore more inclined to choose fragrances based on the actual scent properties).

Uncovering consumer segments based on survey responses

In a second approach, results for the cluster analysis on the survey variables led to a five-cluster solution. Although the attempt to classify respondents into the clusters based on their demographic and psychological characteristics using discriminant analysis resulted in misclassifications of more than 45% of respondents, some differences in demographic and psychological make up of the clusters could be observed. Tables 6 and 7 present the demographic and psychological makeup of the five clusters, respectively. Additionally, all five clusters differed in their attitudes and behavior toward fragrance use. Table 8 lists differences in attitudes toward fragrance for the five clusters and Table 9 presents the importance of different criteria for fragrance selection for the five clusters.

Cluster 1 (n = 85)

Demographics and psychological makeup. Cluster 1 had a majority of women (64%), with half of the population being older than 40 yrs of age, and the other half of the population being evenly spread between the two other age groups. Similar to clusters 3, 4, and 5, respondents in cluster 1 perceived themselves as very agreeable (7.45 on a 9-point scale). They also tended to be more neurotic than respondents in cluster 4 and rated medium-low on self-monitoring compared with the other clusters.

Fragrance usage. With 78% of the respondents in cluster 1 wearing fragrances at least five times a week, respondents in cluster 1 were considered heavy users of fine personal fragrance. They perceived fragrances as part of their regular personal grooming: most strongly agreed that wearing a fragrance was part of their daily routine (94%), made them feel fresh and clean (95%). They wore fragrance for their own satisfaction (98%) and because they simply liked to smell good (100%). Very few received their fragrance as a gift (12%), and most chose their fragrance carefully and paid careful attention to the fragrance smell when selecting a fragrance (86% strongly agreed with that statement). Respondents in this cluster liked noticeable fragrances (92%) and usually received compliments about the fragrance they wore (76%). Although the cluster population was not particularly prone to wear different fragrances depending on the season or to choose the fragrance they were going to wear based on their activities and schedule, 79% of the respondents agreed that they liked to wear different fragrances when they were at home, at work, or on an evening out.

Perception of fragrance benefits. Respondents in cluster 1 strongly believed in the inner-directed emotional benefits associated with fragrances, with more than 75% of the respondents agreeing that wearing a fragrance made them feel more confident (85%) and attractive (87%). The fragrance they wore enhanced their individuality (79%) and made them feel good about themselves (98%). This group also believed in the attractiveness benefit associated with fragrances: 65% admitted to wearing a fragrance because they wanted to appeal to the opposite sex, while 58% wanted to please their spouse or significant other. The respondents, however, did not feel as strongly as cluster 3 about the potential social benefits of fragrances. They strongly disagreed with statements such as "I wear a fragrance because everybody else does" (92%) or "I don't care much about the fragrance smell as long as people around me like it" (91%). They also moderately disagreed with statements such as "I wear a fragrance because it is more socially acceptable" (60% disagreed, 31% neither agreed nor disagreed) or "I wear fragrances to better fit in social settings" (45% disagreed, 42% neither agreed nor disagreed).

TABLE 6.
Demographic makeup of the five clusters

			Cluster 1		Cluster 2		Cluster 3		Cluster 4		Cluster 5		Total	
		N	**85**		**73**		**54**		**40**		**66**		**318**	
			n	%	n	%	n	%	n	%	n	%	N	%
Gender	Women		54	64%	21	29%	24	44%	13	33%	46	70%	158	50%
	Men		31	36%	52	71%	30	56%	27	68%	20	30%	160	50%
Age (yrs)	18-25		23	27%	39	53%	14	26%	19	48%	16	24%	111	35%
	26-40		20	24%	20	27%	20	37%	9	23%	25	38%	94	30%
	41-55		42	49%	14	19%	20	37%	12	30%	25	38%	113	36%
Fragrance usage	4 * a week or less		19	22%	39	53%	15	28%	23	58%	15	23%	111	35%
	5 * a week or more		66	78%	34	47%	39	72%	17	43%	51	77%	207	65%

TABLE 7.
Psychological makeup of the five clusters

		Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5		
	N	**85**	**73**	**54**	**40**	**66**	**p-value**	**LSD**
Mini-markers	Extraversion	6.10	5.64	6.10	6.10	6.29	0.058	--
	Agreeableness	7.45 a	6.93 b	7.25 ab	7.40 a	7.57 a	0.013	0.420
	Conscientiousness	6.84	6.53	6.70	6.91	7.06	0.122	--
	Emotional stability	5.68 b	5.82 b	5.69 b	6.35 a	6.01 ab	0.045	0.441
	Openness	6.26	6.28	6.73	6.39	6.45	0.197	--
Self-Monitoring		-1.36 bc	0.11 b	2.63 a	-1.70 bc	-2.34 c	<0.005	2.38

Note: Means for the mini-markers were calculated on a 9-point scale (1 = extremely inaccurate to 9 = extremely accurate).
Means with the same letter in the same row are not significantly different from one another
Significant differences are reported for alpha = 0.05.
LSD stands for least significant difference.

TABLE 8.
Attitudes towards fragrances for the five clusters

	N	Cluster 1 85	Cluster 2 73	Cluster 3 54	Cluster 4 40	Cluster 5 66	p-value	LSD
F1: Fragrance as part of regular personal grooming		0.51 a	-0.40 bc	-0.14 b	-0.57 c	0.24 a	<0.001	0.332
F2: Fragrance as a mood and confidence enhancer		0.55 a	-0.08 b	0.76 a	-1.42 d	-0.39 c	<0.001	0.265
F3: Fragrance as a tool for social acceptability		-0.33 c	0.45 b	0.93 a	-0.17 c	-0.73 d	<0.001	0.296
F4: Fragrance as a tool for attraction independent of fragrance liking		0.08 a	0.21 a	0.31 a	-0.46 b	-0.31 b	<0.001	0.350
F5: Different fragrances in different situations		0.03 b	-0.54 c	0.56 a	-0.53 c	0.41 a	<0.001	0.327
F6: Awareness: liking for subtle vs. noticeable fragrances		-0.30 c	-0.02 bc	-0.10 bc	0.58 a	0.14 b	<0.001	0.350
F7: Received as a gift/does not care as long as it smells good		-0.37 c	0.65 a	-0.17 bc	0.13 b	-0.17 bc	<0.001	0.336

Note: Means for the mini-markers were calculated on a 9-point scale (1 = extremely inaccurate to 9 = extremely accurate).
Means with the same letter in the same row are not significantly different from one another
Significant differences are reported for alpha = 0.05.
LSD stands for least significant difference.

TABLE 9.
Importance of diverse criteria for fragrance selection for the five clusters

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	p-value	LSD
N	**85**	**73**	**54**	**40**	**66**		
Choice influenced by respondent's own appreciation of the fragrance	0.24 a	-0.39 b	0.13 a	-0.11 ab	0.09 a	**0.001**	0.358
Choice influenced by fragrance's fit with personality and scent lastingness	0.50 a	-0.36 c	0.52 a	-1.25 d	0.05 b	**<0.001**	0.300
Choice influenced by other's appreciation of the fragrance	0.03 b	0.25 ab	0.48 a	-0.39 c	-0.48 c	**<0.001**	0.346
Choice influenced by cost	-0.18 b	0.20 a	0.09 ab	0.32 a	-0.23 b	**0.009**	0.361
Choice influenced by fragrance's external cues	-0.29 c	0.26 b	0.77 a	-0.62 d	-0.18 c	**<0.001**	0.331

Note: Means for the mini-markers were calculated on a 9-point scale (1 = extremely inaccurate to 9 = extremely accurate).
Means with the same letter in the same row are not significantly different from one another
Significant differences are reported for alpha = 0.05.
LSD stands for least significant difference.

Motivations for fragrance choice. Respondents in cluster 1 considered the fragrance sensory characteristics and hedonic value as the most important factor when choosing a fragrance. Among the 85 respondents, most considered that, when selecting a fragrance for themselves, their own liking of the fragrance was very important (average = 3.99 on a 4-point scale), as well as how the fragrance smelled (average = 3.98), lasted (average = 3.61), and fit their personality (average = 3.61). Compared with the other clusters, the choice of respondents in cluster 1 was influenced only moderately by others' appreciation of the fragrance, although a majority of the respondents considered the fragrance's sexiness and the liking of their spouse/significant other for the fragrance as somewhat to very important (averages = 3.28 and 3.13, respectively). Compared with clusters 2 and 4, cost did not seem to be as much of an issue. Although 66% considered price as an important factor in choosing a fragrance, 68% felt that whether the fragrance was on sale was not important. This could suggest that those respondents could be willing to pay a higher price for their fragrance, provided that the fragrance actually met their sensory and hedonistic expectations. Last, a majority of the respondents did not assign much importance to the fragrances' external cues when choosing a fragrance (average < 2), showing that they were less influenced by external cues than clusters 2 and 3, but slightly more so than cluster 4.

Cluster 2 (n = 73)

Demographics and psychological makeup. Similar to cluster 4, cluster 2 consisted of mostly men (71%), with more than half of the respondents being 25 yrs of age or younger (53%), and more than a fourth of the respondents being in the 26-40-yr age group (27%). Compared with the other clusters, this group of respondents rated lower on the agreeableness dimension (average = 6.93 on a 9-point scale). Their ratings for emotional stability were lower than those of cluster 4 and comparable with those of all other clusters. Although no significant difference in extraversion ($p = 0.058$) or conscientiousness ($p = 0.122$) was found among clusters, this group seemed to be the most introverted and the least conscientious among the five clusters. In terms of self-monitoring, respondents in cluster 2 were midrange compared with the other clusters.

Fragrance usage. With 53% of the respondents using fragrance 4 times a week or less, this group can be considered moderate fragrance users compared with the other clusters. Accordingly, even if most considered wearing a fragrance as part of their daily routine (51%) and agreed that fragrances made them feel fresh and clean (84%), these percentages were lower than those in clusters 1, 3 and 5. Additionally, only 68% of respondents in cluster 2 stated that they wore fragrance for their own satisfaction (compared with more than 90% in clusters 1 and 3). Respondents in this cluster also tended to wear only one fragrance for most occasions: they did not wear different fragrances depending on the season or on their schedule. Fragrance intensity was not of major importance for them, although they seemed to slightly prefer noticeable fragrances (64%). Last, more than half of the respondents in this cluster received their fragrance as a gift (51%) and most agreed that they did not care much about the fragrance, as long as it smelled good (71%).

Perception of fragrance benefits. Respondents in cluster 2 were mostly driven by attractiveness benefits of fragrances: most respondents in this group stated that they wore fragrances to appeal to the opposite sex (77%) or to please their significant other (63%). Overall, respondents slightly believed in inner-directed emotional benefits of fragrance: more than half perceived fragrances as a potential confidence enhancer (58%), attractiveness enhancer (62%), and stated that fragrances made them feel better about themselves (70%). Last, the social aspect associated with fragrance did not seem to be a major concern: a great proportion of the respondents in this cluster did not agree or disagree with statements associated with this specific potential benefit of fragrances.

Motivations for fragrance choice. Cluster 2's selection process was most highly influenced by the respondents' own appreciation of the fragrance, closely followed by others' appreciation. Contrary to respondents in clusters 1 and 3, respondents in cluster 2 were not overly concerned by the goodness of fit between the fragrance and their personality. More highly motivated by cost-related characteristics (price and sales) than most respondents, they were slightly less likely to be influenced by external fragrance cues than respondents in cluster 3, and tended to consider fashion as an important factor (53%) when selecting a fragrance.

Cluster 3 (n = 54)

Demographics and psychological makeup. Cluster 3 was well-balanced for demographic criteria, with a population that was evenly spread across gender and age categories. Personality variables showed their ratings to be midrange for extraversion, agreeableness, and conscientiousness. They were among the cluster with the lowest emotional stability and obtained the highest ratings for openness to experience, although no significant difference among clusters was found for that personality dimension. Additionally, they were the group with the highest self-monitoring scores.

Fragrance usage. With 72% of the respondents using fragrance at least 5 times a week, this group was considered heavy fragrance users. Although less marked than in clusters 1 and 5, this group perceived fragrance as part of regular personal grooming. Respondents in cluster 3 wore fragrance for their own satisfaction (89%) and because they simply liked to smell good (98%). As with cluster 1, respondents in this cluster liked noticeable fragrances (85%) and usually received compliments about the fragrance they wore (70%). Additionally, similar to cluster 5, they tended to vary the type of fragrance they used based on their schedule and activities.

Perception of fragrance benefits. Respondents in cluster 3 were driven by all potential benefits of fragrance: they believed in the mood and confidence enhancing power of fragrances, and used fragrances as a tool for interpersonal attraction. With 70% of the respondents in this cluster agreeing with the statement: "I wear fragrances to better fit in social settings", they were the only respondents who believed in social benefits that might be associated with fragrance use.

Motivations for fragrance choice. Respondents in cluster 3 gave higher ratings than other clusters to the importance of most factors in their choice for a fragrance: they were the most likely to be influenced by their own appreciation of the fragrance's sensory characteristics and by its sexiness and goodness of fit with their personality. Additionally, they judged others' appreciation as fairly important when selecting a fragrance for themselves. Last, with more than 50% of the respondents judging brand name, fragrance name and the fact that the fragrance was fashionable as important, they were the most likely to be influenced by external cues when selecting a fragrance.

Cluster 4 (n = 40)

Demographics and psychological makeup. Similar to cluster 2, cluster 4 consisted of mostly men (68%), with slightly less than half of the respondents 25 years of age or younger. The other half of the respondents was evenly spread across the other two age groups. Respondents in cluster 4 perceived themselves as more agreeable than respondents in cluster 2 and compared with other clusters. They also rated themselves as the most emotionally stable respondents among clusters. Compared with other clusters, they perceived themselves as medium-low self-monitors, overall.

Fragrance usage. With 58% of the respondents using fragrance less than 4 times a week, this group was considered as the lowest fragrance users among all clusters. Only 45% considered wearing a fragrance as part of their daily routine. Smelling good was their one and only motivation for wearing fragrance. Most did not wear different fragrances on different occasions and respondents in this cluster gave the highest rating for preferring subtle fragrances over more noticeable scents.

Perception of fragrance benefits. Respondents in this cluster did not associate any benefit with wearing a fragrance except for the fact that they wore fragrances for their own satisfaction (68%) and because they liked to smell good (88%), and fresh and clean (60%). Overall, they did not perceive fragrances as a mood and confidence enhancer, as a tool for social acceptability, or as a tool for attraction.

Motivations for fragrance choice. Their appreciation of the fragrance scent and cost-related factors were the respondents' prime motivations when selecting a fragrance for themselves. Fragrance lastingness and goodness of fit with their personality was only slightly important to them. They did not pay much attention to others' appreciation of the fragrance as well as external cues when selecting a fragrance.

Cluster 5 (n = 66)

Demographics and psychological makeup. This cluster consisted of mostly women (70%). With only 24% of the respondents being less than 25 yrs of age, this age group was slightly less represented than the two other age groups (38% each). Respondents in

cluster 5 achieved the highest scores for extraversion, agreeableness, and conscientiousness. They rated midrange in emotional stability and openness to experience. Among all clusters, this group obtained the lowest ratings overall on the self-monitoring scale.

Fragrance usage. With 77% of the respondents using fragrance at least 5 times a week, this group was considered heavy fragrance users. Wearing a fragrance was part of their personal grooming and made them feel fresh and clean. More than most other clusters, they tended to vary the type of fragrance they used based on their schedule and activities. Unlike most other clusters, they favored slightly noticeable fragrances.

Perception of fragrance benefits. Respondents in cluster 5 wore fragrances mostly for their own satisfaction (97%), because they liked to smell good (98%) and because it made them feel good about themselves (89%). They did not believe in other potential power of benefits of fragrance: most did not express strong opinions about using fragrances as a mood and confidence enhancer, as a tool for social acceptability, or as a tool for interpersonal attraction.

Motivations for fragrance choice. Respondents in cluster 5 were mostly motivated by the fragrance sensory characteristics (smell, lastingness) and their own appreciation of the fragrance. Although such criteria as fragrance goodness of fit with their personality, fragrance sexiness, and their significant other's liking of the fragrance were important to them, these factors were less likely to influence their choice than they were for respondents in clusters 1 or 3. Cost and external fragrance cues were less influential in fragrance selection for respondents in cluster 5 than the previously stated criteria.

DISCUSSION

The present study provided results from two different statistical approaches that allowed the evaluation of factors influencing attitudes and behavior in fragrance use.

In a traditional approach that directly assessed the influence of demographic and psychological variables, the primacy of gender and age as most influential on attitudes

and beliefs was demonstrated. To a lesser extent, geographical area, frequency of fragrance usage, and personality also had some impacts on fragrance beliefs, attitudes, motivations and behaviors. Although the limited number of respondents did not allow the assessment of any interaction effects, the results yielded valuable insights about how individual differences influenced attitudes toward fragrance.

In a clustering approach, in which respondents were grouped based on their responses to the survey, five clusters of respondents were generated. The clusters not only differed in attitudes and behaviors, but also in their demographic and psychological makeup, although discriminant analysis did not allow an accurate categorization of the respondents into clusters based solely on their measured individual characteristics.

Both approaches might find direct applications in marketing and advertising strategies for the fragrance industry, depending on the objective of the fragrance firms. Suppose, for example, that a fragrance firm wants to introduce a cologne to the market that would meet the needs of men in their early 20s. In that case, the first approach might be used: the company should develop an advertising campaign that will insist on social benefits, romantic opportunity and interpersonal attraction motives. Since men in their 20s are more influenced overall by others' liking and less influenced by whether the cologne fits their personality, the advertisement might also emphasize this aspect. Last, results from the survey showed that younger respondents were more sensitive to prices. Therefore, careful pricing strategy also needs to be taken into account. The downside of such a method, however is that it might fail to identify niche market by employing a strategy based on a generalization of the results by gender and age. On the other hand, although the clustering approach might provide some insights, it is not really appropriate in the type of situation presented. Based on the clustering approach, men and respondents in their early 20s were more represented in clusters 2 and 4. However, some women and some older respondents also belonged to those two clusters. The two clusters differed in psychological makeup, as well as in attitudes and motives for fragrance use. However, both clusters were associated with rather similar patterns of importance for diverse criteria for fragrance selection. Fragrance choice for respondents in these two clusters was less likely to be influenced by the respondents' own appreciation of the fragrance or by the fragrance long lastingness and personality fit than for respondents in

the other clusters, whereas cost was more influential than in other clusters, suggesting again that pricing policies might be a more useful way to approach this type of persons. The results also suggested that even if the original target was men in their early 20s, an advertising campaign that would insist on social benefits, romantic opportunity, and interpersonal attraction motives, combined with a specific pricing strategy, could, in fact, appeal to a larger group of respondents.

Now suppose a fragrance company wanted to launch a new feminine fragrance. They wished to introduce a fragrance on the market that would provide some emotional benefits to the wearer. In that case, a clustering approach might be more appropriate to provide additional information on the potential wearers of the fragrance. Results obtained with the clustering approach suggested that clusters 1 and 3 tended to be associated with stronger belief in the potential emotional benefits of fragrances. Although respondents could not be categorized strictly in these clusters based on their demographic information, the clusters both had a higher percentage of older respondents who used fragrances on average more than 5 times a week. These two clusters differed in their psychological makeup, suggesting that advertisers should not emphasize one personality type but rather general confidence and mood benefits. On the other hand, besides the fact that both clusters were most influenced by emotional benefits of the fragrance, some other common trends in motivations and behaviors for fragrance use could be observed for these two clusters. When compared with the three other clusters, both clusters considered that fragrances could be used as a tool for interpersonal attraction, preferred more noticeable fragrances, and were more likely to use different fragrances in different situations. Additionally, for respondents in these two clusters, the choice of a fragrance was most influenced by their own appreciation of the fragrance, followed by long lastingness of the scent and personality fit. Such findings could be incorporated in the marketing and advertising strategies to target the population that would be most likely to be influenced by emotional benefits of fragrance. On the other hand, results obtained with the traditional approach suggested that such a concept would most likely appeal to women in their late 20s and 30s, who had greater openness to new experiences. Additionally, results from the survey on importance of different criteria for fragrance selection revealed that women and respondents with higher openness to experience

preferred longer lasting fragrances that fit their personalities. Therefore, the survey would provide information on the target market and allow for further refinement of the target market and advertising strategy by perhaps incorporating the aspects of age and openness to experience, as well as fragrance lastingness and/or personality fit in the advertising campaign. In this case, both approaches would give valuable information for further development of strategies and refinement of the target market; however, the clustering approach might be more appropriate, especially if the concept became more complex, e.g., if instead of targeting emotional benefits, it combined sets of motives and/or situations such as inner-directed emotional benefits combined with interpersonal attraction motives.

The two approaches presented in this research are complementary and should not be used interchangeably. The traditional approach might be used when a target population is predefined and might help identify specific attitudes and behaviors for the target population, whereas the clustering approach might be more useful when first developing a concept to be tested and identifying the target population. Additionally, the clustering approach might be very useful in identifying specific niches based on motivations for fragrance use. For example, current advertisements do not emphasize the potential emotional benefits that might be related to cologne use for men, although the clustering analysis strongly suggested that some men do believe that cologne might enhance their mood and confidence.

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CHAPTER III.

HEDONIC AND SENSORY DRIVERS OF IMAGE AND PERSONALITY TRAITS ASSOCIATED WITH FINE FRAGRANCES

ABSTRACT

It generally is accepted that the formation of impression relies most on visual and auditory cues. However, the role of scents in impression formation is not fully understood. Olfactory cues could influence impression formation in two ways, specific and nonspecific. Nonspecific influences are based on hedonics – pleasant odors trigger favorable impressions. Specific influences are based on specific sensory properties – specific odors trigger specific personality and image associations independent of their hedonic value.

In the present study, the influence of both hedonic judgment and sensory qualities on fragrance perception was assessed. A total of 318 naïve respondents evaluated 22 scents and rated their perception of the fragrances, which were then related to objective sensory profiles of the fragrances produced by a highly trained descriptive panel.

Independent of their sensory properties, fragrances that were liked were strongly associated with personality traits related to interpersonal attraction, such as sensuality and attractiveness; disliked fragrances were associated with negative personality traits. Independent of hedonics, specific sensory characteristics were associated with personality traits relating to masculinity/femininity and seasonality (warm scents suited for Winter and Fall vs. natural and fresh scents suited for Spring and Summer). Last, personality traits related to social interaction (extraversion, agreeableness) and mood aspects (emotional stability, tension-anxiety and vigor-activity) could only be explained when both specific sensory characteristics and fragrance acceptance were taken into account. Neither hedonic nor sensory properties can fully explain image and personality association patterns, for these two aspects are closely related and influence fragrance perception simultaneously.

INTRODUCTION

Social interactions are driven largely by the impressions we form of other people. It generally is accepted that much of human communication relies on verbal or written cues. However, a large body of research suggests that non-verbal cues also play a large role in the formation of impressions. Numerous studies have focused on the formation of attitudes and first impressions based on visual and auditory cues. A person's lifestyle, personality and mood is thought to be reflected in the way that a person presents him/herself in public in terms of appearance, facial expression, clothing, voice tone, demeanor, and attitudes. Although the use of cosmetic products has been found to enhance appearance and to help convey favorable impressions (Graham, 1993; Graham, 2000), little is known about the role of personal fragrances and perfumes in this respect. In the human world, little attention has been paid to the use of odors as a communication tool, whereas numerous studies have demonstrated that olfactory stimuli perceived in the environment constitute a rich source of information in the animal world (Jellinek, 1991). In contrast, humans seem more likely to experience odors more as pleasurable sensations than as sources of information. Surprisingly however, in an American survey conducted with 800 women, smell was found to be one of the personal attributes that was the most noticed by women at the first meeting. In fact, 43% of the women mentioned 'smell', a percentage slightly lower than for 'face', 'eyes' and 'voice', but higher than for 'hair', 'dress', 'skin' or 'hands' (Byrne-Quinn, 1988). If scent is largely noticed at the first meeting, do olfactory cues also affect the formation of social impressions and lead to inferences about personality? And if they do so, what characteristics of olfactory stimuli drive images and personality associations?

Hypothesis 1 - The primacy of hedonics: the effect of fragrances on image and personality associations is directly linked to hedonics

Several studies have been carried out in the past few years concerning the psychological effects on self-image, others' perceptions, and interactions between people that arise from the use of cosmetics (Graham and Jouhar, 1980; Jouhar *et al.*, 1986).

Graham and Jouhar (1981) observed the effects of cosmetics on a person's perception and found that the use of cosmetics (facial make-up and haircare products) led to more favorable appearance ratings and also to more favorable ratings of personality, as perceived by others. Use of fragrance led to the highest attractiveness ratings when compared with the use of other types of commonly used cosmetics such as facial make-up and nail polish. These observations led to the formation of the hypotheses that "what has been made beautiful is good" (Graham, 2000). Based on these considerations, the author suggested that a pleasant fragrance would be associated with positive image and personality traits: "We would expect perfume to significantly enhance perceived attractiveness and personality, along dimensions similar to those we know are affected by other products, such as make-up. For example a person using a pleasant fragrance should be attributed to more desirable characteristics, such as being more sociable, confident, interesting…" (Graham, 2000).

Studies on the effects of fragrance on mood showed that odors can influence moods based on hedonics: pleasant odors can enhance and unpleasant odors can depress mood (Rotton, 1983; Rotton *et al.*, 1978; Schiffman, 1998; Warren and Warrenburg, 1993). Additionally, pleasant fragrances seem to enhance self-image and self-confidence (Nezlek and Shean, 1990; Nezlek and Shean, 1995; Baron, 1990), increase attraction and produce positive shifts in the social status of the fragrance wearer, as perceived by others (Baron, 1981). The use of perfume in combination with avoidance of additional non-verbal image-enhancing tactics positively affected 'liking and attractiveness' (Baron, 1988). The presence of a fragrance in a product (e.g., hand cream, lotion, or soap) favorably modified perceptions of the user's appearance and personality (Jouhar *et al.*, 1986).

It might be hypothesized that the more pleasant a fragrance, the more positive the image and personality associated with it. However, studies suggest that, independent of hedonics, specific sensory characteristics also may drive the association of specific moods, images, and personality traits with a fragrance.

Hypothesis 2 - Sensory Specificity: fragrance intrinsic characteristics directly influence image, and psychological effects

Of major interest in the study of the intrinsic characteristics of fragrance, their relation to image and psychological effects, and their suitability for a specific type of woman is the theory developed by Paul Jellinek in 1951 and reevaluated in 1997 (Jellinek P, 1997a; Jellinek P, 1997b; Jellinek JS, 1997). The core of Jellinek's theory is his distinction between sensory descriptions of odors (such as sweet or flowery) and the psychological effects of fragrances (such as calming or sultry). Sensory characteristics of a fragrance are linked to its psychological effects, and both are used to determine the suitability of the fragrance for a particular type of woman. Jellinek used psychographic, sociologic, demographic and physical information such as hair type, mother-mistress dimension, activity, age, femininity, and naïve vs. artful behavior to determine the type of fragrance that would best suit an individual woman. For example, according to his theory, floral-fruity fragrances are associated with a narcotic, calming effect and best suit blonde or brunette feminine women, in their 40s-50s, expressing their love in a motherly manner. Spicy, woody scents are fresh and stimulating, and best suit blonde or redheaded masculine women in their 20s, expressing their love more as a mistress than as a mother. This theory provides encouraging insights but relies on the view of a perfumer rather than on the view of the fragrance wearers or perceivers (Jellinek, 1990; Jellinek, 1992). Moreover, it tended to relate sensory characteristics of the fragrances with their mood effects – calming, narcotic, stimulating…– more than with the image they project about personalities, and implied that liking of a fragrance depends primarily on psychological effects of the fragrance.

Studies with naïve respondents relating sensory characteristics of fragrances to image and personality attributes are rare in the current literature. In a recent study, Moskowitz (1998) discussed the relation between sensory, liking, and image attributes for soaps. Sensory attributes clearly were related to liking, but no clear relation was found between sensory and image attributes. Assuming that respondents could validly assign ratings to image attributes of soaps, it was impossible to trace the image ratings back to the sensory inputs.

In the domain of fine personal fragrances, few studies have focused on the specific effects of specific odorants on social interactions. However, studies have focused on specific effects of fragrances on mood, arousal, relaxation, or self-confidence. Steiner (1986), for example, explored a number of evaluative and behavioral measures using 76 volunteers. Results showed that in the presence of a specific fragrance "A", subjects recorded their mood as significantly higher in "high spirits","extroverted feelings", and "arousal" and lower in "despondency" and "introverted feelings" than in the control condition. Subjects who were exposed to fragrance "B" showed a significant increase in "arousal", "despondency", "introversion", "lethargy", and "dreaminess", and a significant decrease in "high spirits" and "self-confidence", i.e., they rated positive on arousal but not on mood effects. Their recall was not significantly improved when exposed to fragrance B. Instead of the hedonic value of the odor, the intrinsic nature of odorants would be responsible for the effect that fragrances can have on mood and memory. Similar results were found when comparing heliotropin and wintergreen oil (Redd and Manne, 1995). Heliotropin reduced stress and anxiety, whereas wintergreen did not, although respondents liked the two odors similarly. Similarly, Warren and Warrenburg (1993) measured mood changes induced by overt presentation of five pleasant "living flower" fragrances to 35-50-year-old women and found that the fragrances elicited, to varying degrees, increases in feelings of happiness, sensuality, relaxation, and stimulation, and reductions in feelings of irritation, depression, stress, and apathy. Specific fragrances thus seemed to have an impact on specific moods. Fragrance also can affect self-confidence and self-image, as shown in a study conducted by Kirk-Smith and Booth (1992). Additionally, research by Wrzesniewski *et al.* (1999) indicated that odors and individual differences strongly influenced liking for places, things and people. Last, results from a recent study suggested that fragrances that differed in their sensory characteristics but that were rated similarly in liking, affected different mood factors and dimensions (Retiveau *et al*., in press).

Based on these studies, it seems reasonable to assume that specific sensory characteristics of fragrances could be associated with specific personalities and images that could be observed in a well-planned scientific study.

One might wonder then, if the formation of impression, and ultimately social interaction, is driven by the hedonic value of a fragrance, by its sensory characteristics or by a combination of both. The present study was undertaken to assess the influence of both hedonic judgment and sensory qualities on people's perception of fragrances.

MATERIALS AND METHODS

Respondents

A total of 318 respondents completed the study. Respondents were screened prior to the study and were disqualified if they reported any discomfort associated with fragrance, any anosmia, or any other condition that might have affected their sense of smell. Subjects also had to wear fragrance at least twice a week to qualify for the study. Respondents were recruited in 2 locations (Manhattan, Kansas, and Union Beach, New Jersey), selected based on their demographic information, and equally divided into 6 categories according to age (18-25 yrs; 26-40 yrs; 41-55 yrs) and gender. In the 18 to55 age range, respondents are likely to demonstrate a relative stability in the order of preference for odors (Vroon, 1997) and good performance in odor identification (Doty *et al.*, 1984; Wysocki and Gilbert, 1989; Wysocki *et al.*, 1991). Respondents older than 18, were assumed to have a fully developed sense of smell. An upper age limit of 55 years was chosen to reduce the likelihood of olfactory impairment.

Odorants and odorant preparation

The samples studied were 22 scents divided into 4 categories. A set of 8 olfactory accords, representative of fragrance categories, were developed at International Flavors and Fragrances (Union Beach, New Jersey). Additionally, a set of 6 fine feminine fragrances was selected to be representative of a wide variety of commercially available fine feminine fragrances. Two fragrances were included in the study, that are marketed to both men and women. Last, 6 colognes were selected to be representative of a wide

variety of commercially available fine masculine fragrances. All fragrances were fully profiled by a trained descriptive panel prior to the study. Table 1 presents the list of samples included in the study, as well as an overall description of the samples' sensory profiles as determined by the trained descriptive panel (See appendix 5A for complete sensory profiles).

TABLE 1.
List of samples included in the study and their descriptions[1]

Olfactory accords			
Code	*Description*	*Code*	*Description*
219	Citrus (orange / tangerine) and sweet	318	Floral complex, with animal undertone
492	Powdery, floral, and sweet, with green and woody notes	196	Floral (mainly white flower), green with light fruity notes
621	Fruity, sweet, with light green undertone	910	Aldehydic, with citrus and spicy notes, and ozone undertones
412	Sandalwood, with citrus notes and resinous undertones	549	Green, floral, and citrusy
Feminine fragrances			
Code	*Description*	*Code*	*Description*
359	Floral, spicy, powdery, woody with light citrus notes	715	Musky and powdery with sweet and woody undertones
211	Fruity floral	316	Floral, powdery, and sweet
513	Floral, powdery, and woody, with light citrus notes	420	Powdery, floral and sweet
Shared fragrances			
Code	*Description*	*Code*	*Description*
122	Fougère and citrus, with floral, woody, and piney notes	861	Citrus, woody, and green
Masculine fragrances			
Code	*Description*	*Code*	*Description*
237	Fougère citrus, with light floral and woody notes	947	Fougère, floral, citrus, and ozone
638	Floral, citrus with light fruity, sweet, and powdery notes	517	Fougère, citrus with light woody, powdery, and ozone notes
759	Musky, powdery, and sweet, with slight floral and citrus undertones	814	Citrus and spice, with fougère and fruity undertones

[1] Descriptions summarize the detailed profiles provided by a highly trained sensory panel

The samples were prepared by dipping a perfumer's strip into the fragrance bottle. The strip was air-dried for 1 minute, folded and introduced into a 4-oz white squeezable plastic bottle with flip-cap. Containers had no identifying feature other than the 3-digit code used to identify each sample. The samples were held for 16 to 24 hours prior to evaluation to allow the fragrance to reach equilibrium.

Squeezable plastic bottles are extensively used in the fragrance industry for consumer testing. Prior testing had shown that the fragrance notes stabilized between 8 and 24 hrs after preparation. Additionally, a descriptive panel had determined that no plastic notes contaminated the fragrances when testing occured 24 hrs or less after sample preparation.

Fragrance evaluation

Each fragrance was evaluated with respect to:

Hedonics. Respondents were asked to rate how much they liked or disliked the scents.

Sensory characteristics/ descriptive properties. An adjective checklist consisting of 9 sensory attributes adapted from studies on fragrance classification and description (Jeltema and Southwick, 1986; Jellinek, 1990; Lawless, 1999) was used for the evaluation. Descriptive attributes included citrusy, cool/minty, floral, fruity, green, herbal, spicy, sweet, and woody. Prior to the study, these attributes were discussed in a focus group and were determined to be sufficient to accurately describe the fragrances and to differentiate among fragrances based on their sensory properties.

Image associated with the fragrance. Fragrance descriptors such as feminine, fashionable, romantic, sensual, warm, energizing, relaxing, etc., were also rated by the respondents

Situation fit. Respondents were asked to rate the appropriateness of wearing the fragrance in different situations (every day at work, on a quiet weekend at home, in the evening at home, or for an exciting evening out) and for various seasons.

Personality associated with the fragrance. Respondents were asked to rate how they agreed or disagreed with statements such as: "The person who would wear this fragrance would be anxious, tense" or "shy, withdrawn, reserved." Lists of adjectives qualifying the five factors of personality were derived from the adjectives assessed in the Mini-markers questionnaire (Saucier, 1994). In addition, dimensions that were beyond the five dimensions of personality and thought to be important for this study were included: femininity-masculinity, sensuality, and self-confidence were assessed (Saucier and Goldberg, 1998; Paunonen and Jackson, 2000).

Study design and procedure

Each respondent committed to come to three 1-hour sessions, scheduled one week apart from each other. Each respondent evaluated 7 to 8 fragrances in a well-ventilated area on each day of the study. By the end of the 3 sessions, each respondent had evaluated all 22 scents included in the test. It was determined during a preliminary study – both by examining data consistency and by asking participants – that 7 to 8 evaluations per session constituted an adequate number and did not cause adaptation, fatigue, or a decrease in concentration for the respondents.

The order of fragrance presentation was randomized for each respondent following a 22*22 Latin square designs, thereby accounting for first-order effects and position. Throughout the test, the respondents were reminded when they should start evaluating the next sample and were encouraged to wait at least one minute between sample evaluations to minimize the risk of lingering fragrance influencing subsequent assessments and increased adaptation due to sniffing behavior.

Data processing and analysis

Individual variables were analyzed using a Mixed model (SAS®, 1998) in which fragrance and order of presentation were as fixed effects. The order by fragrance interaction was also assessed. Respondent was considered a random effect.

A Partial Least Square Regression (PLSR) method (Martens and Martens, 1986) was performed on the data using the Unscrambler® (Camo, 2003), for the sensory dimensions defined by the trained panel as predictors of liking.

A PLSR method (Martens and Martens, 1986) was also performed on the data using the Unscrambler (Camo, 2003) using sensory dimensions defined by the trained panel and hedonic ratings as predictors of image and personality associations.

All variables included in the PLSR were first standardized to eliminate differences in scale types.

RESULTS

Liking for the different fragrances

Table 2 presents the liking scores for all fragrance samples included in the study. The results suggest that, overall, masculine fragrances were liked more than feminine fragrances. Additionally, 2 types of fragrances achieved higher liking scores. These types were masculine fragrances that had fougère and citrus notes (e.g., samples 517, 237, 947) and fruity sweet scents sometimes associated with floral undertones (e.g., samples 621, 638, 211). Musky, powdery, and sweet scents (samples 759, 715) achieved significantly lower liking scores, and were only slightly more liked than floral, powder, sweet fragrances (samples 316, 420) and spicy citrus/woody scents (samples 814, 359, 861). Interestingly, most olfactory accords were disliked (mean < 4.00). Results from descriptive analysis suggested that these samples were less complex in their sensory profiles than the fine fragrances. Olfactory accords were often one-dimensional, and lacked body and blendedness, i.e., they were often defined by one very strong note (e.g., citrus for 219; aldehydic for 910; sandalwood for 412) with one or two underlying characteristics.

TABLE 2.
List of samples included in the study and their liking scores

Code	Description	Type	Liking[1,2]
517	Fougère, citrus (woody, powdery, ozone)	Masculine	5.33 a
621	Fruity, sweet (green)	Accord	5.30 a
237	Fougère, citrus (floral, woody)	Masculine	5.27 a
638	Floral, citrus (fruity, sweet, powdery)	Masculine	5.12 ab
211	Fruity, floral	Feminine	5.09 ab
947	Fougère, floral, citrus, ozone	Masculine	5.01 bc
513	Floral, powdery, woody (citrus)	Feminine	4.98 bc
759	Musky, powdery, sweet (floral, citrus)	Masculine	4.81 cd
122	Fougère, citrus (floral, woody, piney)	Shared	4.80 cd
715	Musky, powdery (sweet, woody)	Feminine	4.68 de
814	Citrus, spice (fougère, fruity)	Masculine	4.54 ef
316	Floral, powdery, and sweet	Feminine	4.51 efg
549	Green, floral, and citrus	Accord	4.42 fg
359	Floral, spice, powdery, woody (citrus)	Feminine	4.41 fg
420	Powdery, floral, and sweet	Feminine	4.26 gh
861	Citrus, woody, and green	Shared	4.13 hi
219	Citrus (orange / tangerine) and sweet	Accord	4.08 hi
492	Powder, floral, and sweet (green, woody)	Accord	3.95 i
196	Floral-white flower, green (fruity)	Accord	3.60 j
318	Floral complex with animal undertone	Accord	3.60 j
910	Aldehydic, citrus, spicy (ozone)	Accord	3.60 j
412	Sandalwood, citrus (resinous)	Accord	3.11 k

[1] Means are reported on a 7-point scale (7 = like very much; 4 = neither like nor dislike; 1 = dislike very much).
[2] Different letters within a column indicate mean values that are significantly different at $p<0.05$.

The PLSR analysis indicated that the residual validation variance reached a minimum after the two first PLS factors. Therefore a two-factor solution was considered optimal to describe the relationship between sensory properties and hedonic scores for all scents included in the study. The first two PLS factors accounted for only 18% of the variability in the descriptive data, suggesting the need to include additional factors to explain a greater amount of the variation of the descriptive data. However, the first two extracted factors were found to account for 87% of the variability in liking. Therefore, the model appeared to provide a good prediction of liking. Figure 1 shows the PLS map that relates descriptive terms and consumer liking for all samples included in the study. As noted above, consumer liking is driven mostly by fougère and fruity notes. Furthermore, the PLSR revealed that some olfactory accords were outliers in the data set. Careful interpretation of the PLSR was thus necessary.

A second PLSR was then refitted to the data, using only the fine fragrance data. This analysis indicated that the residual validation variance reached a minimum after the two first PLS factors. Again, two factors were considered optimal for describing the relationship between sensory properties and hedonic scores for all scents included in the study. Figure 2 represents the PLS map that relates descriptive terms to consumer liking for the 14 fine fragrances. The first two PLS factors accounted for 47% of the variability in the descriptive data, and still accounted for a large amount of the variability in the hedonic data (85%). These results suggested that, for the range of fine fragrances tested, 47% of the variability in the descriptive data could explain most of the variability in liking. Similar to the analysis of variance and PLSR results presented previously, fougère notes drove liking strongly, especially when associated with light ozone-marine notes and some citrus. Fruity notes also drove liking to some extent. Sweet, powdery, animal and floral notes were associated with lower liking scores, overall. Last, fragrances that had spicy or green notes were less liked overall than other fragrances.

Consumer liking is driven by fragrances sensory characteristics. Complex, blended masculine fougère fragrances and simple fruity sweet scents were most liked by consumers. Musky fragrances, as well as floral, powdery, sweet, and green, woody, spicy scents were less liked. Less complex olfactory accords generally were disliked.

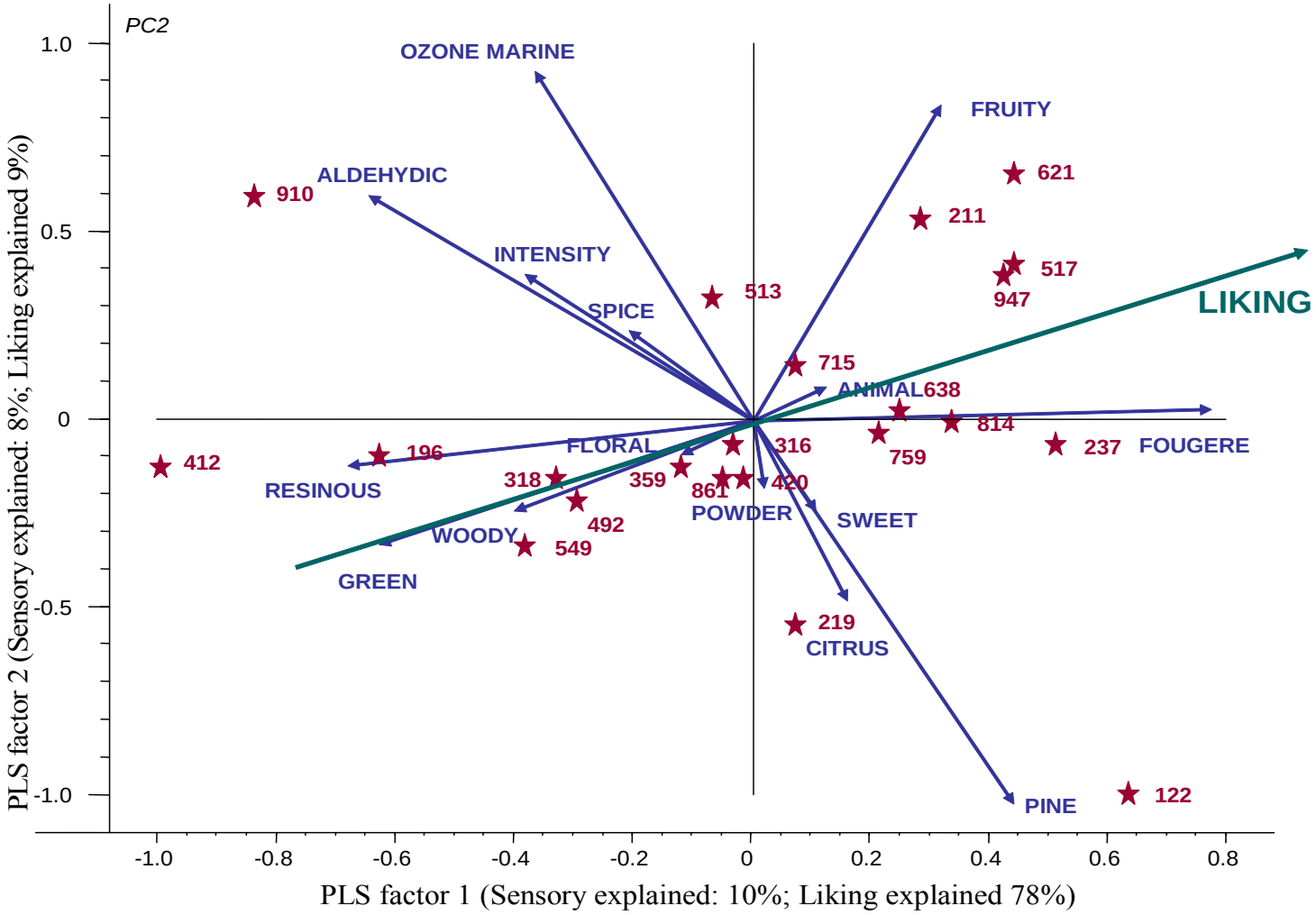

FIGURE 1.
Map of the first two PLS factors relating descriptive terms to consumer liking for **all samples** in the study.

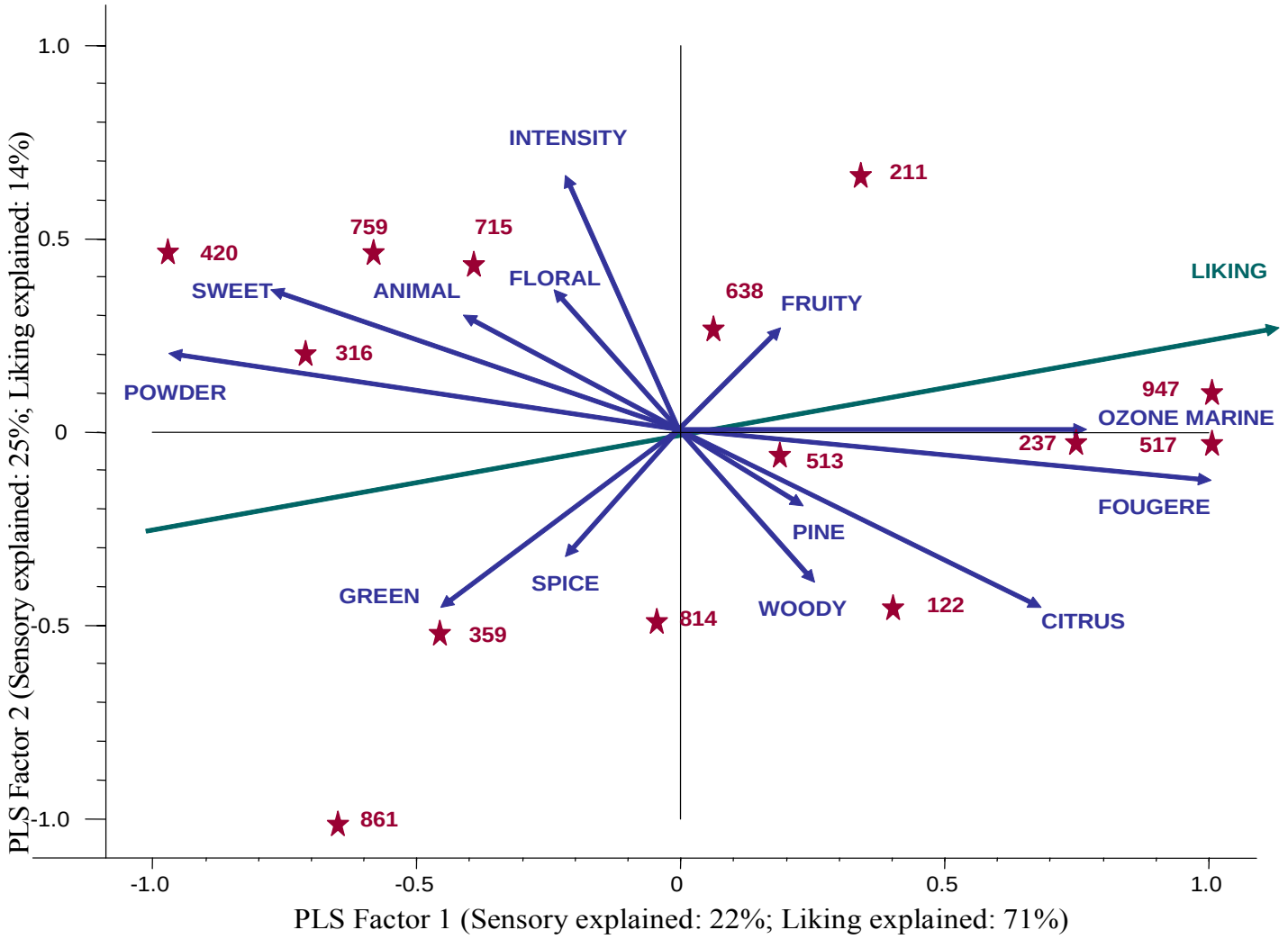

FIGURE 2.
Map of the first two PLS factors relating descriptive terms to consumer liking for **all fine fragrances** in the study.

It seems, therefore, difficult to assess the influence of sensory characteristics and hedonics on personality and image associations, independent of each other. However, results suggested multidimensionality of liking in the present study, i.e., fragrances with different sensory profiles were liked equally. Samples 621 (fruity, sweet), 638 (floral, citrus) and 517 (fougère, citrus) had considerably different sensory profiles, yet did not have significantly different liking scores (between 5.33 and 5.12 on a 7-point scale). By looking at commonalities in image and personality association of fragrances with similar liking scores but different sensory properties, one might determine the role of hedonics, independent of sensory quality, as a driver of associations. Additionally, fragrances that did not differ much in their sensory profiles had significantly different liking scores. The liking scores for 517 and 122 (5.33) was significantly different (5.33 vs. 4.80) although both scents were described as fougère and citrus. Similarly, 316 and 492 were both sweet, powdery, and floral, but had significantly different liking scores (4.51 vs. 3.95). By assessing commonalities in the image and personality associations of fragrances with similar sensory profiles but different liking scores, one might determine the role of sensory properties as drivers of fragrance image and personality association, independent of hedonics.

Sensory perception, situation fit, and image and personality associations for the different fragrances

Although for some attributes an order effect or an order by sample interaction was observed, analysis of the order and order by sample effects revealed that, for most attributes, no trend could be discerned. Therefore, the effect of order and order by fragrance interactions were considered to be random effects and were not taken into account for further interpretation of the data. However, it is important to note here that the significance of order effect mandates careful experimental design, such as the use of the Williams Latin Square design in the present study, when attempting to better understand the properties of products as perceived by consumers.

Tables 1,2, 3, and 4 in Appendix 7 present consumer scores for sensory properties, situation fit, image, and personality associations, respectively, for all fragrances included in the study.

When looking at individual scores, no simple linear correlation between liking and sensory properties as perceived by the consumers could be determined. Liking, however, was strongly positively correlated with fragrance image attributes (e.g., sensual [r = 0.94] and romantic [r = 0.93]) and personality traits (e.g., creative, imaginative [r = 0.96], conscientious [r = 0.91], attractive, appealing [r = 0.98], confident, assured [r = 0.94], and sensual, sexy [r = 0.95]). Additionally, correlation coefficients between liking and some other aspects of fragrance perception were low ($r < 0.5$). Characteristics such as feminine, or masculine, were only slightly correlated to fragrance liking, as were personality traits such as shy, reserved, folksy, down-to-earth, and energetic, active.

The correlations among descriptive attributes (as evaluated by the trained panel) and image, situation, and personality associations were weaker, indicating that individual sensory properties had less influence on the associations than did liking. However, it might be argued that some combination of sensory properties might drive these associations. Such a relationship cannot be observed using simple linear correlations.

A PLSR analysis was performed to relate hedonic and descriptive sensory characteristics to consumer responses for all samples. The analysis indicated that the residual validation variance reached a minimum after the three first PLS factors. Therefore three factors were considered optimal for describing the relationship between consumer liking, descriptive sensory properties and perceived consumer attributes pertaining to fragrance sensory perception, situation fit, and image and personality associations for all scents included in the study.

The first PLS factor (15% of the variability in the descriptive/hedonic data; 47% of the variability in the consumer data) had strong negative correlation with consumer liking and only a slight correlation with any descriptive attribute. In terms of consumer attributes, Factor 1 was negatively associated with fragrance image such as romantic, memorable, classic, and fashionable. Factor 1 was also negatively associated with personality associations related to sensuality and attractiveness (sensual, sexy, attractive, appealing), self-confidence (confident, assured), intellect (creative, complex, as opposed to uncreative, unintellectual) and conscientiousness (organized, conscientious, as opposed to disorganized, careless). The second PLS factor (22% of the variation in the hedonics and descriptive data; 14% of the variability in the consumer associations and

descriptions) opposed feminine to masculine fragrances, i.e. floral, sweet, powdery, and animal (musky) scents with fougère, citrus, ozone marine, woody, and spicy colognes. Feminine fragrances were also characterized by personality traits of femininity, introversion (shy, reserved, quiet), calmness and folksy, down-to-earth personality. Masculine colognes were associated with masculine, rough and tough personalities.

The maps of the first two PLS factors are presented in Figures 3 and 4. Figure 3 demonstrates the location of the independent and dependent variables. Figure 4 represents sample location in the space defined by the independent variables, i.e., descriptive terms and hedonics.

Figure 4 also shows the two-dimensionality of the liking space (ellipses group samples with similar liking scores, by 0.25-point increments in liking). Fragrances such as samples 621, 211, and 638, which combine high hedonic values, with fruity-floral notes (as opposed to aldehydic, resinous, woody and spicy notes), are perceived as feminine by consumers. These fragrances are located in the upper left-hand corner of the map (Figure 4) and are associated with images such as relaxing, fresh, natural and warm (Figure 3). They are perceived as suitable for home and likely to be worn in Spring or Summer. The person who would wear such fragrances would be highly agreeable (sympathetic and warm as opposed to cold and rude) and relaxed, as opposed to anxious, tense, moody and irritable. In the lower left-hand corner, fragrances such as samples 517, 237, 947, and 122, combine high hedonic values with fougère notes and no green note. These fragrances are perceived as masculine by consumers and are associated with images such as modern, energizing, and empowering. They are suitable for cold seasons (Fall and Winter) and are likely to be worn on an exciting evening out. They are associated with extraverted and energetic/active personality traits.

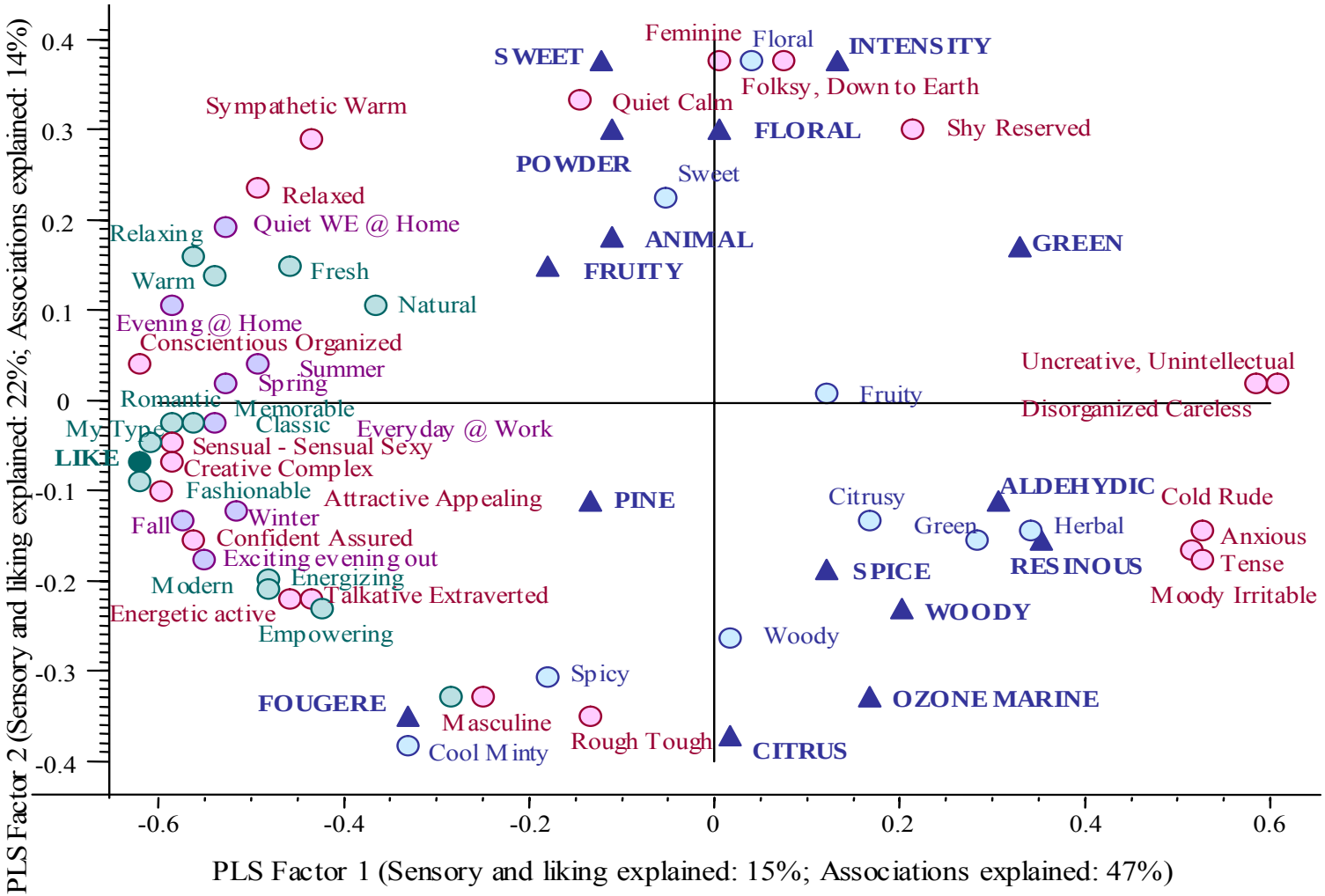

FIGURE 3.

Map of the first two PLS factors relating descriptive terms and consumer liking (upper case) to consumer description, situation, image and personality associations (lower case) for all samples in the study.

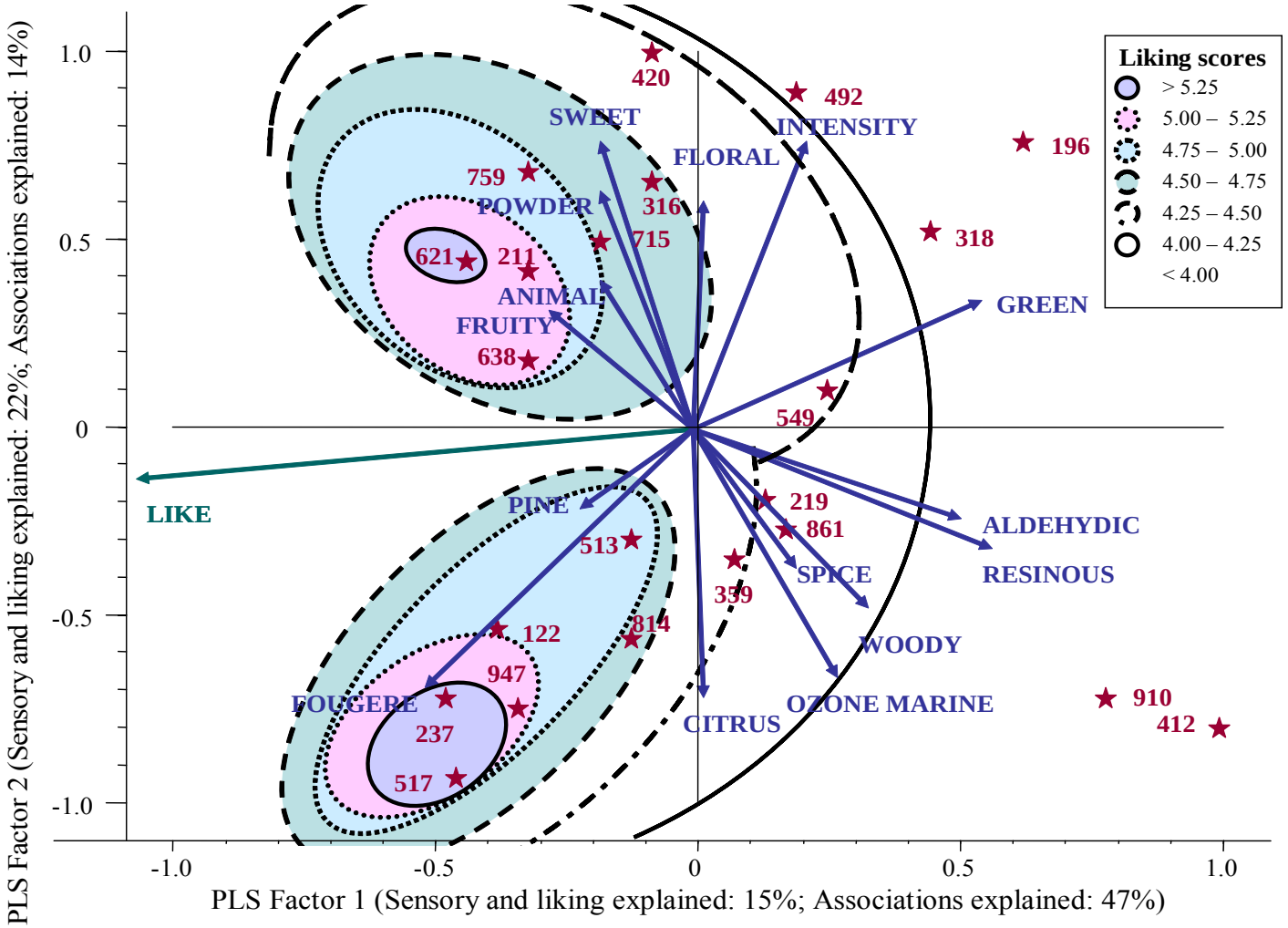

FIGURE 4.
Location of the products on the first two PLS factors relating descriptive terms and consumer liking to consumer description, situation, image and personality associations for all samples in the study.

The third PLS factor explained 12% of the variability in the independent variables (hedonics and descriptive terms) and an additional 9% of the variability in the dependent variables (consumer associations and descriptions). Fruity, green notes correlated positively with PLS Factor 3. Powdery, woody, animal, and sweet notes correlated negatively with PLS Factor 3. In terms of consumer descriptions, PLS Factor 3 opposed: 1) fragrances that were perceived by the consumer as fruity, green, citrusy and herbal. These fragrances were associated with natural and fresh images, and suitable for the warm seasons (Summer and Spring); and 2) fragrances that were perceived as spicy and woody to some extent. These fragrances were associated with warm and classic images, and suitable for cold seasons (Fall and Winter).

The maps of the second and third PLS factors are presented in Figures 5 and 6. Figure 5 demonstrates the location of the independent and dependent variables. Figure 6 demonstrates samples' location in the space defined by the independent variables, i.e., descriptive terms and hedonics. Liking is not heavily loaded on either of the two factors, suggesting that most of the associations with high loadings on the map are driven by sensory properties of the fragrance, independent of liking.

This map showed that fruity, green scents were associated with natural, fresh images. Samples that elicited these sensory notes were appropriate for Spring and Summer. Samples that combined fruity and citrus notes were described as green, citrus and herbal by consumers. These samples were perceived as energizing and were associated with an extraverted and energetic personality. Fougère-type fragrances with light citrus and ozonic notes were associated with masculine, rough tough personality. Woody scents were perceived as classic and appropriate for Fall and Winter. Animal, powdery scents were associated with an image of warmth, and quiet, calm personality traits. Last, sweet and floral fragrances were considered relaxing, for home use, and were associated with agreeable, relaxed, and introverted personality traits.

Similar to the analysis performed to relate sensory properties to hedonic value of the fragrances, a second PLSR analysis was performed on the data with only the fine fragrances included. Maps for the first two PLS factors are presented in Figures 7 and 8. Results are quite similar to those observed with the entire data set.

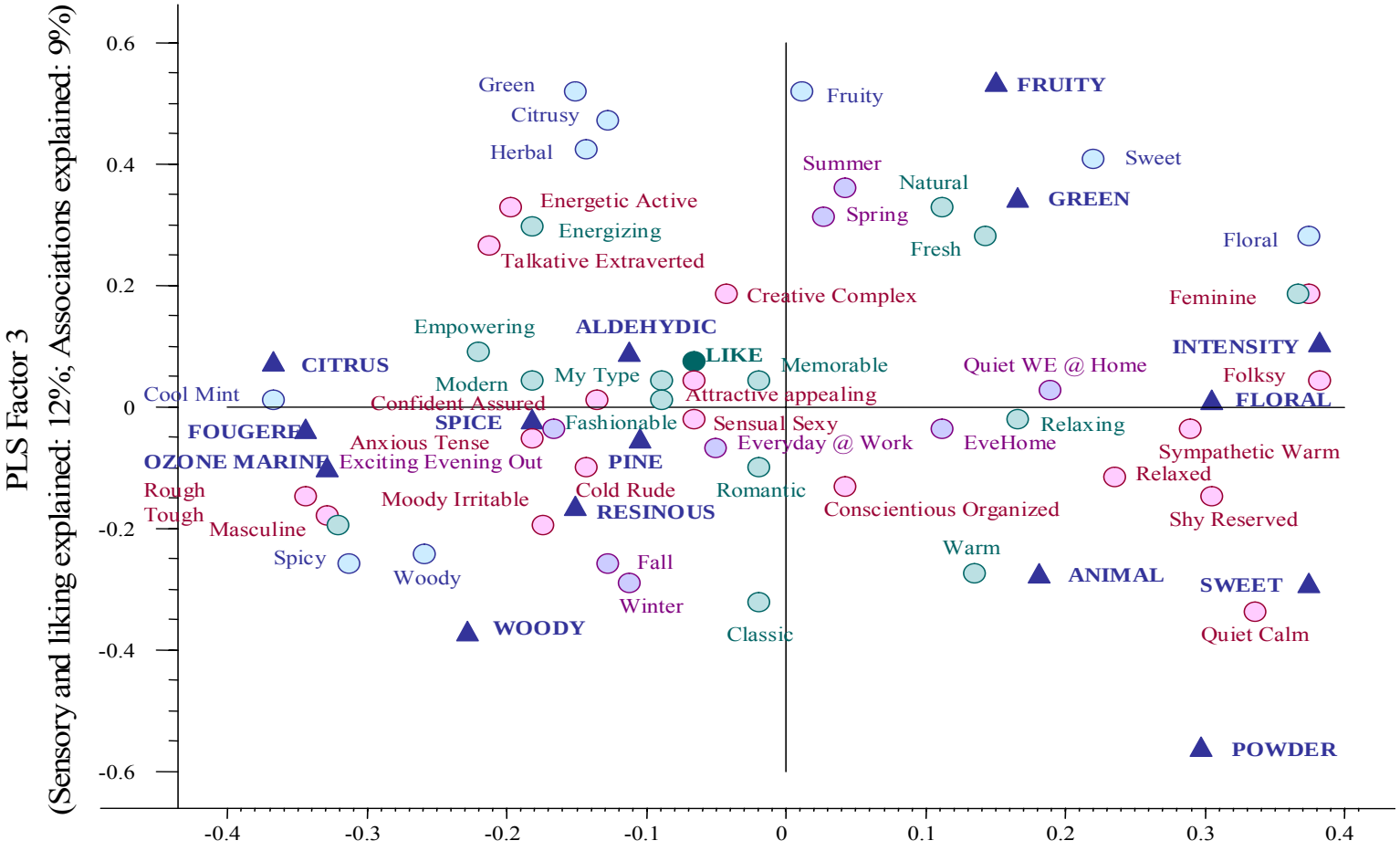

FIGURE 5.

Map of the second and third PLS factors relating descriptive terms and consumer liking (upper case) to consumer description, situation, image and personality associations (lower case) for all samples in the study.

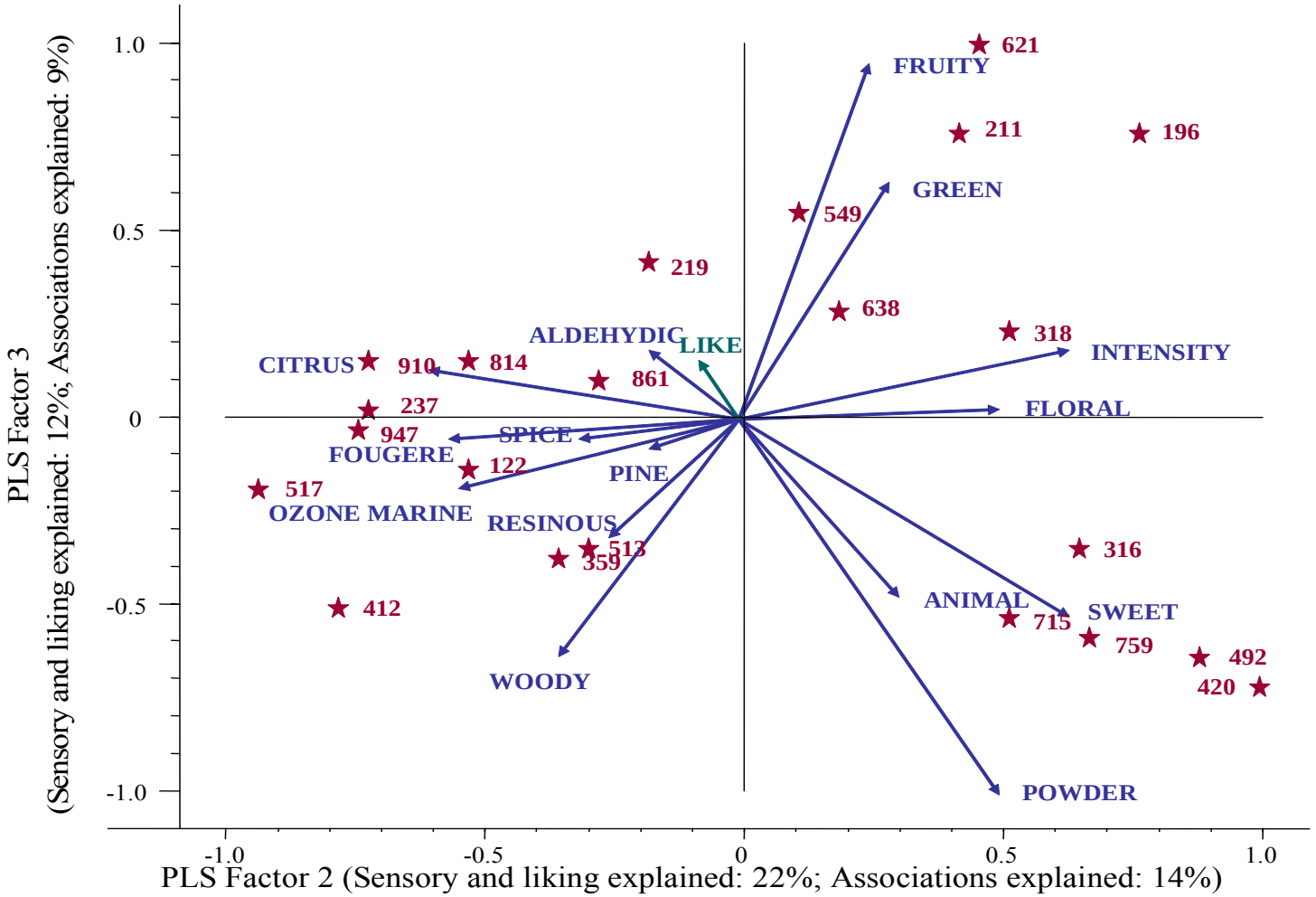

FIGURE 6.

Location of the products on the second and third PLS factors relating descriptive terms and consumer liking to consumer description, situation, image and personality associations for all samples in the study.

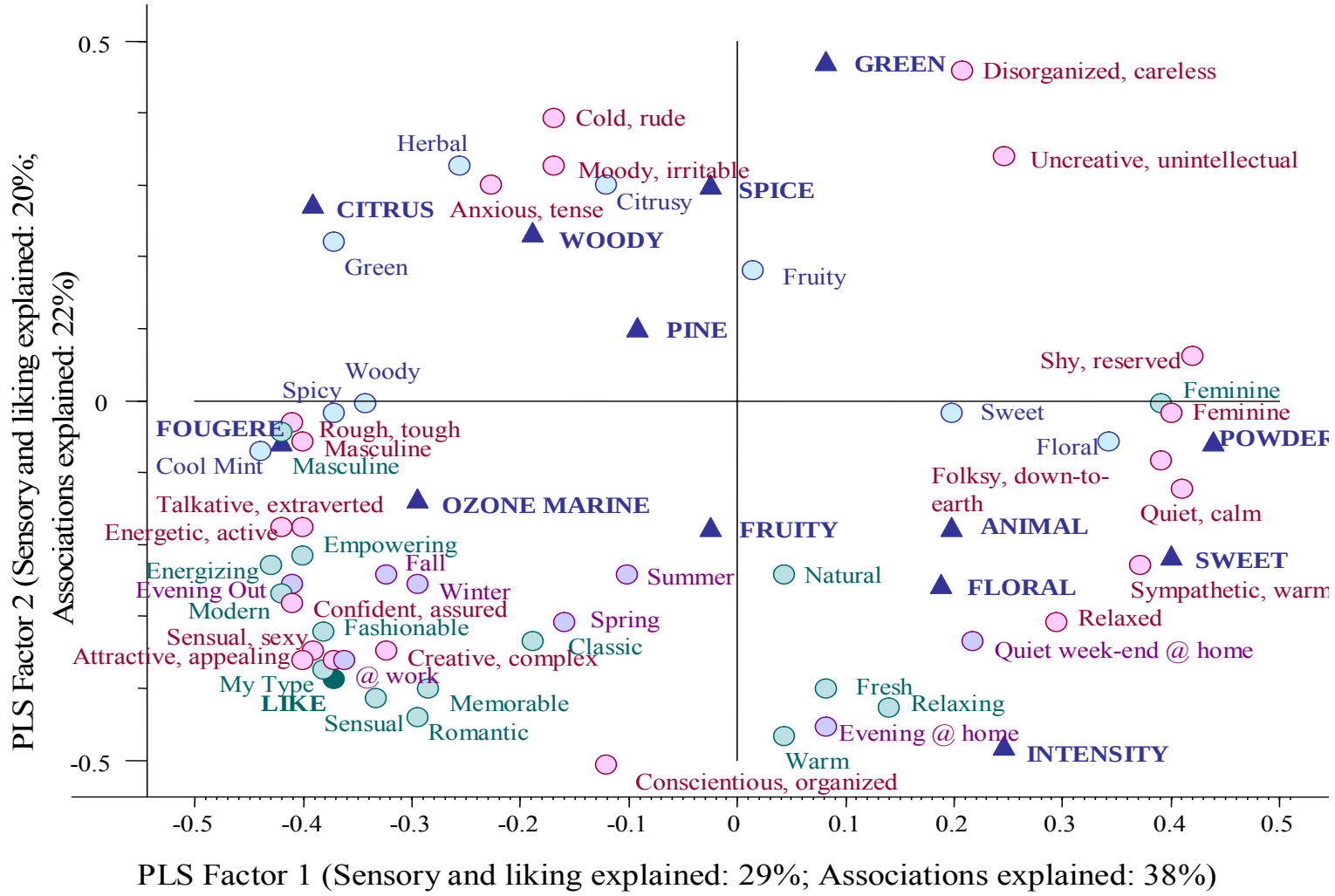

FIGURE 7.

Map of the two first PLS factors relating descriptive terms and consumer liking (upper case) to consumer description, situation, image and personality associations (lower case) for fine fragrances included in the study only.

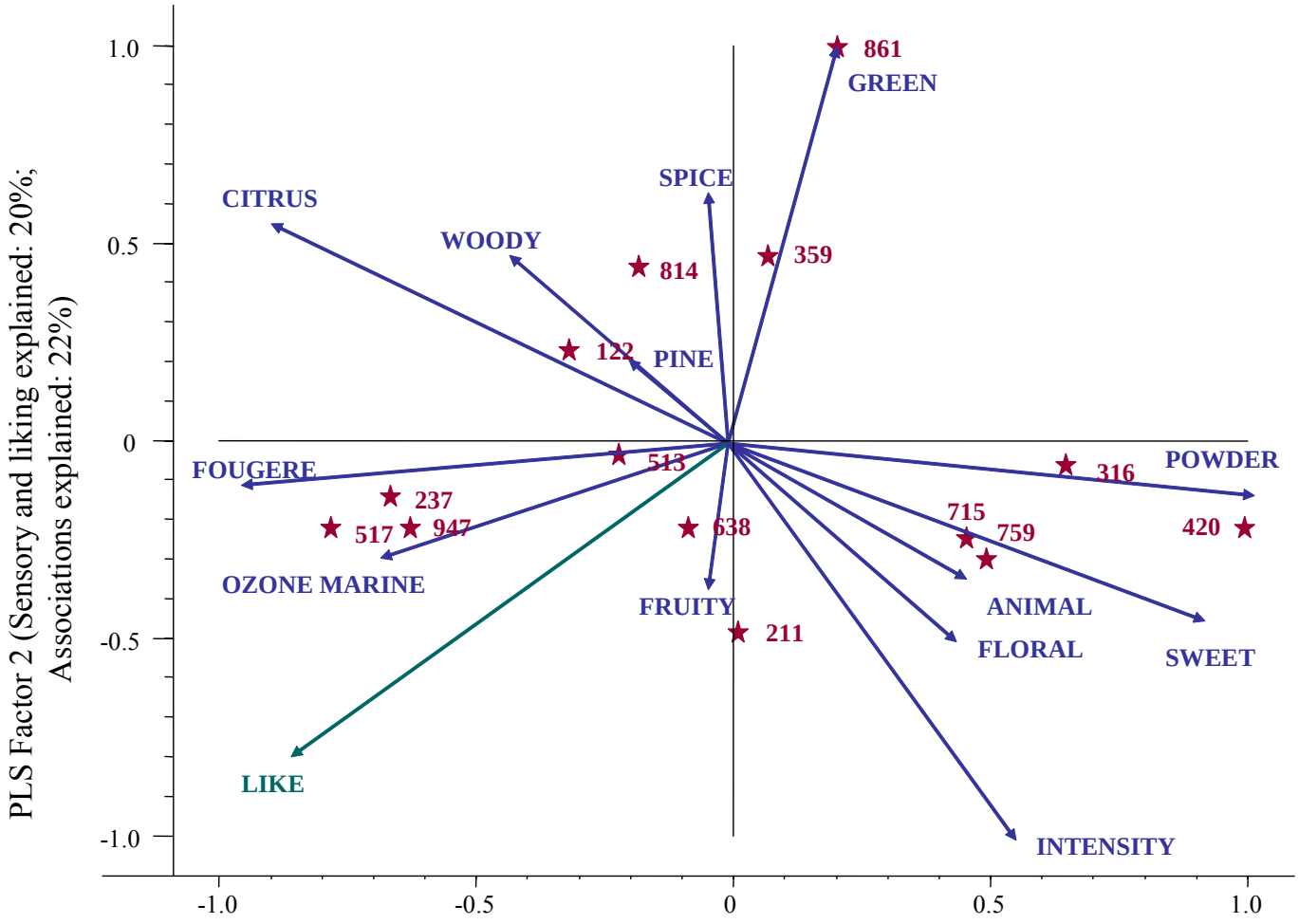

FIGURE 8.

Location of the products on the two first PLS factors relating descriptive terms and consumer liking to consumer description, situation, image and personality associations for fine fragrances included in the study only.

CONCLUSION

Relating hedonics to fragrance sensory properties

The present study was conducted in an attempt to relate intrinsic sensory properties of fragrances to consumer responses. Although sensory properties might explain liking, results strongly suggested that respondents did not like only one type of fragrance, but rather fragrances presenting variable combinations of sensory properties. Overall, blended fragrances seemed to be preferred over one-dimensional olfactory accords. Masculine fragrances, with fougère, light citrus and light ozonic notes were highly liked. So were femimine fragrances with fruity and sweet notes. This does not necessarily mean that a fragrance that would combine fruity notes with fougère would achieve high acceptance among consumers.

The relationship between consumer liking and fragrance sensory properties appears to be complex, and one needs to further specify product categories to better grasp the influence of sensory characteristics on fragrance acceptance. It would be useful to select a specific fragrance category (e.g., the oriental fragrance family, or the fruity-floral fragrance space, or the fougère cologne category) to further investigate the specific influence of intrinsic sensory properties on liking within similar fragrances.

Hedonic vs. sensory drivers of image and personality associations

The influence of sensory characteristics and hedonics on personality and image associations is a quite complex phenomenon. Results suggested multidimensionality of liking in the present study, i.e., fragrances with very different sensory profiles were liked equally. By looking at commonalities in the image and personality association of fragrances with similar liking scores but different sensory properties, it was, however possible to determine the role of hedonics, independent of sensory quality, as a driver of associations. Additionally, by assessing commonalities in the image and personality association of fragrances with similar sensory profiles but different liking scores, it was possible to determine the role of sensory properties as a driver of fragrance image and personality association, independent of hedonics.

Independent of sensory properties, fragrances that were liked were strongly associated with personality traits relating to interpersonal attraction, such as sensuality and attractiveness. Personality traits related to social interaction (extraversion, agreeableness) and mood aspects (emotional stability, tension-anxiety, and vigor-activity) tended to be related to both specific sensory characteristics and fragrance acceptance. For example, when a fragrance was liked and had fougère properties, it was associated with an extraverted and energetic personality, when a fragrance was liked and had fruity properties, it was associated with an agreeable, warm and relaxed personality. Last, independent of hedonics, specific sensory characteristics were associated with personality traits relating to masculinity/femininity and seasonality (warm scents, suitable for Fall and Summer were opposed to fresh, natural scents, suitable for Spring and Summer). Floral, sweet, and musky fragrances were associated with feminine, folksy, relaxed, agreeable, introverted and calm traits; spicy and woody scents were associated with masculine, rough-tough personalities. Specific sensory characteristics were also associated with seasonality. Woody and musky scents were perceived as warm and classic, and suitable for Fall and Winter. That was different from fruity, citrus scents, perceived as fresh, natural, and suitable for Spring and Summer. In conclusion, although the hedonic value seems to be a good predictor of many personality and image associations, sensory properties also have a strong impact on the formation of impressions and therefore should not be overlooked in fragrance evaluation and marketing.

Practical implications and need for further study

The present study was conducted in a laboratory setting and it is unknown whether the results are representative of what a person might perceive in a real-life situation, as a result of the multitude of other stimuli that might impact the formation of first impressions. However, this study provides valuable insights into which specific personality characteristics are associated with pleasant fragrances and which traits are directly linked to specific sensory properties of a fragrance. Such findings might have practical implications in the field of social psychology. If one encounters for the first time a woman wearing a pleasant floral and sweet fragrance, one might make judgments about

the woman's personality and perceive her as sensual and attractive, and warm and kind. Because of these positive attributions, on might feel more confident in engaging in social interaction. Similarly, if an introverted woman is wearing a masculine, fougère fragrance, which is associated with energetic, active mood and extraverted personality, she might feel more confident and talkative and engage more easily in a conversation with a stranger.

Additionally, by providing insights on which sensory properties are associated with specific personality traits and image, the present results may find direct applications in new product development and marketing strategies. Last, this information adds a dimension to fragrance perception that may be useful to fragrance professionals. These findings could, for example, enable a salesperson to better recommend fragrances by targeting the motivations, needs, and/or expectations of a potential client. For instance, if a man is looking for a fragrance that will make him feel more energetic and confident, a fougère fragrance might be suggested. If a woman is looking for a relaxing fragrance to wear at home, a fruity, sweet fragrance would probably be a good choice. If someone is looking for a gift for a friend, yet does not know his/her friends tastes, a description of the personality of the friend might be of help to best choose a fragrance that would fit that friend's personality.

Although more research is needed to better understand the interrelationships among fragrance hedonics, sensory characteristics, and impression formation in a real-life setting, the present study already provided some valuable insights into these phenomena that have direct practical applications.

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CHAPTER IV.

INDIVIDUAL DIFFERENCES, LIKING PATTERNS, AND INFERENCES ABOUT THE IMAGE AND PERSONALITY TRAITS ASSOCIATED WITH SPECIFIC FRAGRANCES

ABSTRACT

A total of 318 respondents evaluated 22 fine fragrances. Based on their liking patterns, the respondents were then divided into 4 segments. The segments did not differ in demographic and psychological makeup, however, respondents in the different segments differed in their motivations for fragrance use and beliefs in potential benefits of fragrance use. Among all segments, similarities in image and personality associations were observed. Independent of liking, the masculinity-femininity dimension was clearly defined by specific sensory characteristics and associated with specific personality traits in all clusters. Independent of sensory characteristics, liking consistently drove associations related to sensuality and attractiveness in all clusters. However, for some mood-related associations (energizing or relaxing for example), clusters differed in their perceptions of fragrances. Such associations were driven by liking only in some clusters, whereas they were driven by sensory characteristics in others, or by a combination of liking and sensory characteristics. Practical implications for marketing and advertising strategies are discussed.

INTRODUCTION

The formation of first impressions is largely driven by the totality of the information available at the first meeting. It is generally accepted that much of human communication relies on verbal or written cues. However, a large body of research suggests that non-verbal cues also play a large role in the formation of impressions. Numerous studies have focused on the formation of attitudes and first impressions based on visual and auditory cues. A person's lifestyle, personality, and mood is thought to be reflected in the way that person presents him/herself in public in terms of appearance, facial expression, clothing, voice tone, demeanor, and attitudes. Although the use of cosmetic products enhances appearance and helps convey favorable impressions, little is known about the role of personal fragrances and perfumes in this respect. Associations could be driven by both hedonic and specific sensory properties of fragrances and might be subject to large individual differences.

Individual differences, including gender, age, familiarity, and personality, have effects on a number of preferences, including preferences for forms and colors (Eysenck, 1940; Eysenck, 1941); aesthetic judgments (Peel, 1945; Moffet and Dreger, 1975; Juhasz and Paxson, 1978; Eysenck, 1992; Furnham and Avison, 1997); music (McCown *et al.*, 1997; Schwartz, 2002); leisure pursuits (Jin and Austin, 1995) and exercise (Courneya and Hellsten, 1998); as well as learning styles (Blickle, 1996) and occupations (Segal, 1992; Judge *et al.*, 1999). Of special interest is the body of research concerning food choice and consumption as a function of personality (Furnham and Heaven, 1999). Numerous models have been developed in an attempt to explain eating behaviors and food preferences. Some models emphasize the interrelationships between food intrinsic properties (i.e., appearance, odor, flavor, texture, etc.), hedonics, individual differences (including psychological, socio-economic, physiological and cultural factors), and environmental influences (Shepherd, 1989; Shepherd and Farleigh, 1989; Shepherd and Sparks, 1994; Raudenbush *et al.*, 1995; Goldberg and Strycker, 2002). Other models focus on individual differences in attitudes and motivations, rather than on demographic variables or personality traits to attempt to explain behaviors (Ajzen and Fishbein, 1980;

Shepherd, 1988). A close relationship might exist among odor intrinsic characteristics, hedonics, individual differences (demographic, personality and/or attitudes and beliefs), and environmental influences.

The present study was conducted to determine whether and how groups of respondents who differed in patterns of liking for various fragrances also differed in demographic and psychological makeup, as well as attitudes and behavior toward fragrance use. Among liking segments, similarities and differences in specific association patterns linked to hedonic and sensory characteristics of the fragrances were also assessed and discussed.

MATERIALS AND METHODS

Respondents

A total of 318 respondents completed the study. Respondents were screened prior to the study and were disqualified if they reported any discomfort associated with fragrance, anosmia, or any other condition that might have affected their sense of smell. Subjects also had to have a history of wearing fragrance at least twice a week to qualify for the study. Respondents were recruited in two locations (Manhattan, Kansas, and Union Beach, New Jersey), selected based on their demographics, and equally divided into six categories according to age (18-25 yrs; 26-40 yrs; 41-55 yrs) and gender. In the 18 to55 yrs age range, respondents are likely to demonstrate a relative stability in the order of preference for odors (Vroon, 1997) and good performance in odor identification (Doty *et al.*, 1984; Wysocki and Gilbert, 1989; Wysocki *et al.*, 1991). Additionally, respondents older than 18 were assumed to have a fully developed sense of smell. An upper age limit of 55 years was chosen to reduce the likelihood of olfactory impairment.

Measurement of individual differences

Respondents were asked to complete a questionnaire consisting of demographic information – age, gender, frequency of fragrance usage – and of psychographics - Saucier's Mini-markers (Saucier, 1994) and self-monitoring scale (Snyder, 1974).

- The Mini-markers correspond to a self-administered personality test and consist of a list of 40 adjectives evaluating the five dimensions of personality as defined by the Five Factor Model (Goldberg, 1990). Each adjective is evaluated on a 9-point scale. Scores for extraversion-introversion, agreeableness, intellect, emotional stability, and conscientiousness are then computed.
- Snyder's Self-monitoring scale corresponds to a set of 18 true-false statements evaluating the personality trait of self-monitoring. An overall score is then computed.

A score was calculated for the each of the personality constructs evaluated. For the Mini-markers, scores were then compared with normative values (Saucier, personal communication, 2004). Mean scores for each factor fell into the interval for the normative mean ± 2 standard deviation.

For each construct, the panel of respondents was then divided into three categories: high, medium and low based on the distribution of the scores for that construct.

Measurement of beliefs and attitudes towards fragrances

A survey on attitudes and beliefs toward fragrances was developed and revised prior to the study. Comments from a focus group were used to refine some of the original statements; results from a pilot study allowed for the reduction of the survey to a set of 48 statements.

The first set of statements concerned respondents' beliefs and attitudes towards fragrance/cologne. Respondents were asked to indicate on a 5-point Likert scale (1 = disagree strongly to 5 = agree strongly) how much they agreed or disagreed with 34 statements such as 'I like to wear different fragrances when I am at home, at work, or during an evening out'; 'The fragrance I wear makes me feel good about myself'; 'I wear fragrances because it reflects social status', etc.

Each statement was grouped under one of the seven factors (Factor Analysis computed with SYSTAT Version 10.2) that best explained attitudes and behavior towards

fragrances. The factors were further grouped under two categories. Motivations for fragrance use encompassed inner-directed motives, perceived emotional benefits, social motives and attraction motives. Behavioral aspects of fragrance use included the use of unique vs. multiple fragrances depending upon activities and schedule, preference for subtle vs. noticeable fragrances, and acquisition of fragrance as a gift vs. as a personal choice.

The second set of statements related to the importance of 14 criteria for fragrance selection. Respondents were asked to indicate, on a 4-point scale (1 = not important at all to 4 = very important), how important were the name of the fragrance, their liking of the fragrance, the price, the fact that other people like the fragrance, etc. Additionally, criteria influencing fragrance choice were divided into 5 factors: personal appreciation of the scent, fragrance lastingness and personality fit, other's appreciation of the fragrance, cost-related issues, and external cues (e.g. fragrance name, package…).

Factor scores were computed for each respondent.

Odorants and odorants preparation

The samples studied were 22 scents divided into 4 categories. A set of 8 olfactory accords, representative of fragrance categories, were developed at International Flavors and Fragrances (Union Beach, New Jersey). Additionally, a set of 6 fine feminine fragrances was selected to be representative of a wide variety of commercially available fine feminine fragrances. Among the 22 samples in the study, 2 fragrances marketed to both men and women were included in the study. Lastly, 6 colognes were selected to be representative of a wide variety of commercially available fine masculine fragrances. All fragrances were fully profiled by a trained descriptive panel prior to the study. Table 1 presents the list of samples included in the study, as well as an overall description of each sample's sensory profile as determined by the trained descriptive panel (See appendix X for complete sensory profiles).

Samples were prepared by dipping a perfumer's strip into the fragrance bottle. The strip was air-dried for 1 minute, folded, and introduced into a 4-oz white squeezable plastic bottle with flip-cap. Containers had no identifying feature other than the 3-digit

code used to identify each sample. The samples were then held for 16 to 24 hours prior to evaluation to allow equilibrium to be reached in the container.

TABLE 1.
List of samples included in the study and their descriptions[1]

Olfactory accords			
Code	*Description*	*Code*	*Description*
219	Citrus (orange/tangerine) and sweet	318	Floral complex, with animal undertone
492	Powdery, floral, and sweet, with green and woody notes	196	Floral (mainly white flower), green with light fruity notes
621	Fruity, sweet, with light green undertone	910	Aldehydic, with citrus and spicy notes, and ozone undertones
412	Sandalwood, with citrus notes and resinous undertones	549	Green, floral, and citrusy
Feminine fragrances			
Code	*Description*	*Code*	*Description*
359	Floral, spicy, powdery, woody with light citrus notes	715	Musky and powdery with sweet and woody undertones
211	Fruity floral	316	Floral, powdery, and sweet
513	Floral, powdery, and woody, with light citrus notes	420	Powdery, flora,l and sweet
Shared fragrances			
Code	*Description*	*Code*	*Description*
122	Fougère and citrus, with floral, woody, and piney notes	861	Citrus, woody, and green
Masculine fragrances			
Code	*Description*	*Code*	*Description*
237	Fougère and citrus, with light floral and woody notes	947	Fougère, floral, citrus, and ozone
638	Floral, citrus with light fruity, sweet, and powdery notes	517	Fougère, citrus with light woody, powdery, and ozone notes
759	Musky, powdery, and sweet, with slight floral and citrus undertones	814	Citrus and spice, with fougère and fruity undertones

[1] Descriptions summarize the detailed profiles provided by a highly trained sensory panel

Squeezable plastic bottles are extensively used in the fragrance industry for consumer testing. Prior testing had shown that fragrance notes stabilized between 8 and 24 hrs after preparation. Additionally, a descriptive panel had determined that no plastic notes contaminated the fragrances when testing occurred within 24 hrs of sample preparation (S. Warrenburg, personal communication, 2003).

Fragrance evaluation

Each fragrance was evaluated with respect to (Ballots can be found in Appendix 3c):

Hedonics. Respondents were asked to rate how much they liked or disliked the scents.

Sensory characteristics/descriptive properties. An adjective checklist consisting of 9 sensory attributes adapted from studies on fragrance classification and description (Jeltema and Southwick, 1986; Jellinek, 1990; Lawless, 1999) was used for the evaluation. Descriptive attributes included citrusy, cool/minty, floral, fruity, green, herbal, spicy, sweet, and woody. Prior to the study, these attributes were discussed in a focus group and were determined to be sufficient to accurately describe the fragrances and to differentiate among fragrances base on their sensory properties.

Image associated with the fragrance. Fragrance descriptors such as feminine, fashionable, romantic, sensual, warm, energizing, relaxing, etc., were also rated by the respondents

Situation fit. Respondents were asked to rate the appropriateness of wearing the fragrance in different seasons and situations (every day at work, on a quiet weekend at home, in the evening at home, or for an exciting evening out).

Personality associated with the fragrance. Respondents were asked to rate how they agreed or disagreed with statements such as: "The person who would wear this fragrance would be anxious, tense" or "shy, withdrawn, reserved." Lists of adjectives qualifying the 5 factors of personality were derived from the adjectives assessed in the Big Five questionnaire (Saucier, 1994). In addition, dimensions that were beyond the big five and supposed to be significant for this particular study, such as femininity-masculinity,

sensuality, and self-confidence were also assessed (Saucier and Goldberg, 1998; Paunonen and Jackson, 2000).

Study design and procedure

Each respondent committed to come to three 1-hour sessions, scheduled one week apart. Each respondent evaluated 7 to 8 fragrances in a well-ventilated area on each day of the study. By the end of all 3 sessions, each respondent had evaluated all 22 scents included in the test. It was determined during a preliminary study – both by examining data consistency and by asking participants – that 7 to 8 evaluations per session constituted an adequate number and did not cause fatigue or a decrease in concentration for the respondents.

The order of fragrance presentation was randomized for each respondent following a 22*22 Latin square design, thereby accounting for first-order effects and position. Throughout the test, respondents were reminded when they should start evaluating the next sample and were encouraged to wait at least one minute between sample evaluations to minimize the risk of lingering fragrance influencing subsequent assessments and increased fatigue due to sniffing behavior.

Data processing and analysis

Respondents were grouped into clusters based on their liking scores for the fragrances using cluster analysis. For each cluster, means scores were computed for liking of the different fragrances included in the test. Liking data were analyzed using a Mixed model (SAS, 1998) in which fragrance, cluster, and order of presentation were main fixed effects. Cluster by fragrance and order by fragrance interactions also were treated as fixed effects. Respondent(cluster) was treated as a random effect. Because the fragrance by cluster interaction was significant, statistically significant differences in liking for different fragrances within each cluster were then determined. Additionally, a Partial Least Square (PLS) regression was performed on the data. This procedure attempted to relate cluster liking for the fragrances included in the test with sensory characteristics as described by a highly trained panel.

Frequency tables were generated by cluster for the nominal variables related to individual differences (gender, age, location, and usage). A chi-square test was performed for each variable to assess whether clusters differed in their demographic make-up.

Respondents' personality variables were analyzed using a General Linear Model (SAS®, 1998) in which cluster was treated as a main effect. Duncan's means comparison test was performed to assess statistical differences in the psychological makeup of the clusters of respondents.

Results from the survey on attitudes and behavior toward fragrances were analyzed using the same procedure.

For each cluster, means scores were computed by fragrance for sensory variables, image variables, situation fit and personality variables. Each variable was analyzed using a Mixed model (SAS, 1998) in which fragrance, cluster and order of presentation were main fixed effects. Cluster by fragrance and order by fragrance interactions also were treated as fixed effects. Respondent(cluster) was treated as a random effect.

A Principal Component Analysis (PCA) was performed by cluster of respondents on the means for sensory variables to evaluate fragrance perception for each cluster. Additionally, PCA was performed by cluster of respondents on the means for all sensory, association, image, and situation variables. Scores for liking and 'My type of fragrance' were not included in the PCA. All means were normalized to a 5-point scale prior to performing PCA on the covariance matrix of the means. This approach was preferred over the use of PCA on the correlation matrix to account for true variability in the data.

RESULTS AND DISCUSSION

Cluster definition: respondents differed in liking for the tested fragrances

Results from cluster analysis revealed four segments or clusters in the population tested. As expected, liking patterns differed from cluster to cluster. Means and significant differences among fragrances for liking scores are presented by cluster in Table 2.

TABLE 2.
Liking scores by cluster

Cluster 1			Cluster 2			Cluster 3			Cluster 4		
Sample	N = 72		Sample	N = 127		Sample	N = 60		Sample	N = 47	
122	5.19	a	517	5.76	a	211	5.33	a	237	5.83	a
513	5.18	a	621	5.75	a	621	5.33	a	638	5.55	a
237	5.06	ab	237	5.72	a	517	5.00	ab	517	5.53	a
715	5.06	ab	513	5.55	ab	715	4.90	abc	621	5.49	ab
759	4.99	abc	638	5.50	abc	759	4.52	bcd	947	5.43	ab
947	4.88	abcd	211	5.43	abcd	196	4.45	bcde	759	5.30	ab
638	4.79	abcde	947	5.34	bcde	638	4.33	cdef	211	4.79	bc
517	4.65	abcde	122	5.31	bcde	549	4.32	def	814	4.45	cd
549	4.64	bcde	359	5.16	cdef	219	4.22	def	513	4.36	cd
420	4.56	bcde	814	5.09	defg	947	4.12	def	316	4.32	cd
814	4.50	bcde	715	4.99	efgh	316	4.10	def	122	3.89	de
316	4.49	cde	219	4.88	fgh	318	4.10	def	420	3.87	de
211	4.46	cde	549	4.78	fghi	237	4.08	def	318	3.47	ef
621	4.46	cde	316	4.75	ghi	910	4.08	def	492	3.45	ef
861	4.40	de	759	4.65	hi	359	4.00	defg	219	3.38	efg
492	4.29	e	861	4.50	ij	861	4.00	defg	715	3.34	efg
359	4.24	e	420	4.49	ij	513	3.95	defgh	196	3.32	efg
318	3.18	e	492	4.20	jk	122	3.92	rfgh	359	3.28	efg
219	3.07	fg	910	3.98	kl	420	3.78	fghi	549	3.19	efg
910	2.94	fg	196	3.69	lm	814	3.48	ghi	861	3.11	fg
196	2.76	fg	318	3.62	lm	492	3.42	hi	910	2.87	fg
412	2.51	g	412	3.57	m	412	3.28	i	412	2.62	g

Note: Scores are reported on a 7-point scale (1 = dislike extremely; 4 = neither like nor dislike; 7 = like extremely)

Additionally, Figure 1 presents the results of a PLS regression, in which liking data were tentatively explained by the sensory properties of the fragrances, as determined by a panel of trained judges. Results of the PLS regression showed a two-factor solution. The first PLS factor explained 52% of the variability in liking and only 10% of the variability in sensory description. Liking for all clusters was highly positively correlated to Factor 1, suggesting that all clusters disliked fragrances that had stronger aldehydic, green, ozone marine, or resinous notes (negative correlation with Factor 1) and liked colognes with fougère notes (positive correlation with Factor 1). Additionally, with the exception of sample 621 (fruity sweet olfactory accord), all olfactory accords obtained low scores on Factor 1, suggesting that simple fragrances were disliked overall by respondents in all clusters, possibly because of their lack of amplitude and blendedness compared with the fine fragrances in the test. Fragrance belendedness reflects the degree to which the fragrance characteristics fit together in the product. It includes overall impact, the appropriateness of the various attributes their relative intensity in the complex and the way in which they harmonize. Amplitude is judged on three aspects: the fragrance base (body, fullness), its notes (intensity, impact, longevity) and the overall effect of these two together (balance, blendedness). Since most olfactory accords were less complex and blended than most fine fragrances in the test, they lacked amplitude. Factor 2 explained an additional 13% of the variability in liking and 15% of the variability in the descriptive data. Liking for Cluster 3 was highly positively correlated with Factor 2, which suggested a higher liking for fruity fragrances (samples 621 and 211) , whereas Cluster 1 showed a negative correlation with Factor 2, which was primarily the result of depressed scores in liking for fruity scents.

In general, all clusters tended to dislike olfactory accords (except for sample 621, a fruity sweet blend). However, differences in liking patterns could be observed among clusters for fine fragrances.

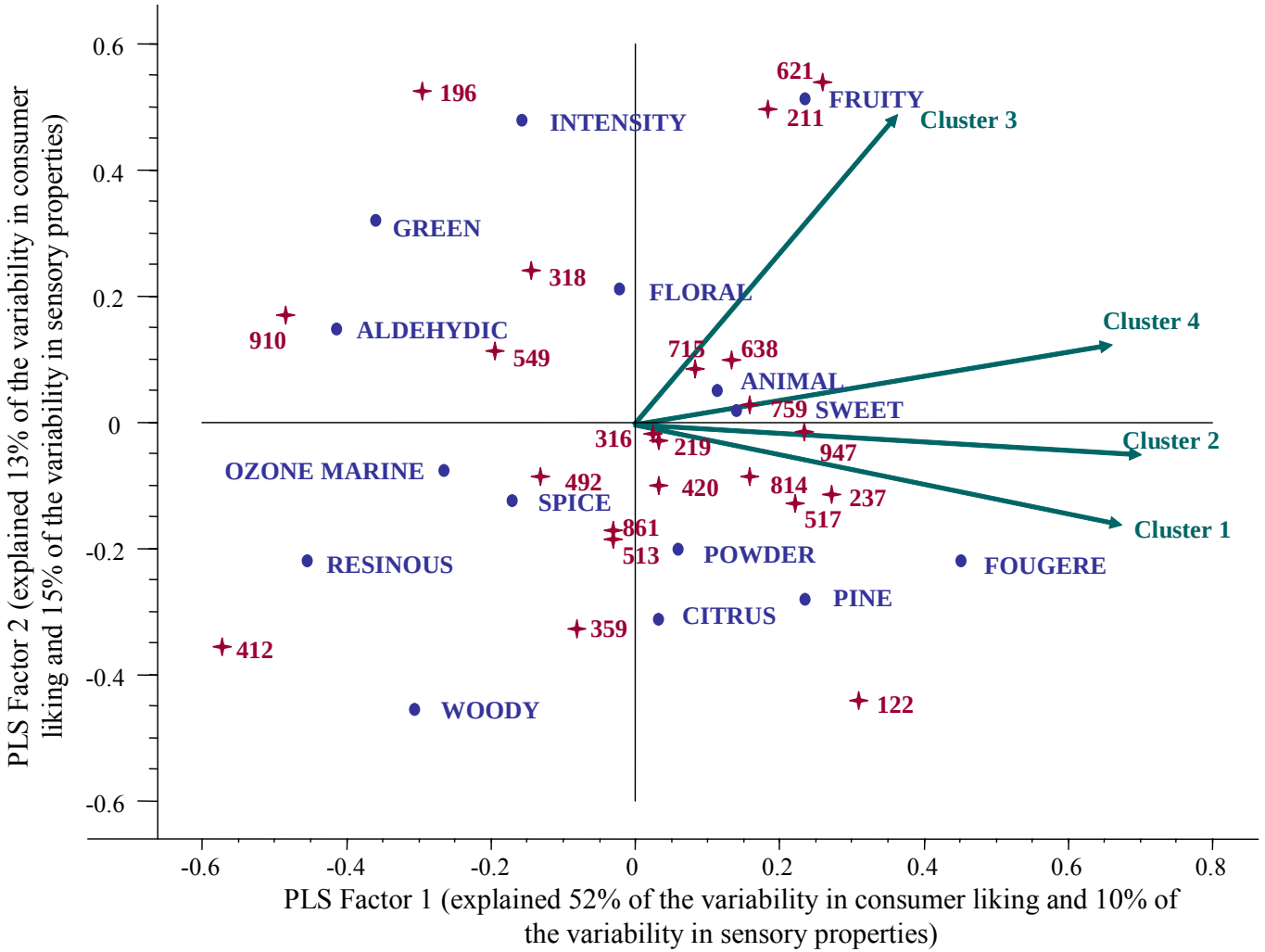

FIGURE 1.
Map of the two first PLS factors relating descriptive terms (upper case) to consumer liking by cluster (lower case and identified by the cluster number) for all samples in the study.

Cluster 1: Liking was driven mostly by amplitude. For respondents in Cluster 1, dislike was strongly driven by lack of blendedness and amplitude of the scent. All olfactory accords included in the test obtained very low ratings. Additionally, fine fragrances with a strong note that could reduce the overall amplitude of the scent were not as liked as more blended and round fragrances. For example, samples 359 (spice = 3.0), 861 (green = 2.5), and 211 (fruity = 6.0) were not as well liked as samples 517, 237 or 420. Additionally, respondents in Cluster 1 did not differentiate much between fine fragrances for liking, with the most rounded blended fine fragrances being liked equally. Trends could, however, be observed within the fine fragrances, with woody-citrus fragrances and powdery musky scents being liked the most overall, followed by floral sweet fragrances. Fruity scents were among the least liked fine fragrances.

Cluster 2: Liking was driven by fougère notes and by fruity blends. For respondents in Cluster 2, liking was driven by fougère/citrus or intense fruity characteristics. Products that were the most liked comprised samples 517, 237, and 513, which combined citrus and fougère notes, and samples 211, 621, and 638, which were characterized by the descriptive panel as having high fruity notes. As with Cluster 1, dislike in Cluster 2 was driven mostly by lack of amplitude in a fragrance (all olfactory accords were disliked, with the exception of 621). Among the fine fragrances, animal, sweet, and powdery notes along with woody, spicy, and green notes drove dislike.

Cluster 3: Liking was high for fruity fragrances and for musky, powdery scents. In Cluster 3, respondents' liking was driven primarily by intensity coupled with fruity and animal/powdery characteristics. Products that were most liked were samples 211, 621, 196 and 638 (high fruity notes), samples 715 and 759 (strong musky notes with sweet and powdery undertones), and sample 517 (citrus and fougère notes, with powdery and ozonic undertones, in which it differs from 237 and 947). Spicy and woody notes along with strong scents that combined sweet and powdery characteristics drove disliking. Products that were the least liked were samples 412, 492, 420, 814, 122, 513, 861, and 359 characterized by woody, spicy or sweet powdery (without musk) notes.

Cluster 4: Liking was driven by masculine characteristics (fougère, citrus) and fruity blends. Respondents in Cluster 4 were defined by their liking for masculine fragrances. They liked feminine and shared fragrances less overall. A response of strong dislike was driven by lack of blendedness and amplitude; all olfactory accords but 621 (fruity/sweet accord) obtaining low liking scores. Sensory characteristics that drove liking included intensity and citrus/fougère notes. Additionally, intense fruity scents were also liked (samples 621 and 211). Dislike was driven by fragrances with low intensity and spicy or green notes (samples 910, 412, 861, 549, 359, and 196).

Did the clusters differ in demographic, psychological, attitudinal and/or behavioral characteristics?

Analysis of the age, gender, and usage frequency distributions for the respondents did not show any significant differences among the four clusters (Table 3).

TABLE 3.
Frequency distribution for age, gender, and fragrance usage by cluster

	Cluster 1 (n = 72)	**Cluster 2 (n = 127)**	**Cluster 3 (n = 60)**	**Cluster 4 (n = 47)**
Age groups (yrs)	**Chi-square = 6.58, p = 0.36**			
18-25	26	38	23	19
	36.11%	29.92%	38.33%	40.43%
26-40	19	47	14	10
	26.39%	37.01%	23.33%	21.28%
41-55	27	42	23	18
	37.50%	33.07%	38.33%	38.30%
Gender	**Chi-square = 0.41, p = 0.94**			
Women	35	67	31	23
	48.61%	52.76%	51.67%	48.94%
Men	37	60	29	24
	51.39%	47.24%	48.33%	51.06%
Usage	**Chi-square = 1.96, p = 0.58**			
4 times a week or less	23	41	25	15
	31.94%	32.28%	41.67%	31.91%
5 times a week or more	49	86	35	32
	68.06%	67.72%	58.33%	68.09%

Additionally, no statistically significant differences were found among the four clusters, with regard to their psychological make-up, except for the personality trait of extraversion (Table 4). Self-reported ratings of extraversion were significantly higher for respondents in Cluster 1 than for respondents in the 3 other clusters.

TABLE 4.
Mean values for personality variables by cluster of respondents

	Cluster 1 (n=72)	**Cluster 2 (n=127)**	**Cluster 3 (n=60)**	**Cluster 4 (n=47)**
Extraversion	6.40 A	5.92 B	5.83 B	5.88 B
Agreeableness	7.39	7.36	7.09	7.35
Conscientiousness	6.78	6.72	6.74	7.05
Stability	5.92	5.82	5.76	5.98
Intellect	6.47	6.38	6.31	6.41
Self-monitoring	0.17	-0.80	-1.19	-1.45

Note: Within a row, means with different letters are significantly different from each other at the 0.05 level (upper cases letters) or at the 0.1 level (lower cases letters). Means comparison method: Duncan.

As shown in Table 5, analysis of attitudinal responses revealed more differences among clusters than did demographic and psychological variables. Motivations for wearing fragrance only slightly differed from cluster to cluster.

TABLE 5.
Means table by cluster for attitudes toward fragrances, motives for fragrance use and belief in fragrance benefits

	Cluster 1 (n = 72)	Cluster 2 (n = 127)	Cluster 3 (n = 60)	Cluster 4 (n = 47)
Inner -directed motives	**-0.07 ab**	**0.16 a**	**-0.18 b**	**-0.06 Ab**
Wearing a fragrance is part of my daily routine	3.96 ab	4.09 a	3.70 b	3.70 b
Wearing a fragrance makes me feel fresh and clean	4.21	4.27	4.08	4.19
I wear a fragrance because I like to smell good	4.49 AB,bc	4.57 A,ab	4.33 B,c	4.68 A,a
I wear fragrances for my own satisfaction	4.14	4.26	4.05	4.26
I only wear fragrance on special occasions (-)	1.72	1.73	1.88	1.89
Emotional benefits	**0.12 a**	**0.06 ab**	**-0.13 ab**	**-0.21 b**
Fragrances enhance my self-esteem	3.10 A,a	3.31 A,a	2.98 AB,a	2.64 B,b
When I wear a fragrance, I feel more confident about myself	3.75 A	3.57 AB	3.35 A	3.45 AB
Wearing a fragrance makes me feel more attractive	3.76 A	3.62 AB	3.37 B	3.62 AB
When I wear a fragrance, I am in a better mood	3.54 A,a	3.41 AB,b	3.43 AB,b	3.17 B,b
Wearing a fragrance enhances my individuality	3.29 a	3.22 ab	2.90 b	3.17 ab
The fragrance I wear enhances my personality	3.58 a	3.30 ab	3.18 b	3.38 ab
When I wear a fragrance, it makes me feel more professional	3.36 AB,a	3.50 A,a	3.40 A,a	3.04 B,b
The fragrance I wear makes me feel good about myself	4.24	4.23	4.03	4.17
Wearing a fragrance satisfies my need for fantasy	2.31	2.31	2.33	2.09
My fragrance completes my outfit	3.28 A,a	3.23 A,ab	2.88 AB,bc	2.68 B,c

Note: Means for each factor (in bold and grey) correspond to the means of factor scores by cluster. Means for each individual statement are based on a 5-point scale (1 = disagree strongly; 5 = agree strongly). Within a row, means with different letters are significantly different from each other at the 0.05 level (upper cases letters) or at the 0.1 level (lower cases letters). Means comparison method: Duncan.
The sign (-) accompanies statements that are negatively correlated with the overall factor to which they are assigned.

TABLE 5. (Cont.)

	Cluster 1 (n = 72)	Cluster 2 (n = 127)	Cluster 3 (n = 60)	Cluster 4 (n = 47)
Social motives	**0.07 AB,a**	**-0.04 AB,ab**	**0.19 A,a**	**-0.27 B,b**
I wear a fragrance because it is more socially acceptable	2.36 a	2.22 ab	2.37 a	1.98 b
I wear fragrance/cologne because everybody else does	1.58 B	1.68 B	2.02 A	1.64 B
I wear fragrances to better fit in social settings	2.79	2.47	2.57	2.62
I wear fragrance because it reflects my status	2.42	2.15	2.17	2.15
I don't care much about how the fragrance smells as long as people around me like it	1.97 a	1.80 ab	1.93 a	1.62 b
Attraction motives	**-0.06 B**	**-0.07 B**	**-0.12 B**	**0.30 A**
I wear fragrance/cologne because I want to appeal to the opposite sex	3.60	3.46	3.53	3.64
I wear fragrances to please my spouse/significant other	3.36 b	3.57 ab	3.45 ab	3.79 a

Note: Means for each factor (in bold and grey) correspond to the means of factor scores by cluster. Means for each individual statement are based on a 5-point scale (1 = disagree strongly; 5 = agree strongly). Within a row, means with different letters are significantly different from each other at the 0.05 level (upper cases letters) or at the 0.1 level (lower cases letters). Means comparison method: Duncan.
The sign (-) accompanies statements that are negatively correlated with the overall factor to which they are assigned.

Respondents in all clusters identified inner-directed motives as their primary reason for wearing a fragrance. Slight differences among clusters existed: respondents in Cluster 3 were less likely to mention that they wore fragrance because they liked to smell good; respondents in Cluster 2 were the most inclined to consider fragrance as part of their daily routine. Respondents in Cluster 1 most strongly believed in the emotional benefits of fragrances. Attraction was a less important motivation for them. On the opposite side, respondents in Cluster 4 considered attraction as a stronger motivation for wearing fragrance than potential emotional benefits. Respondents in Cluster 2 and Cluster 3 believed in emotional benefits of fragrances but did not differ in their judgment from

either Cluster 1 or Cluster 4 on that dimension. Additionally, similar to Cluster 1, they gave significantly lower ratings to the attraction motive than did respondents in Cluster 4, although this factor still constituted a strong motivational factor for fragrance use in this group. Last, social motives constituted the least self-reported motivation for fragrance use in all clusters. Here again, some discrepancies were observed among clusters: respondents in Cluster 4 disagreed more strongly with statements such as "I wear a fragrance because it is more socially acceptable", or "I don't care much about the fragrance as long as people around me like it" than did respondents in Cluster 1 and Cluster 3. Besides motivations for fragrance use, cluster populations did not differ much in fragrance behaviors such as wearing unique vs. multiple fragrance or receiving a fragrance as a gift vs. personally choosing the fragrance (Table 6). Slight differences in fragrance behaviors could, however, be observed concerning liking for subtle vs. noticeable fragrances. Respondents in Cluster 3 favored more subtle fragrances, whereas respondents in Cluster 2 and Cluster 4 tended to like more noticeable fragrances.

TABLE 6.
Means table for fragrance behaviors by cluster

	Cluster 1 (n = 72)	Cluster 2 (n = 127)	Cluster 3 (n = 60)	Cluster 4 (n = 47)
Unique vs. multiple fragrances	**0.02**	**0.00**	**-0.03**	**0.10**
I wear different fragrances depending on the season	2.79	2.78	2.70	2.70
I choose the fragrance I am going to wear based on my schedule and activities	2.79	2.91	2.90	3.00
I like to wear different fragrances when I am at home, at work or during an evening out	3.75	3.58	3.43	3.53
Subtle vs. noticeable fragrances	**-0.15 b**	**0.04 ab**	**0.19 a**	**-0.09 b**
I don't like to wear fragrances that everybody notices	2.38 B,bc	2.56 AB,ab	2.85 A,a	2.19 B,c
I prefer subtle fragrances	3.19 b	3.18 b	3.32 ab	3.55 a
I like other people to notice my fragrance (-)	3.92	3.80	3.65	3.77
I usually receive a lot of compliments about my fragrance (-)	3.46	3.47	3.23	3.57
Gift vs. personal choice	**-0.16**	**0.09**	**0.10**	**-0.12**
I wear my current fragrance/cologne because I received it as a gift	2.36	2.56	2.55	2.13
I don't care much about the fragrance I wear as long as it smells good	2.83 b	3.20 ab	3.30 a	2.91 ab
I really pay attention to how the fragrance smells when selecting a fragrance	4.64	4.54	4.38	4.60

Note: Means for each factor (in bold and grey) correspond to the means of factor scores by cluster. Means for each individual statement are based on a 5-point scale (1 = disagree strongly; 5 = agree strongly). Within a row, means with different letters are significantly different from each other at the 0.05 level (upper cases letters) or at the 0.1 level (lower cases letters). Means comparison method: Duncan.
The sign (-) accompanies statements that are negatively correlated with the overall factor to which they are assigned.

Last, as shown in Table 7, all clusters rated their own liking for the fragrance as the most important criterion for fragrance choice, followed by the fact that the fragrance would have a long-lasting smell and would fit the respondent's personality. Other's appreciation of the fragrance was still considered as a somewhat important criterion for fragrance selection by respondents in all clusters.

TABLE 7.
Importance of diverse criteria in the selection of process of fragrances by cluster

	Cluster 1 (n = 72)	Cluster 2 (n = 127)	Cluster 3 (n = 60)	Cluster 4 (n = 47)
Own appreciation of the fragrance	**0.25 A,a**	**-0.18 B,b**	**-0.10 AB,b**	**0.24 A,a**
Importance of the wearer's liking of the fragrance	3.99 A,ab	3.86 B,c	3.90 AB,bc	4.00 A,a
Importance of the fragrance smell	3.97 a	3.87 b	3.86 b	3.93 ab
Fits personality and lastingness	**-0.02**	**0.05**	**-0.01**	**-0.06**
Importance of the fact that it fits the wearer's personality	3.25	3.20	3.13	3.09
Importance of the lastingness of the scent	3.36	3.47	3.42	3.52
Other's appreciation of the fragrance	**0.09**	**-0.02**	**-0.15**	**-0.03**
Importance of the fact that the spouse / significant other likes the fragrance	3.29 AB	3.30 AB	3.07 B	3.42 A
Importance of the fact that others like the fragrance	2.60	2.54	2.62	2.39
Importance of the fragrance's sexiness	2.89	2.82	2.73	2.78
Cost	**-0.06 ab**	**0.01 ab**	**0.21 a**	**-0.11 a**
Importance of the price	2.74 AB,b	2.87 AB,ab	3.05 A,a	2.62 B,b
Importance that it is on sale	2.33	2.31	2.45	2.32
Fragrance's external cues	**0.07**	**-0.01**	**0.03**	**-0.02**
Importance of the brand name	1.99	1.93	2.03	1.96
Importance of the fragrance name	1.93	1.84	1.90	1.91
Importance of advertising	1.58	1.61	1.52	1.45
Importance of the packaging	1.64	1.67	1.67	1.77
Importance of the fact that it is fashionable	2.17 A,a	2.04 AB,ab	1.78 B,b	2.09 AB,a

Note: Means for each factor (in bold and grey) correspond to the means of factor scores by cluster. Means for each individual statement are based on a 5-point scale (1 = disagree strongly; 5 = agree strongly). Within a row, means with different letters are significantly different from each other at the 0.05 level (upper cases letters) or at the 0.1 level (lower cases letters). Means comparison method: Duncan.
The sign (-) accompanies statements that are negatively correlated with the overall factor to which they are assigned.

Price was considered to some extent, as well, in all clusters. All clusters rated external cues such as brand, packaging, and advertising as marginal criteria in the fragrance selection process. Slight differences were observed among clusters. Respondents in Cluster 1 and Cluster 4 reported that their own liking and the fragrance sensory characteristics were the most important criteria for fragrance selection more often than did respondents in Cluster 2. Cost was more likely to be a deciding factor for fragrance purchase for respondents in Cluster 3 than for those in Cluster 4. On the other hand, respondents in Cluster 4 were more willing to choose a fragrance that would please their spouse or significant other, compared with respondents in Cluster 3.

Sensory perceptions of the different fragrances

Results from the analysis of variance conducted on the sensory variables by cluster are presented in Appendix 8, Table 1. Although for some attributes an order effect or an order by sample interaction was observed, analysis of the order and order by sample effects revealed that, for most attributes, no trend could be discerned. Therefore, the effect of order and order by fragrance interactions were considered to be random effects and were not taken into account for further interpretation of the data. However, it is important to note here that the significance of order effect mandates careful experimental design, such as the use of the Williams Latin Square design in the present study, when attempting to better understand the properties of products as perceived by consumers.

The lack of significance of the cluster by fragrance interaction for floral, sweet, citrus, spicy and herbal suggests that respondents in all clusters perceived and used most sensory attributes in a similar manner. A cluster by fragrance interaction was noticed for woody, green, and cool/mint, properties that consumers might be less familiar with, and fruity. Interestingly, the PCA, generated by cluster, produced sensory maps (Figure 2) that were very similar among clusters. For all clusters, the first Principal Component (PC) accounted for 60% to 75% of the total variability. For all clusters, citrus, fruity and sweet were the attributes that loaded positively on the first PC. The second PC explained an additional 17% to 24% of the total variability.

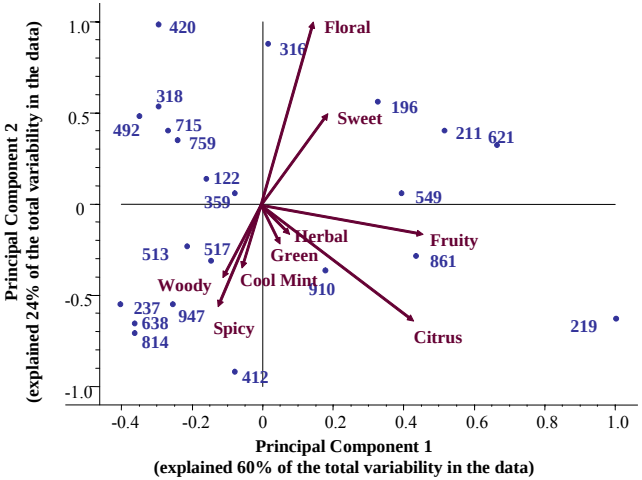

Figure 2a. Sensory map generated from Cluster 1 data

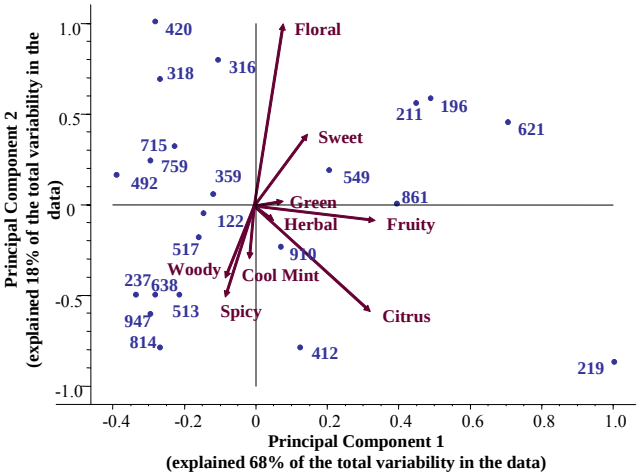

Figure 2b. Sensory map generated from Cluster 2 data

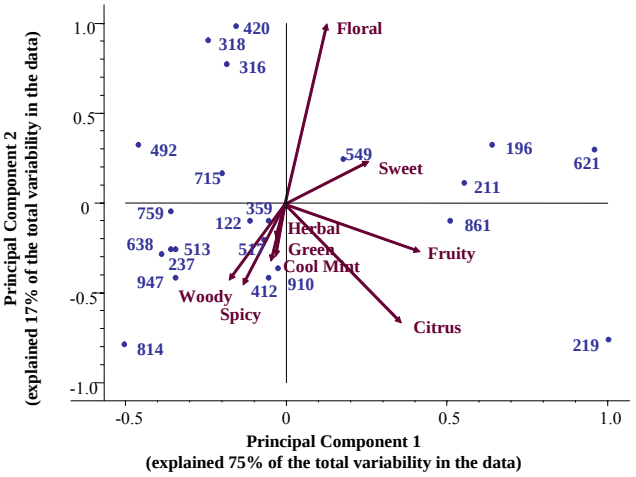

Figure 2c. Sensory map generated from Cluster 3 data

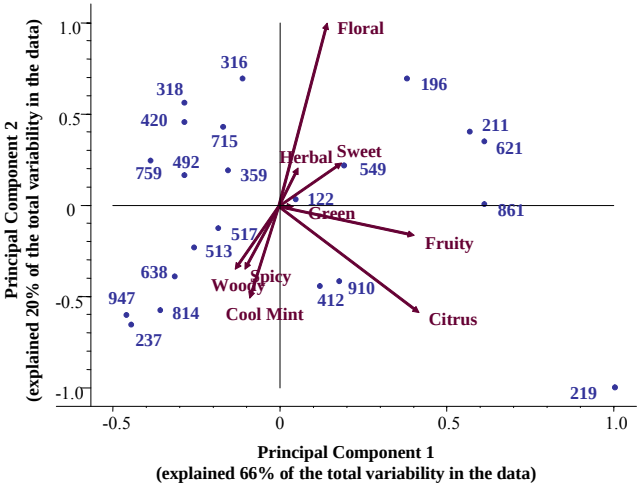

Figure 2d. Sensory map generated from Cluster 4 data

FIGURE 2.

Maps of the first two PCs performed on the consumer sensory data by cluster, for all samples in the study.

For all clusters, sweet and floral loaded positively with the second PC, and woody, spicy, and citrus loaded negatively with the second PC. Green, cool-mint, and herbal did not load heavily on any of these two dimensions. Additionally, the location of the samples on the maps was very similar from cluster to cluster. In the upper-right hand corner, samples 196, 621, and 211 grouped together and were characterized by high fruity and sweet notes. In the bottom right hand corner, Sample 219 was characterized by the highest citrus notes combined with low sweetness. In the upper left hand corner, Samples 420, 318, and 316 formed a floral group. Samples 715, 759, and 492 grouped in the middle left of the map and were characterized by both floral and woody notes. Last samples 638, 237, 947, and 814 grouped at the bottom left hand corner and were characterized by spicy and woody notes.

Even in the presence of cluster by fragrance interactions, the sensory maps generated by each of the four clusters were very similar to one another, suggesting that differences in perception were minor among clusters. It is therefore unlikely that observed differences in liking among clusters were a result of differences in sensory perception of the fragrances.

Image and personality associations and situation fit for the different fragrances

Results from the analysis of variance conducted on the association data are presented in Appendix 8, Table 2 (image variables), Appendix 8, Table 3 (personality associations) and Appendix 8, Table 4 (situation variables). For most response variables, either an order effect or an order by sample interaction was highly statistically significant. Such findings were expected due to the large data set. However, further analysis of the data revealed that no trend could be discerned for the effect of order or in the interaction across attributes.

The results, presented in Appendix 8, Tables 2, 3, and 4, also revealed that, for most attributes, a cluster by fragrance interaction was present. Exceptions did, however, occur: associations such as feminine, masculine image and personality, and personality traits such as folksy and down-to-earth, shy and reserved, quiet and calm, and rough and tough were consistent among clusters.

In order to compare the association patterns in the 4 clusters, 4 PCA maps were generated (Figures 3, 4, 5 and 6). A two-factor solution was suitable for all clusters and explained between 76% and 80% of the total variability in the consumer data. As with the previous analysis, two independent dimensions were clearly evident in all clusters. The feminine-masculine dimension opposed feminine, sweet, and floral scents to masculine, woody, cool-minty, and spicy scents in all clusters and was independent of the second dimension, which can be most aptly explained by liking. Feminine scents were highly correlated with shy, reserved and folksy, down-to earth, and quiet, calm personality traits, whereas masculine fragrances were consistently associated with rough, tough personality by all 4 clusters. Additionally, most positive personality and image associations related to interpersonal attraction and self-confidence (e.g., sensual, sexy, attractive, appealing, confident, assured, and romantic) were strongly positively correlated with liking in all clusters while such personality traits as cold, rude, tense, moody… were associated with disliked fragrances.

When the fragrances were at least somewhat liked, sensory qualities drove positive associations consistently for all clusters. For example, the descriptive panel described samples 517 and 237 as fougère and citrus in character, with woody undertones. Although some slight differences in liking were observed (samples 517 and 237 were among the most liked fragrances in clusters 2 and 4, and were liked somewhat by clusters 1 and 3), all clusters evaluated the sensory properties in a very similar way, generating comparable sensory profiles. Identically, consistent among all clusters and independent of liking, fragrances 517 and 237 were perceived as memorable, modern, romantic, sensual, and suitable for an exciting evening out, and were associated with confident and assured personality traits. Similarly, all clusters, except Cluster 1, liked samples 621 and 211. The two fragrances were characterized by the descriptive panel as fruity and sweet. Independent of liking, they were associated consistently by all clusters with sweet and fruity notes, and feminine and fresh images. They were also perceived as suitable for Spring and Summer. Last, musky and powdery scents such as samples 715 and 759, although they differed in liking scores among clusters, were consistently described as relaxing and associated with quiet, calm personality as opposed to talkative, extraverted traits.

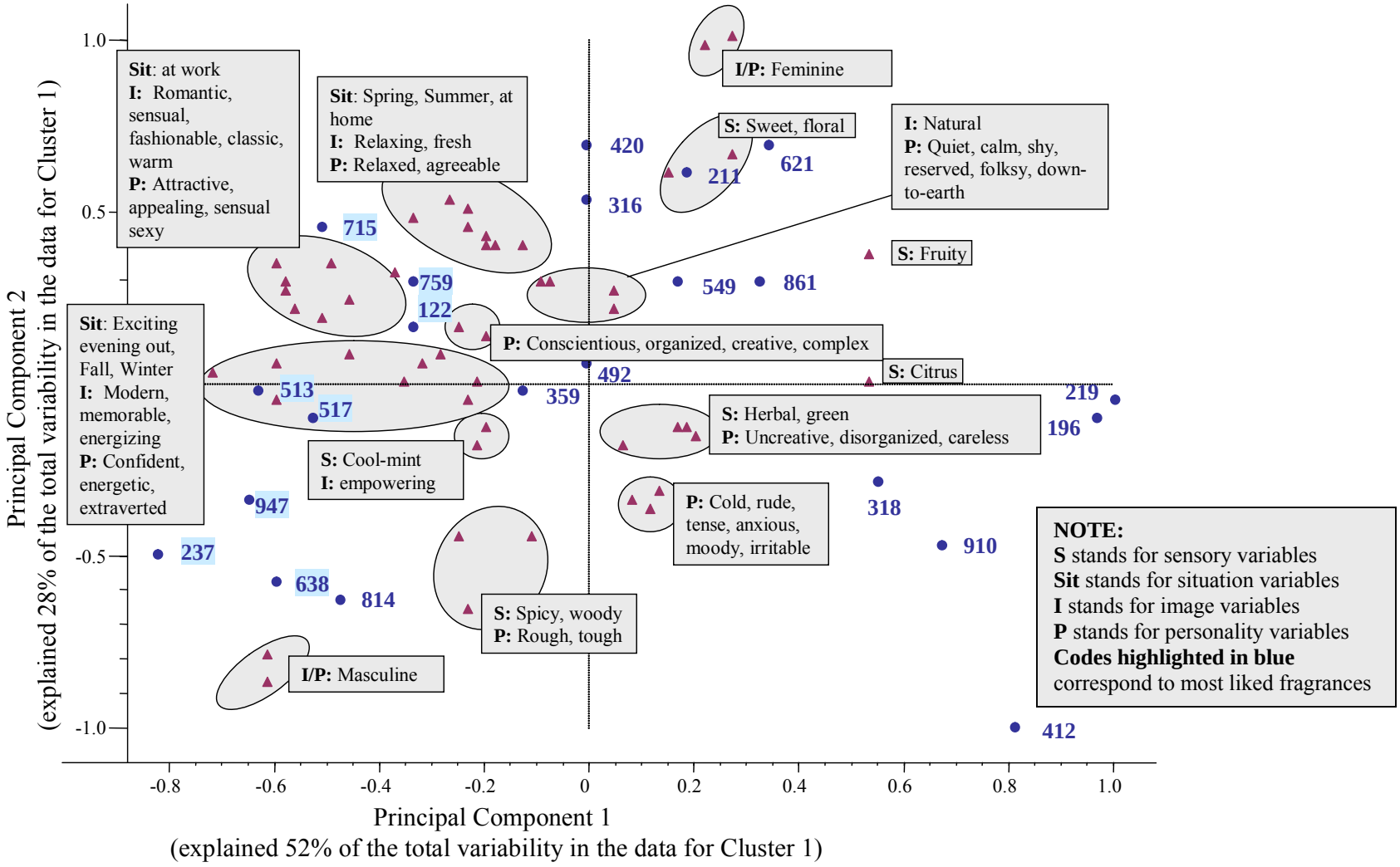

FIGURE 3.

Map of the first two PCs performed on all consumer variables for all samples in the study for Cluster 1.

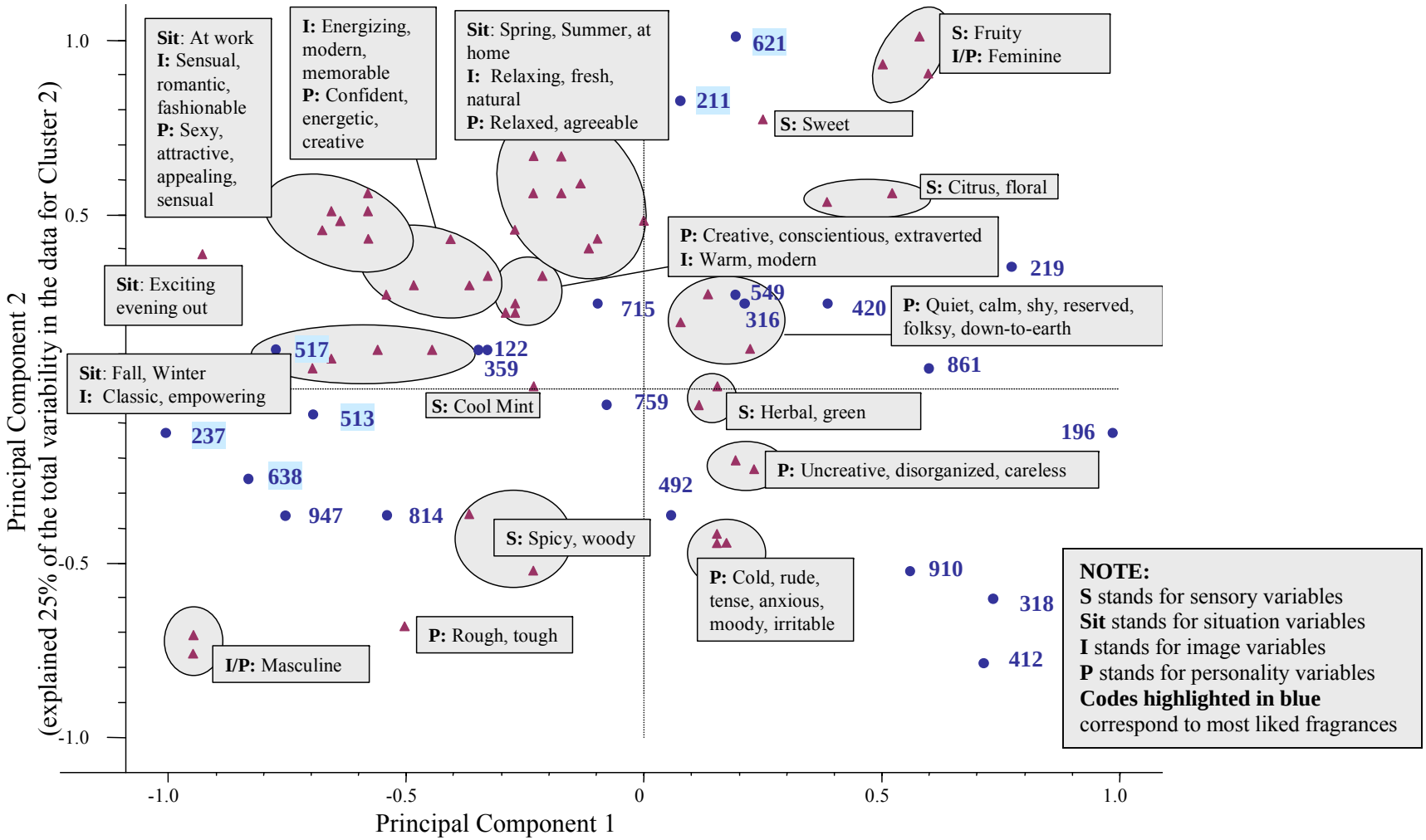

FIGURE 4.

Map of the first two PCs performed on all consumer variables for all samples in the study for Cluster 2.

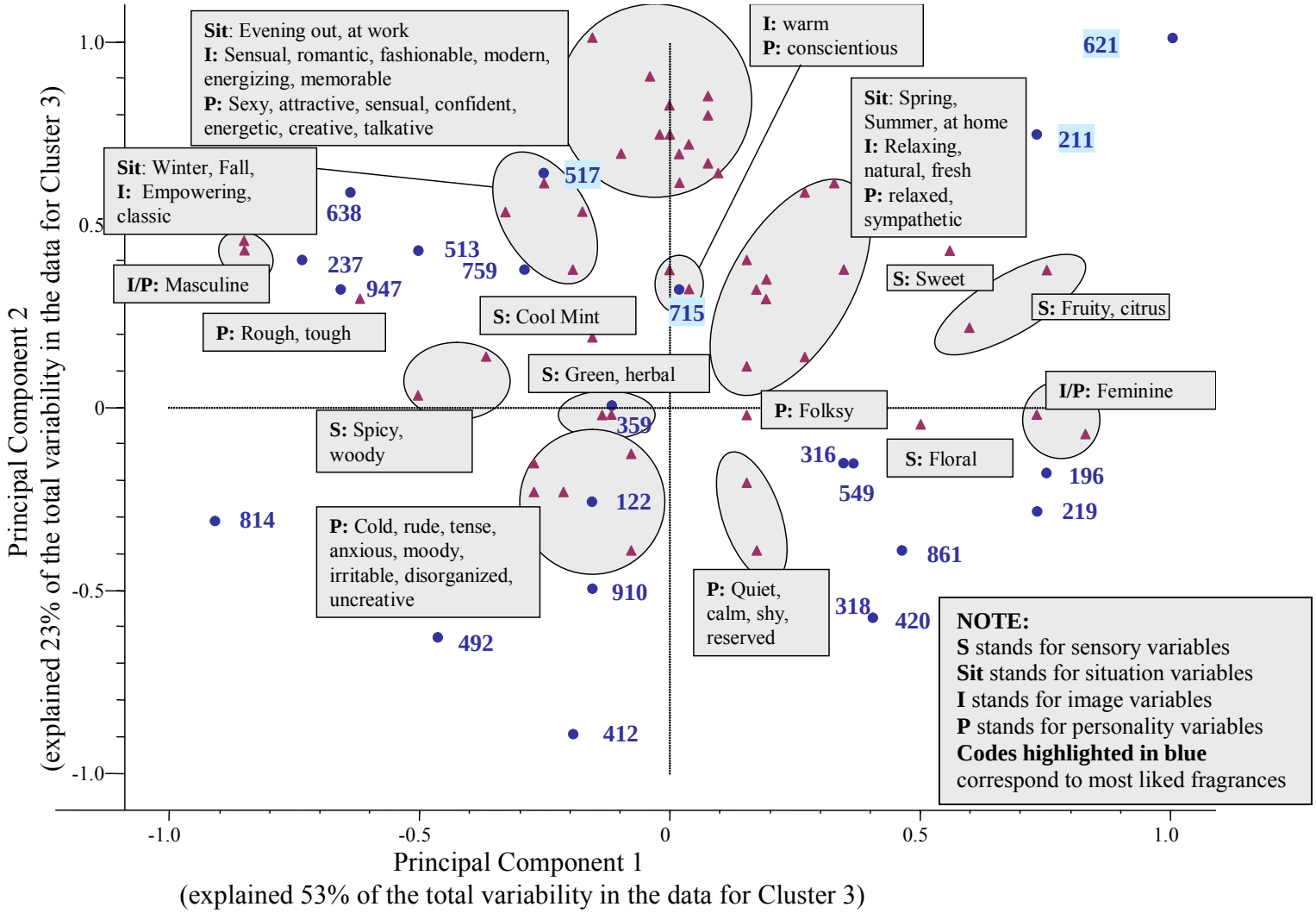

FIGURE 5.

Map of the first two PCs performed on all consumer variables for all samples in the study for Cluster 3.

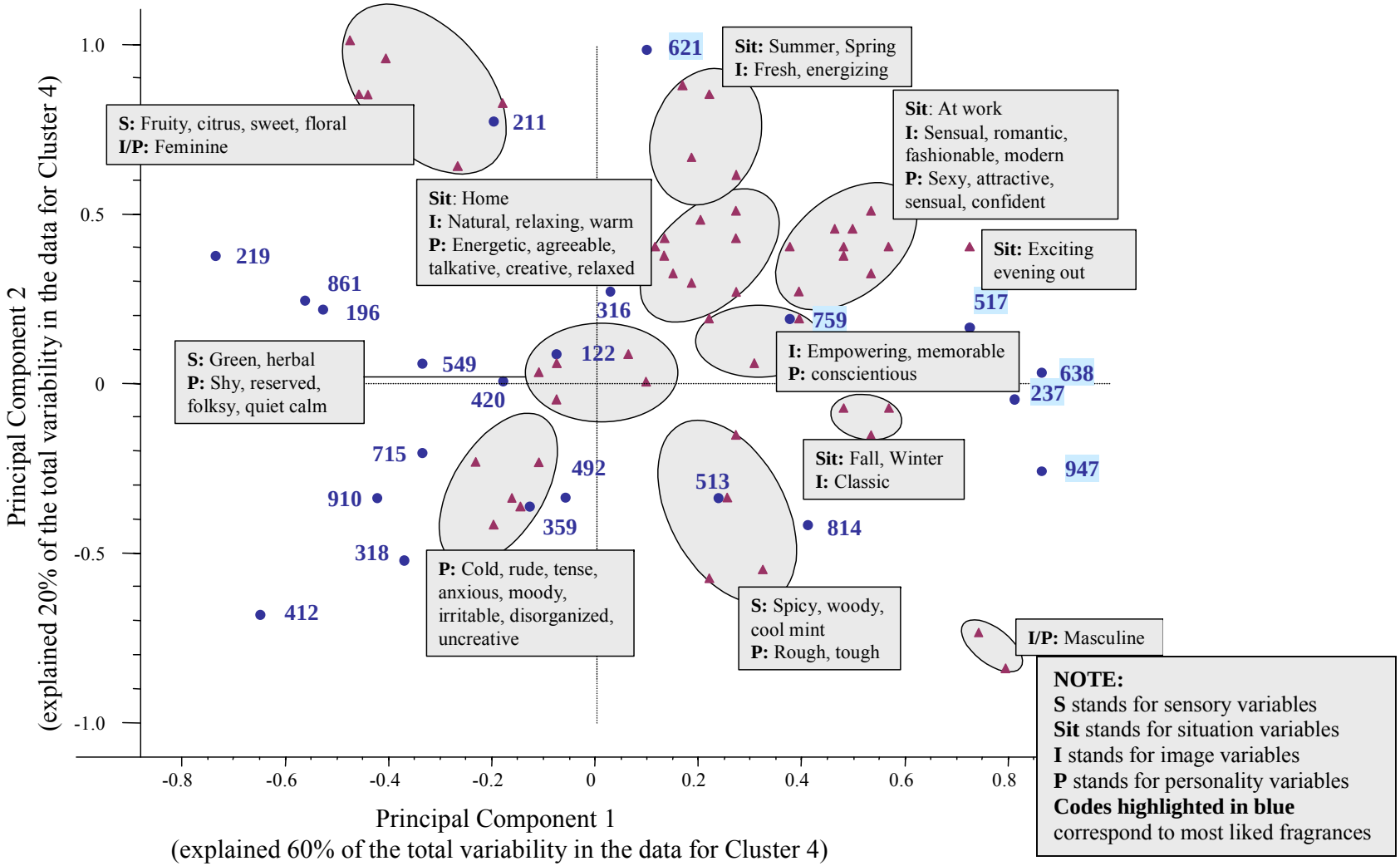

FIGURE 6.

Map of the first two PCs performed on all consumer variables for all samples in the study for Cluster 4.

Interestingly, a cluster effect could be observed for some associations. Liking and the personality trait of extraversion were strongly positively correlated in Cluster 2 ($r = 0.9$), somewhat positively correlated in Cluster 1 ($r = 0.64$), only slightly correlated in Cluster 3 ($r = 0.55$) and negatively correlated in Cluster 4 ($r = -0.79$). Similar trends could be observed for traits such as conscientious, organized or images such as classic. Last, independent of liking, some clusters were more inclined to make inferences and associations on some specific dimensions than others. For example, energizing was associated with masculine fragrances such as 947, 517, 237 and 638 in Cluster 1. It was associated with liked fougère fragrances and citrus scents such as 237, 219 or fruity sweet scents such as 638, 211 and 621, independent of masculinity in Clusters 2 and 4. Cluster 3 perceived fruity scents (621 and 211) as most energizing. Specific effects for various clusters also were found for natural, relaxing, and romantic images.

CONCLUSIONS

In the present study, 318 respondents were categorized into 4 clusters based on their patterns of liking for different fragrances. With the exception of Cluster 3, respondents in all clusters generally disliked most unblended olfactory accords in comparison with fine fragrances. Additionally, respondents in different clusters differed in their liking for individual fine fragrances. Respondents in Cluster 1 did not differentiate much among the fragrances and liked most fine fragrances equally, although trends showed slightly higher liking for woody-citrus scents and oriental fragrances (musky, powdery, and sweet). Respondents in Cluster 2 liked fougère/citrus and fruity-sweet fragrances most, and respondents in Cluster 3 liked fruity-sweet notes better than oriental scents. Last, respondents in Cluster 4 liked masculine fragrances most, with fougère fragrances being the most appealing to this group and floral fragrances being disliked overall. Interestingly, in all clusters, liking was not driven by only one set of specific sensory characteristics. Respondents liked, for example, fruity-sweet fragrances and musky powdery scents equally, which emphasized the multi-dimensionality of consumer liking for fragrances and the need for careful interpretation of multidimensional representations of the data, such as mapping using PLS regression.

Interestingly, the 4 clusters did not differ in their demographic or psychological make-up, except for self-reported extraversion. Findings in the present study do not resemble those of Mensing and Beck (1988) in a study of the relationships among odors, individual differences, and hedonics. This study was conducted with 600 German women, and the researchers examined the influence of extraversion and emotional stability on fragrance preferences and found that women with similar personality types liked similar perfumes. For example, high extraverts wore and liked more noticeable, energizing, fresh scents, whereas high introverts liked warmer, more comforting, oriental scents. Similarly, emotionally ambivalent persons liked more floral-powdery notes, whereas emotionally stable women preferred aldehydic-floral or Chypre (i.e., green, mossy, woody) types of fragrances. On the contrary, the present study strongly suggested that individual differences in age, gender, and personality, although they might influence liking, are not sufficient to accurately predict consumer liking for different fragrances.

On the other hand, among clusters, respondents differed in their motivations for fragrance use, beliefs in potential benefits of fragrance use, behaviors concerning fragrance use and criteria for fragrance selection. It is unclear whether and how these differences in attitudes could directly influence liking, however, data gathered about these attitudes provide interesting additional information that can help define each cluster and might be very useful in terms of developing marketing and advertising strategies.

The analysis of the sensory profiles of the fragrances in the various clusters showed quite a high consistency in the use of sensory terminology to describe properties of the scents. These results showed that, although the clusters differed in their liking patterns, they did not differ much in their sensory perception of the fragrances, as evaluated in the present study. One of the limitations of this study however, is that the respondents described the scents based on a predetermined set of descriptive attributes that did not cover some aspects of perception. Such terms as musky or aldehydic were not included in the adjective list due to the lack of familiarity of untrained consumers with such descriptive terms.

Lastly, at first glance, patterns of associations appeared similar for all clusters. In all clusters, two independent dimensions were defined. The masculine-feminine continuum drove some personality associations (rough-tough vs. shy, reserved, quiet,

calm, etc.). The second dimension was most explained by liking, with liked fragrances being associated with positive image and personality traits and disliked fragrances with negative image and personality traits. In all clusters and independent of sensory qualities, high positive correlations were observed between liking and such variables as romantic, confident, assured, sensual and attractive, appealing. Within the liked fragrances, fragrance sensory properties also played a large role in determining image and personality associations. Some consistency could be found among clusters when the fragrances were liked to some extent but differed in sensory properties. Fruity, sweet scents were consistently associated with femininity, relaxed mood state and freshness; fougère citrus scents were consistently perceived as memorable, modern, romantic, and sensual; musky powdery scents were consistently associated with relaxing image and quiet, calm personality trait as opposed to talkative and extraverted traits. Some specific cluster effect could also be observed, suggesting individual differences in patterns of association and preferences for associations based on different dimensions of image and personality.

The present study proposes a different way of looking at the issue of individual differences in liking for fragrances. Instead of specifying a target population in advance, or developing a concept, segments were defined based on their documented liking patterns. The failure to show statistically significant differences in the demographic or psychological makeup of the clusters clearly showed that the generalization of liking patterns based on individual differences in gender, age and personality might not be a large factor in determining liking. On the other hand, segments that differed in liking patterns also differed in their motivations for fragrance use and, to some extent, in their patterns of image and personality associations. These findings confirmed the fact that fragrance liking strongly influenced the formation of impression but that sensory characteristics also had a large impact. Last, clusters that differed in liking patterns also differed to some extent in their preferential dimension of attribution. Some clusters relied almost entirely on liking to draw inferences about some attributes, such as energizing or relaxing. Others relied primarily on the sensory properties of the scent, independent of liking.

Implications for strategic marketing and advertising become clear. Knowing that respondents in Cluster 1, for example, disliked unblended fragrances and liked powdery musky scents, one might try to develop a scent similar to 715 or 759 to achieve high acceptance. Additionally, respondents in Cluster 1 associated such scents with romantic, sensual, relaxing, and fresh images and with attractive, sensual, relaxed, and agreeable personalities. Advertising for such scents could therefore emphasize any of these characteristics to generate consumer expectations that would be confirmed upon smelling the fragrance. However, the patterns of motivation for fragrance use in Cluster 1 show those respondents in this cluster are more inclined to believe in emotional benefits of fragrances and are less driven by attraction motives than other clusters. Such findings might help refine the advertising strategy, which should now emphasize the potential emotional benefits (relaxing and warm) over the attractiveness aspect (sensual, attractive, appealing).

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CONCLUSION

The present research attempted to discuss some methodological issues associated with the evaluation of complex scents, such as fine fragrances, and to better understand the interrelationships among individual differences, fragrance perception, fragrance liking, and image and social interactions.

Three independent panels, differing in the number of evaluators and the degree of training/experience in fragrance descriptive analysis, evaluated a total of 22 scents, i.e., some olfactory accords and some fine fragrances available on the market. Two of the panels were highly trained in sensory analysis techniques and used reference standards to perform descriptive analysis of the fragrances. The third panel consisted of untrained respondents. They evaluated the 22 scents, answering predetermined questions on specific sensory properties of the fragrances, and providing information about their subjective perception of the fragrance in terms of hedonic reaction, image and personality associations and situational fit of the fragrances. In addition, respondents on this panel completed a demographic survey, two personality tests, and an attitudinal and behavioral survey on fragrance use.

Some methodological issues were first discussed, emphasizing the need for standard procedures and consistency throughout fragrance evaluation, both from the descriptive and consumer standpoints.

The use of consistent methodology in the preparation of fragrance samples is critical for an accurate description of the sensory properties of fragrances. Slight changes in dry-down time, for example, might induce differences in sensory profiles because of differing evaporation rates of fragrance components. Such differences in sensory qualities might not necessarily constitute a major problem in a fragrance categorization task; they

might be misleading, however, when one attempts to relate descriptive data to chemical or consumer data.

Additionally, the consistent use of validated questionnaires, such as the survey on motivations and attitudes for fragrance use presented here, might constitute an important strength for the fragrance industry. Newly developed evaluative instruments, if validated, might represent powerful tools not only for furthering research and better understanding individual attitudes, behaviorsm and perceptions, but also for developing new marketing and advertising strategies, as well as for improving customers' guidance and education.

The interplay of individual differences and all aspects of fragrance perception was also investigated.

Panel training and experience in sensory methodologies do not impact fragrance sensory perception tremendously. The fragrance profiles generated by highly trained panels were representative overall of consumers' perceptions, provided that the consumer panel was large enough. Results demonstrated, however, that the more extensive the training and experience in descriptive evaluation of the product category, the more extensive the discriminative capabilities of the panel among groups of fragrances and the greater the consistency of classification with the fragrance industry. By developing their own terminology, trained descriptive sensory panelists can describe products in a comprehensive and thorough way, uncover sensory dimensions that might not be defined otherwise, and provide reproducible and actionable results. Such panels also represent a cost-effective way of providing representative sensory profiles of scents. Trained and untrained panels should therefore not be used interchangeably, and the use of various types of panels must be weighed against both scientific and business needs.

Demographic and psychological differences influence motivations, beliefs, attitudes and behaviors with respect to fragrance use. For example, if both men's and women's primary motivation to wear fragrance is to smell good, fresh, and clean, overall men are more motivated by potential social benefits of fragrances and tend to use

fragrance as a tool for interpersonal attraction more than women do. Women, on the other hand, are more motivated than men by the potential emotional benefits that fragrance may provide. Similarly, from a personality standpoint, fragrance purchasing behavior is more influenced by others' appreciation of the fragrance and external cues, such as advertising or packaging, for high self-monitors than for low self-monitors. Interestingly, if demographics and psychological variables might explain independent aspects of motivations and attitudes toward fragrances, they are not sufficient to fully account for the variability in attitudinal and behavioral patterns: attempts to classify respondents based solely on their demographic and psychological makeup into groups with similar patterns of attitudes and behaviors for fragrance use resulted in more than 45% misclassifications. This implies that two approaches might be taken when one desires to better understand individual differences in attitudes and behaviors and to develop marketing and advertising strategies. When a target population is predefined based on demographics and/or personality traits, and the goal of the company is to reach that target market, then focusing on the direct impact of demographic and/or personality variables on attitudes and behaviors might help better understand the motivations and expectations of that targeted group. On the other hand, when the focus of the company is to sell a concept, a clustering approach based on attitudes and behaviors related to that concept might be preferred in order to further define the population that will be most attracted by such a concept.

In terms of fragrance perception and independent of respondents' individual differences, the combination of both intrinsic sensory characteristic and fragrance hedonic value is necessary to understand patterns of image and personality traits associated with different fragrances. Some fragrances had similar liking scores yet very different sensory profiles. Thus, it was possible to assess the influence of hedonics independent of sensory properties. Overall, personality traits relating to interpersonal attraction, such as sensuality and attractiveness, were strongly related to fragrance liking, whereas disliked fragrances were associated with negative personality traits. Additionally, some fragrances that had similar sensory profiles were associated with significant differences in liking scores. Thus, it was possible to assess the influence of

sensory properties independent of liking. Most of the differences in fragrance perception accounted for by sensory properties were related to the femininity-masculinity continuum and to seasonality. Independent of hedonics, floral, sweet, and musky fragrances were associated with feminine, folksy, agreeable, introverted, and calm traits; spicy, woody scents were associated with masculine, rough-tough personality. Woody and musky scents were perceived as warm, classic, and suitable for Fall and Winter; fruity and citrus scents were perceived as fresh, natural, and suitable for Spring and Summer. However, results suggested that neither hedonic nor sensory properties fully explained image and personality association patterns, for these two aspects were closely related and influenced fragrance perception simultaneously. For example, when a fragrance was liked and had fougère properties, it was associated with an extraverted and energetic personality. When a fragrance was liked and had fruity properties, it was associated with an agreeable and relaxed personality. This emphasized the fact that personality traits related to social interaction (extraversion and agreeableness) and mood aspects (emotional stability, tension-anxiety and vigor-activity) tended to be influenced by both fragrance acceptance and specific sensory properties.

Interestingly, similar findings were observed when individual differences in liking patterns were taken into account. Four consumer segments were defined based on patterns of liking for fragrances. Similar to the overall population and independent of sensory properties, hedonics consistently drove associations related to sensuality and attractiveness in all clusters. Also, independent of hedonics, the masculinity-femininity dimension was clearly identified in all clusters. Feminine fragrances, i.e., sweet, fruity, or floral fragrances, were associated with a shy, reserved and quiet personality; masculine fragrances, described as woody, and spicy, were associated with a rough-tough personality. Additionally, some specific segment effects could be observed: clusters that differed in liking patterns, and to some extent in their motivations for fragrance use, also differed in their preferential dimension of attribution. Some clusters relied almost entirely on liking to draw inferences about attributes such as energizing or relaxing, whereas others relied primarily on the sensory properties of the scent to make inferences concerning these mood-related attributes.

The interplay of individual differences and fragrance perception is extremely complex and, since the present study was conducted in a laboratory setting, it is unknown whether the results are representative of what a person might perceive in a real-life situation, as a result of the multitude of other stimuli that might impact the formation of a first impression. Although more research is needed to better understand the interrelationships among individual differences and fragrance hedonics, sensory characteristics, and impression formation in real-life settings, the research presented here provides valuable insights into these phenomena – insights that have direct implications in terms of understanding consumer perceptual processes, potential influences of fragrances on social interactions, and strategic planning for marketing and advertising of fine personal fragrances.

APPENDIX.

APPENDIX 1.

EVALUATION MATERIALS AND STATISTICAL ANALYSIS PROGRAMS FOR PANEL 1: HIGHLY TRAINED PANEL WITH PRIOR EXPERIENCE IN DESCRIPTIVE EVALUATION OF FINE FRAGRANCES

APPENDIX 1A.
TERMS AND DEFINITIONS FOR DESCRIBING FRAGRANCES FOR PANEL 1

Terms	Definitions
FLORAL	Total aroma associated with flowers.
White Flower	White flowers such as gardenias and jasmine.
Ylang Ylang	Floral, sweet, white flower, thymol, piney, resinous, tropical, animal
Jasmine	White flower, jasmine, green, sweet, animal-urine, hormonal, tropical fruit
Rose	Roses, floral, dried woody, musty Roses, floral, dried woody, musty
Muguet	Class that includes lily of valley and Muguet 41.315
Lily of the valley	Lily, green, sweet, floral, hyacinth, white flower
Muguet 41.315	Lily of the valley; citrus
Violet	Violet, floral, earthy
Floral/Other	Other flowers not mentioned above including hyacinth and carnation
Hyacinth	Viney, bell peppers, green beans, woody, earthy, white flowers, stemmy
CITRUS	Citrus aromatic impact that includes the raw and cooked notes and the distilled and expressed oil notes
Lime	Lime oil, lime juice
Orange	Orange candy, orange oil, fresh oranges, and orange juice
Bergamot	Citrusy, resinous, sweet, woody, orange
Lemon	Lemon oil, freshly squeezed lemon juice, citral
Grapefruit	Freshly squeezed grapefruit oil, grapefruit juice
Tangerine	Freshly squeezed tangerine juice
Mandarin	Tangerine strings, albedo, sweet, mandarin orange, woody
Citral	Lemon, piney, maltol-vanillin, sweet, caramelized, Pledge
ALDEHYDIC	Nasal pungency, sweaty, fatty, soapy
Aldehyde C-8	Green, citrus, animal fat, ferns, spring
Aldehyde C-12	Green, cilantro, animal fat, ozonic
FRUITY	Total aroma associated with fruit.
Peach	Peaches, peach pits, processed peaches, sweet, fruity, fleshy
Grape/DMA	Grape character related to artificial concord grape drinks and gums [dimethyl anthranilate]
Green Apple	Overall impact of apples, cooked apples, raw apples, jolly rancher apple
Berry	Raspberry, cherry, strawberry blueberry
Red berry	Fruity, raspberry, cherry, strawberry
Melon	Melon flesh, rinds
Cantaloupe	Fermented melon rinds
Melon Ollifac	Green melon rind, artificial watermelon, Jolly Rancher, perfume-y overripe cantaloupe, peachy, slightly grape
Watermelon	Specific melon character related to watermelon fruit or green watermelon rind
Tropical	Tropical fruits including pineapple, guava, mango, passion fruit
Banana	Banana, banana flavored candy, amyl acetate
Papaya/mango	Fragrant ethereal tropical character of mango and papaya, often with some terpene character
FOUGERE	Dominant sweet note combined with a mossy, lavender note, with citrus character.
Lavender	Lavender, sweet, herbaceous, floral, woody undertones.
Mossy	Moss, earth, reminiscent of damp forest floor

Terms	Definitions
PINE	Terpene found in pine and pine cleaners.
Spruce	Spruce, pine, lime, wood sap, resinous, sweet, Christmas tree
Alpha Pinene	Black pepper, musty, piney, brown spice, eucalyptol
Turpineol	Limey, piney, terpeney, Mr. Clean
SPICE	General category of brown and black spices.
Black	Ground black pepper, spicy
Pepper	Ground white pepper, ground black pepper.
Anise	Sweet; licorice, anise, cool, anethole, nasal cooling
Brown	Brown spices (specifically cinnamon, clove, nutmeg, etc.).
Clove Bud Oil	Clove, sweet, brown-spice, medicinal, eugenol
Clove Leaf Oil	Clove, sweet, spicy
Cinnamon.Bark Oil	Sweet, woody, spicy, ground cinnamon bark
SWEET	Class if aromas that include honey, anise, maple syrup, brown sugar, vanilla, ethyl butyrate, benzaldehyde
Amber	Sweet sap, [related somewhat to woody, resinous, and powdery.
Caramelized	Heated/browned sugars and/or carbohydrates
Vanillin	Vanillin crystals, marshmallows.
POWDERY	Combination of vanillin and floral [usually rose]notes
CAMPHOR	Ethereal class of character notes including Eucalyptus, thymol, rosemary, cedar leaf, menthol, pine
HERBACEOUS	Green herbs such as oregano, thyme, basil, parsley, sage, rosemary, etc.
WOODY	General category of woody
Sandalwood	Specific sweet wood character of the sandalwood tree
RESINOUS	Medicinal, woody, tree sap, tar, balsamic
Olibanum	White pepper, sap, resinous, piney
Terpene	Piney, limey
GREEN	General class that includes stems, grass, leaves and the green of green herbs
Triplal	Cut grass
Green Leaves	Fresh leaves (not dried)
Stems	Fresh plant stems (not dried), such as those found in freshly cut flowers
Fermented Green	Fermented grass, stems, leaves, and vegetable matter
MOSS / CHYPRE	Moss, earth, and wet wood reminiscent of damp forest floor
Oakmoss	Woodsy, compost, chopped up leaves, musty, sweet, smoky
OZONIC / MARINE	Ozone, melon rinds, pre and post rain smells, and ocean or bay breezes
ANIMAL	Farm animals, stalls and barns
Leather	Animal origins, animal secretions, leather, and fat
Musk	Hormone, sweat, animal urine, [e.g., musk ketone, galaxolide, ethylene brassylate]

APPENDIX 1B.
STATISTICAL CODE TO ASSESS STATISTICAL DIFFERENCES BETWEEN TWO PREPARATION METHODS (1-MIN DRY-DOWN VS. 15-MIN DRY-DOWN) FOR PANEL 1

```
data Specfrag;

**** Recall the csv data file from its original location *****;

Infile "Y:\Research\Fragrance and personality\Descriptive analysis\Spectrum\data.csv"
delimiter=',';

Input SAMPLE prodrep REP Intensity
FLORAL WhiteFlo Jasmine Rose Muguet LilyValley Violet FloralOther Carnation
Hyacinth CITRUS Lime Orange Bergamot Lemon Grapefruit Tangerine ALDEHYDIC
FRUITY Peach Berry Melon Tropical GreenApple DMA FOUGERE Lavender Mossy
PINE SPICE Black Pepper Anise Brown SWEET Amber Caramelized Vanillin
POWDER WOODY Sandalwood RESINOUS GREEN Triplal       Greenleafs Stems
FermGreen OZONEMARINE ANIMAL Leather Musk Catpee;

Proc print data=Specfrag; run;

** The data fragrance now has two additional variables:
   • method (2 levels: 1 = 15-min dry-down; 2 = 1-min dry-down
   • repmethod (two levels that corresponds to the two replications for each method) **;

data frag; set specfrag;
If rep=1 then method=1; if rep=2 then method=1; if rep=3 then method=2; if rep=4 then
method=2;
If rep=1 then repmethod=1; if rep=2 then repmethod=2; if rep=3 then repmethod=1; if
rep=4 then repmethod=2;
run;


Proc sort data = frag; by sample method;
Proc means;  by sample method;
        var Intensity--Catpee;
        proc print; run;

proc glm data=frag;
        class sample method repmethod;
        model Intensity--Catpee= sample method  sample*method repmethod;
        means sample method / lsd lines;
        lsmeans sample*method / pdiff;
run;
```

APPENDIX 2.

SENSORY LEXICON, EVALUATION MATERIALS, AND STATISTICAL ANALYSIS PROGRAMS FOR PANEL 2: HIGHLY TRAINED PANEL WITHOUT PRIOR EXPERIENCE IN DESCRIPTIVE EVALUATION OF FINE FRAGRANCES

APPENDIX 2A.
TERMS, DEFINITIONS, AND REFERENCES FOR DESCRIBING FRAGRANCES DEVELOPED BY PANEL 2

Main Category	Definitions, subcategories and references	
Floral	A combination of fragrant aromatics and impressions associated with flowers. These notes may be reminiscent of well-defined flower notes, or of a whole bouquet of floral effects. In perfumery, floral fragrances usually are feminine fragrances. The floral family can be subdivided into Single note floral (a single floral note is usually predominant, such as gardenia, rose, lilac, muguet, violet…) and Floral Bouquet (a flowery combination of various floral nuances blended together and without any specific note being highlighted)	
	Rose	A combination of floral aromatics associated with roses and geranium References: Rose water (Humco) Citronellol (Givaudan) Rose Fragrance (IFF)
	White Flower	A combination of floral aromatics associated with white flowers such as jasmine, orange blossom, hedione, gardenia, tuberose or ylang-ylang References: Jasmine Fragrance Oil (Frontier Natural Products) Jasmelia (IFF) Orange Flower Ether (IFF) Gardenia Fragrance Oil (Frontier Natural Products) Ylang Ylang III, essential oil, certified organic (Aura Cacia)
	Muguet	A combination of floral aromatics somewhat reminiscent of flowers such as lily of the valley and azalea References: Lyrame (IFF) Muguesia (IFF) Muguet Aldehyde 50 (IFF) Lily of the Valley Fragrance oil (Frontier Natural Products)
	Sweet Floral	A combination of floral aromatics with sweet undertones somewhat reminiscent of sweet flowers such as lilac References: Lindenol (IFF) Lilac Fragrance Oil (Frontier Natural Products)

Main Category	Definitions, subcategories and references		
Floral (continued)	*Violet*	Floral notes that are reminiscent of violets and irises	
		References:	Irisone pure – alpha beta ionone (Givaudan)
			Alpha ionone (IFF)
			Methyl ionone gamma Coeur (IFF)
	Spicy Floral	Floral aromatics with spicy undertones somewhat reminiscent of flowers such as carnation, and acacia	
		References:	IsoCycloGeraniol – carnation note (IFF)
			Carnation Fragrance Oil (Frontier Natural Products)
	Other Floral	Floral aromatics that are associated with flowers such as hyacinth, reseda or osmantus	
		References:	Hyacinth Body (IFF)
			Reseda Body (IFF)
			Hyacinth Fragrance oil (Frontier Natural Products)
Citrus	Wide category of light, slightly sharp, clean, fruity, citrus aromatics such as orange, lemon, bergamot and lime. The citrus notes can range from peely to juicy/seedy to oxidized or candy-like. The category is further subdivided into subcategories including:		
	Grapefruit	References:	Expressed Grapefruit oil
	Lemon		Oil Lemon Brazil (Ungerer Company)
	Orange		Oil Orange Sweet - Sesquiterpeneless (Fritzsche D&O)
	Bergamot		Bergamot oil (Aura Cacia Aromatherapy)
	Tangerine		Tangerine oil (Aura Cacia Aromatherapy)
	Lime		Lime oil (Aura Cacia Aromatherapy)
	Peel		Lime and lemon peel
Aldehydic	A combination of specific sensation described as watery, tallowy, enveloping, heavy or even “snuffed candle” and that are produced by the short-chain aliphatic aldehydes. When concentrated, aldehydes are extremely powerful and pungent.		
		References:	Cyclamen Aldehyde extra (Givaudan)
			Aldehyde C-14 or gamma undecalactone (Givaudan)
			Aldehyde C-10 (Givaudan)
			Aldehyde C-11 (Givaudan)

Main Category	Definitions, subcategories and references		
Fruity - Non Citrus	Sweet aromatics reminiscent of a variety of different fruits, such as peach, grape, cassis, melon, strawberry, currant, blackberry, juniper, apples, pears, cherries, raisins and prunes. Subcategories include:		
	Berry	Aromatics reminiscent of a variety of berries, which may include grapes, blackberries, raspberries, strawberries, black currant, red currant, cherries, blueberries, cranberries…	
		References:	Blackberry WONF (McCormick) Raspberry Flavor Key (IFF) Fraistone (IFF) and Benzyl-n-Butyrate (IFF) (1:1)
	Tree Fruit	Aromatics reminiscent of a variety of tree fruits including orchard fruits such as apples and pears and stone fruits such as apricots, peaches, nectarines and plums.	
		References:	Delta – Damascone (IFF) Green Apple Shampoo (Suave)
	Melon	Aromatics reminiscent of a variety of melon fruits including cantaloupe, honeydew…	
		References:	Freshly sliced cantaloupe, honeydew and watermelon
	Tropical fruits	Aromatics associated with tropical fruits such as banana, mango, kiwi and pineapple	
		References:	Tropical Fruit Flavor Key (IFF)
	Other fruits	Fruity aromatics that might be somewhat artificial and estery	
		References:	Dimethyl Anthranilate
Sweet Aromatics	Aromatics associated with the impression of sweet substances (marshmallow, maple, vanillin).		
	Floral Sweet	Sweet aromatics with a somewhat floral undertone, that include notes such as vanilla, chocolate, coumarin and amber notes	
		References:	Vanilla Flavor Natural and Artificial (Bell Flavors and Fragrances) Coumarin (Matheson Coleman and Bell)
	Brown Sweet	Sweet aromatics associated with brown caramelized notes that are found in honey, molasses, maple syrup and caramel	

Main Category	Definitions, subcategories and references	
Sweet Aromatics (cont.)		
	Fruity Sweet	Sweet aromatics somewhat reminiscent of fruits (cherry-like, almond-like, coconut-like) and cotton candies. References: Aldehyde C-16 pure - ethyl methyl phenyl glycidate (Givaudan) Benzaldehyde Lactone
Herbaceous	Often combined with spicy notes, the herbaceous notes are characterized by crisp, clean aromatics reminiscent of crushed leaves and green stems and associated with as sage, rosemary, thyme, and lavender	
	Herbaceous / Floral	Blended Lavender Lavandin (George Lueders and Co)
	Dried Herbs	Thymol Marjoram oil Herbac (IFF)
Spicy	Aromatics associated with spices	
	Black Spice	An aromatic associated with black spices, such as black pepper Reference: Black pepper oil (IFF)
	Brown Spice	A brown, slightly woody, musty aromatic characteristic of ground allspice. Brown spices include cinnamon, cloves (eugenol), coriander, nutmeg, ginger or cardamom References: Cinnamomum Cassia (Frontier Aromatherapy) Cashmeran ® (IFF) Jamaican Ginger oil

Main Category	Definitions, subcategories and references		
Green	Green is the general term to describe notes reminiscent of freshly cut grass, crushed leaves or green stems and twiggy, galbanum, triplal notes with dried notes including hay-like, and tea/tobacco leaves notes.		
	Fresh	References:	Galbanum Coeur (IFF) Triplal (IFF) Slices of fresh cucumber
	Dried	References:	Hay/Straw Tea leaves Tobacco leaves
Ozone Marine	Fragrance notes that are somewhat reminiscent of the scent of the air after rain, fresh outdoor smell, soapy, scent of the seashore…		
	Rainy	References:	Floralozone (IFF) OzoFleur (IFF) Precyclemome B (IFF)
	Soapy / floral	References:	Cyclemome A (IFF)
Woody / Nutty	Woody nutty notes combine sweet, brown, musty, flat, dark, dry aromatics associated with the bark of trees, powdery notes reminiscent of oriental woods (sandalwood, patchouli, vetiver , cedarwood) and brown aromatics associated with nuts.		
	Nutty	References:	Walnut oil Hazelnut Almond Coconut
	Dry wood	References:	Cedarwood oil, Virginia (Aldrich) Cedrenyl Acetate Chinese (IFF) Vetiverol (Givaudan)
	Oriental wood	References:	Santaliff (IFF) Patchouli Bois de Rose
	Raw Wood	References:	Pencil Wet Cardboard

Main Category	Definitions, subcategories and references		
Resinous / Piney	Odor impression reminiscent of olibanum, pine, fir, spruce, juniper and others of this family.		
	Resinous	References:	Balsam Resin (Fries and Fries) Iso Bornyl Propionate (IFF) Olibanum oil English distilled SAS (IFF)
	Piney	References:	Pine
	Fir / Coniferous	References:	Juniperberry oil English distilled SAS (IFF)
Camphor / Mint	Odor impressions that combine fresh, clean, medicinal, sharp and mentholic smells and are reminiscent of camphor, menthol and mint oil		
	Medicinal	References:	Eucalyptus oil 80% (IFF)
	Camphor	References:	Rosemarel (IFF) Menthol Crystals
	Minty	References:	Spearmint oil Native (Berje)
Moss / Chypre	Odor impression that are reminiscent of moss	Reference:	Oakmoss (IFF)
Leather / Musk	Notes associated with leather and musky scents		
	Leather / Animal	References:	Iso Butyl Quinoline (IFF) Grisalva (IFF) Indole Aroma (IFF) Maritima (IFF)
	Musk	References:	Ambrettolide (IFF) Galaxolide (IFF) Celestolide (IFF)

APPENDIX 2B.
DESCRIPTIVE BALLOT FOR PANEL 2

Rep __ Date_____ Panelist #_____ Fragrance #04001030

Sample #	638	237	316	947	621
Overall Intensity					
Solvent / Alcohol					
Citrus					
Lemon					
Lime					
Bergamot					
Grapefruit					
Orange					
Peel					
Other					
Fruity - Non Citrus					
Berry					
Red berry					
Black berry					
Grape					
Tree Fruit					
Apple					
Pear					
Plum/ peach/ apricot					
Melon					
Tropical fruit					
Pineapple					
Mango					
Banana					
Kiwi					
Other					
Sweet Aromatics					
Vanilla					
Chocolate					
Amber / Coumarin					
Brown Sweet					
Fruity Sweet					
Other					
Spicy					
Black spice					
Brown spice					

Sample #	638	237	316	947	621
Floral					
Rose					
White Flower					
Muguet					
Sweet Floral					
Violet					
Spicy Floral					
Other Floral					
Aldehydic					
Herbaceous					
Herbaceous / Floral					
Dried Herbs					
Green					
Fresh					
Dried (Tea/tobacco)					
Woody / Nutty					
Nutty					
Woody Dry (cedar, vetiver)					
Woody Oriental (sandalwd, patchouli)					
Raw Wood					
Resinous / Piney					
Resinous					
Piney					
Fir Coniferous					
Camphoraceous / Minty					
Camphor / Medicinal					
Minty					
Ozonic / Marine					
Rainy					
Soapy Floral					
Moss / Chypre					
Leather / Musk					
Leather / Animal					
Musk					

Note: Panelists were instructed to give an intensity score to each fragrance category, citrus, floral, herbaceous, etc. (rows are highlighted on the ballot) using a 15-point numerical scale (from 0 = none to 15 = extremely strong, with 0.5-point increments). Within each category, each subcategory was rated using a 3-point categorical scale (0 = not present, 1 = present in small quantity, and 2 = mostly present).

APPENDIX 2C.
STATISTICAL CODE TO ASSESS STATISTICAL DIFFERENCES AMONG FRAGRANCES FOR THE MAIN FRAGRANCE CATEGORIES FOR PANEL 2

```
data SACfrag;
infile "W:\Hn\SAC\Annlyse\Descriptive -Fragrance May04\data.csv" delimiter=',';

input prod Rep Panel Intensity Solvent Citrus Lemon Lime Bergamot Grapefruit Orange Peel OtherCitrus
Fruity     Berry     TreeFruit Melon Tropical OtherFruit SweetArom       Vanilla Chocolate
           Coumarin BrownSweet FruitySweet            OtherSweet Spicy BlackSpice BrownSpice Floral
Rose WhiteFlower           Muguet SweetFloral Violet SpicyFloral OtherFloral Aldehydic
Herbaceous FloralHerb DriedHerb Green Fresh Dried WoodyNutty Nutty DryWood OrientalWood
RawWood ResinPine Resin Piney Fir CamphorMint Medicinal Minty OzoneMarine Rainy SoapyFloral
MossChypre LeatherMusk Leather Musk ;
proc print data=SACFRag; run;

proc freq data=sacfrag; tables Prod Rep Panel; run;
Proc sort data = sacfrag; by prod;
proc freq data=sacfrag; by prod;
           table Solvent Citrus--Musk; run;
proc means data=sacfrag;
           var Intensity--Musk; by prod;
           output out=meansout;run;
           data meansall; set meansout;if _stat_='MEAN'; run;
           proc print; run;

proc glm data = sacfrag;
           title2 'Analysis of Variance';
           Class Prod Rep Panel;
           model Intensity Citrus Fruity SweetArom Spicy Floral Aldehydic
           Herbaceous         Green     WoodyNutty ResinPine CamphorMint OzoneMarine MossChypre
                      LeatherMusk= Prod Rep Prod*Rep Panel panel*prod;
           Test H=Prod Rep e=Prod*Rep;
           means Prod/LSD lines e= Prod*Rep;
run;
quit;
```

APPENDIX 3.

EVALUATION MATERIALS AND STATISTICAL ANALYSIS PROGRAMS FOR PANEL 3: UNTRAINED CONSUMER PANEL

APPENDIX 3A.
MEASUREMENTS OF INDIVIDUAL DIFFERENCES FOR RESPONDENTS IN PANEL 3

Fragrance 03-04 Demographics + Survey Project #04001030

Panelist _____ **Date** _____

Demographic questionnaire

Please, answer a few questions about yourself. This information will remain confidential

1) Please indicate your gender. Are you… Male ☐ Female ☐

2) Please indicate your age group. Are you…

Under 18 ☐
18-25 ☐
26-40 ☐
41-55 ☐
Over 55 ☐

3) Please indicate how often do you wear fine personal fragrances, such as perfume, cologne and/or eau de toilette on an average week?

Once a week or less ☐
2 to 4 times a week ☐
5 to 7 times a week ☐
More than once a day ☐

4) Please use this list of common human traits to describe yourself as accurately as possible. Describe yourself as you see yourself at the present time, not as you wish to be in the future. Describe yourself as you are generally or typically, as compared to other persons you know of the same sex and roughly your same age. Before each trait, please write a number indicating how accurately that trait describes you, using the following rating scale.

Inaccurate				?	Accurate			
Extremely	Very	Moderately	Slightly		Slightly	Moderately	Very	Extremely
1	2	3	4	5	6	7	8	9

_____ Bashful	_____ Energetic	_____ Moody	_____ Systematic
_____ Bold	_____ Envious	_____ Organized	_____ Talkative
_____ Careless	_____ Extraverted	_____ Philosophical	_____ Temperamental
_____ Cold	_____ Fretful	_____ Practical	_____ Touchy
_____ Complex	_____ Harsh	_____ Quiet	_____ Uncreative
_____ Cooperative	_____ Imaginative	_____ Relaxed	_____ Unenvious
_____ Creative	_____ Inefficient	_____ Rude	_____ Unintellectual
_____ Deep	_____ Intellectual	_____ Shy	_____ Unsympathetic
_____ Disorganized	_____ Jealous	_____ Sloppy	_____ Warm
_____ Efficient	_____ Kind	_____ Sympathetic	_____ Withdrawn

PLEASE, TURN OVER… →

Panelist _____

5) Indicate whether each of the following statements is true (or mostly true) or false (or mostly false) about yourself with an X in the appropriate column.

T: true or mostly true F: false or mostly false.

	T	F
1. I find it hard to imitate the behavior of other people	☐	☐
2. At parties and social gatherings, I do not attempt to do or say things that other will like	☐	☐
3. I can only argue for ideas which I already believe	☐	☐
4. I can make impromptu speeches even on topics about which I have almost no information	☐	☐
5. I guess I put on a show to impress or entertain others	☐	☐
6. I would probably make a good actor	☐	☐
7. In a group of people I am rarely the center of attention	☐	☐
8. In different situations and with different people, I often act like very different persons	☐	☐
9. I am not particularly good at making other people like me	☐	☐
10 I am not always the person I appear to be	☐	☐
11. I would not change my opinions (or the way I do things) in order to please someone or gain their favor	☐	☐
12. I have considered being an entertainer	☐	☐
13. I have never been good at games like charades or improvisational acting	☐	☐
14. I have trouble changing my behavior to suit different people and different situations	☐	☐
15. At a party I let others keep the jokes and stories going	☐	☐
16. I feel a bit awkward in public and do not show up quite as well as I should	☐	☐
17. I can look anyone in the eye and tell a lie with a straight face (if for a right end)	☐	☐
18. I may deceive people by being friendly when I really dislike them	☐	☐

APPENDIX 3B.
SURVEY ON MOTIVATIONS, ATTITUDES, AND FRAGRANCE BEHAVIORS FOR RESPONDENTS IN PANEL 3

Fragrance 03-04 Demographics + Survey Project #04001030

Panelist _____

Fragrance survey

1) Following are some statements concerning believes and attitudes towards fragrance / cologne. Please indicate by a number (1 to 5) before each statement how much you AGREE or DISAGREE with each of the following statements, using the following rating scale.

Disagree Strongly	Disagree Moderately	Neither Agree nor Disagree	Agree Moderately	Agree Strongly
1	2	3	4	5

_____ I like to wear different fragrances when I am at home, at work or during an evening out
_____ The fragrance I wear makes me feel good about myself
_____ The fragrance I wear enhances my personality
_____ I don't care much about the fragrance I wear as long as it smells good
_____ I like other people to notice my fragrance
_____ I really pay attention to how the fragrance smells when selecting a fragrance
_____ When I wear a fragrance, I am in a better mood
_____ I wear different fragrances depending on the season
_____ I don't like to wear fragrances that everybody notices
_____ I wear a fragrance because it is more socially acceptable
_____ My fragrance completes my outfit
_____ I wear fragrance because it reflects my status
_____ I choose the fragrance I am going to wear based on my schedule and activities
_____ Wearing a fragrance enhances my individuality
_____ Wearing a fragrance satisfies my need for fantasy
_____ I wear fragrances for my own satisfaction
_____ When I wear a fragrance, it makes me feel more professional
_____ I wear fragrance/ cologne because I want to appeal to the opposite sex
_____ When I wear a fragrance, I feel more confident about myself
_____ I wear fragrances to better fit in social settings
_____ I wear fragrances to please my spouse / significant other
_____ I wear fragrance/ cologne because everybody else does
_____ I wear my current fragrance / cologne because I received it as a gift
_____ Wearing a fragrance makes me feel more feminine
_____ Wearing a fragrance makes me feel more masculine
_____ I wear a fragrance because I like to smell good
_____ Wearing a fragrance makes me feel fresh and clean
_____ Wearing a fragrance is part of my daily routine
_____ I usually receive a lot of compliments about my fragrance
_____ I don't care much about how the fragrance smells as long as people around me like it
_____ I only wear fragrance on special occasions
_____ I prefer subtle fragrances
_____ Wearing a fragrance makes me feel more attractive
_____ Fragrances enhance my self-esteem

PLEASE, TURN OVER… ⟶

2) Following are some criteria for fragrance selection. Please write a number between 1 and 4 indicating the importance of each criterion for you while chosing your own fragrance / cologne

Not important at all	Not very important	Somewhat important	Very important
1	2	3	4

WHEN SELECTING A FRAGRANCE/COLOGNE FOR YOURSELF, HOW IMPORTANT IS ...

_____ the name of the fragrance
_____ your liking of the fragrance
_____ that it is fashionable
_____ that your spouse / significant other likes it
_____ the attractiveness of the packaging
_____ your belief that other people will like it
_____ that it is on sale
_____ the lastingness of the scent
_____ that it fits your personality
_____ its sexiness
_____ the fragrance smell
_____ advertising
_____ its price
_____ brand name

APPENDIX 3C.
FRAGRANCE EVALUATION MATERIALS FOR RESPONDENTS IN PANEL 3

Fragrance 03/04 Questionnaire Project # 04001030

Panelist _____ **Date** _____

Sample: 211

Please, flip the lid open on the first plastic bottle, squeeze the bottle and smell the fragrance in it before answering a few questions about the fragrance. You may smell it as much as you want.

1) Please indicate how much you **LIKE** this fragrance **OVERALL**

DISLIKE			Neither like	LIKE		
Very much	Moderately	Slightly	nor dislike	Slightly	Moderately	Very much
☐	☐	☐	☐	☐	☐	☐

2) Thinking about the **STRENGTH** of the scent, how strong is the scent of this fragrance?

Much too strong	Somewhat too strong	Just about right	Somewhat too weak	Much too weak
☐	☐	☐	☐	☐

3) Following are some adjectives used to describe a fragrance. Before each adjective, please write a number **between 0 and 5** indicating your perception of the fragrance, where **0** means **not at all** and **5** means **extremely**.

THIS FRAGRANCE IS… (Please indicate your answer by a number **between 0 and 5**)

_____ Citrusy	_____ Feminine	_____ Masculine	_____ Romantic
_____ Classic	_____ Floral	_____ Memorable	_____ Sensual
_____ Cool / Minty	_____ Fresh	_____ Modern	_____ Spicy
_____ Empowering	_____ Fruity	_____ My type of fragrance	_____ Sweet
_____ Energizing	_____ Green	_____ Natural	_____ Warm
_____ Fashionable	_____ Herbal	_____ Relaxing	_____ Woody

Please, turn over….

Sample: _____

4) Following are some moments / situations in which people wear fragrance / cologne. Before each situation, please write a number **between 1 and 5** indicating how much you **AGREE** or **DISAGREE** with the following statements, using the following rating scale.

Disagree Strongly	Disagree Moderately	Neither Agree nor Disagree	Agree Moderately	Agree Strongly
1	2	3	4	5

THIS FRAGRANCE WOULD BE PERFECT IN THE FOLLOWING SITUATIONS
(Please indicate your answer by a number **between 1 and 5**)

_____ Everyday at work
_____ On a quiet weekend at home
_____ In the evening at home
_____ For an exciting evening out
_____ In the Fall
_____ In the Winter
_____ In the Spring
_____ In the Summer

5) Following are some adjectives used to describe a fragrance. Before each adjective, please write a number **between 1 and 5** indicating how much you **AGREE** or **DISAGREE** with the following statements, using the following rating scale.

Disagree Strongly	Disagree Moderately	Neither Agree nor Disagree	Agree Moderately	Agree Strongly
1	2	3	4	5

THE PERSON WHO WOULD WEAR THAT FRAGRANCE WOULD BE....
(Please indicate your answer by a number **between 1 and 5**)

_____ Anxious, tense
_____ Attractive, appealing
_____ Cold, rude, harsh
_____ Confident, self-assured, self-satisfied
_____ Conscientious, organized, practical
_____ Creative, Imaginative, Complex, deep
_____ Disorganized, sloppy, careless
_____ Energetic, active
_____ Feminine
_____ Folksy, down-to earth, casual, natural
_____ Masculine
_____ Moody, irritable
_____ Quiet, calm
_____ Relaxed
_____ Rough, tough
_____ Sensual, seductive, sexy
_____ Shy, withdrawn, reserved
_____ Sympathetic, warm, cooperative, kind
_____ Talkative, extraverted, assertive
_____ Uncreative, unintellectual

APPENDIX 3D.
WILLIAMS LATIN SQUARE DESIGN USED FOR FRAGRANCE EVALUATION FOR RESPONDENTS IN PANEL 3

seq	SESSION 1							SESSION 2							SESSION 3						
	Sa1	Sa2	Sa3	Sa4	Sa5	Sa6	Sa7	Sa8	Sa9	Sa10	Sa11	Sa12	Sa13	Sa14	Sa15	Sa16	Sa17	Sa18	Sa19	Sa20	Sa21	Sa22
1	122	196	621	237	420	359	219	492	318	549	517	638	316	759	715	861	814	947	513	910	412	211
2	196	237	122	359	621	492	420	549	219	638	318	759	517	861	316	947	715	910	814	211	513	412
3	237	359	196	492	122	549	621	638	420	759	219	861	318	947	517	910	316	211	715	412	814	513
4	359	492	237	549	196	638	122	759	621	861	420	947	219	910	318	211	517	412	316	513	715	814
5	492	549	359	638	237	759	196	861	122	947	621	910	420	211	219	412	318	513	517	814	316	715
6	549	638	492	759	359	861	237	947	196	910	122	211	621	412	420	513	219	814	318	715	517	316
7	638	759	549	861	492	947	359	910	237	211	196	412	122	513	621	814	420	715	219	316	318	517
8	759	861	638	947	549	910	492	211	359	412	237	513	196	814	122	715	621	316	420	517	219	318
9	861	947	759	910	638	211	549	412	492	513	359	814	237	715	196	316	122	517	621	318	420	219
10	947	910	861	211	759	412	638	513	549	814	492	715	359	316	237	517	196	318	122	219	621	420
11	910	211	947	412	861	513	759	814	638	715	549	316	492	517	359	318	237	219	196	420	122	621
12	211	412	910	513	947	814	861	715	759	316	638	517	549	318	492	219	359	420	237	621	196	122
13	412	513	211	814	910	715	947	316	861	517	759	318	638	219	549	420	492	621	359	122	237	196
14	513	814	412	715	211	316	910	517	947	318	861	219	759	420	638	621	549	122	492	196	359	237
15	814	715	513	316	412	517	211	318	910	219	947	420	861	621	759	122	638	196	549	237	492	359
16	715	316	814	517	513	318	412	219	211	420	910	621	947	122	861	196	759	237	638	359	549	492
17	316	517	715	318	814	219	513	420	412	621	211	122	910	196	947	237	861	359	759	492	638	549
18	517	318	316	219	715	420	814	621	513	122	412	196	211	237	910	359	947	492	861	549	759	638
19	318	219	517	420	316	621	715	122	814	196	513	237	412	359	211	492	910	549	947	638	861	759
20	219	420	318	621	517	122	316	196	715	237	814	359	513	492	412	549	211	638	910	759	947	861
21	420	621	219	122	318	196	517	237	316	359	715	492	814	549	513	638	412	759	211	861	910	947
22	621	122	420	196	219	237	318	359	517	492	316	549	715	638	814	759	513	861	412	947	211	910

Note: A total of 350 respondents qualified to participate in the test. Each participant was randomly assigned to a sequence, leading to about 15 to 18 respondents per sequence

APPENDIX 3E.
SAS CODE FOR THE ANALYSIS OF THE SURVEY VARIABLES – COMPARING TWO STATISTICAL APPROACHES

```
DM 'LOG;CLEAR;OUTPUT;CLEAR;';
options nodate pageno=1;
options symbolgen;

data demo;
%let location=C:\Documents and Settings\retiveau\My Documents\Results by cluster Attitude;

*** Recall the demographics data file from its original location *****;

infile "Y:\Research\Fragrance and personality\Consumer Experiment\Consumer Experiment
March04\Data\csv\demo.csv" delimiter=',';

input ID Sex AgeN Use
Bash Bold Carl Cold Complex Coop Crea Deep Disorg Eff Ener Envious Extravert Fretful Harsh Imagin
Ineff Intel Jealous Kind Moody Org Philos Practic Quiet Relaxed Rude Shy Sloppy Symp Syst Talk
Temper Touchy Uncrea Unenv Unint Unsymp Warm Withdrawn
Q501 Q502 Q503 Q504 Q505 Q506 Q507 Q508 Q509 Q510 Q511 Q512 Q513 Q514 Q515 Q516 Q517
Q518
Q601 Q602 Q603 Q604 Q605 Q606 Q607 Q608 Q609 Q610 Q611 Q612 Q613 Q614 Q615 Q616 Q617
Q618 Q619 Q620 Q621 Q622 Q623 Q624 Q625 Q626 Q627 Q628 Q629 Q630 Q631 Q632 Q633 Q634
FragName FragLik Fashion SpouseLike Packaging OtherLike OnSale LastLong FitsPerso Sexy Smell Ads
Price BrandName
;

******* ANALYSIS OF DEMOGRAPHIC AND PSYCHOLOGICAL INFORMATION ********;


********** DEMOGRAPHIC ANALYSIS **********;
If sex=1 then gender='male  '; If sex=2 then gender='female';
If sex=1 then gend1=1; If sex=2 then gend1=0;
If AgeN=1 then age='Under18'; If AgeN=2 then age='18-25  ';
If AgeN=3 then age='26-40  '; If AgeN=4 then age='41-55  ';
If AgeN=5 then age='Over 56 ';
If use=1 then usage='4* or less'; If use=2 then usage='4* or less';
If use=3 then usage='5* or more'; If use=4 then usage='5* or more';
If AgeN=1 then age1=1; If AgeN=2 then age1=1; If AgeN=3 then age1=0;
If AgeN=4 then age1=0; If AgeN=5 then age1=0; If AgeN=1 then age2=0;
If AgeN=2 then age2=0; If AgeN=3 then age2=0; If AgeN=4 then age2=1;
If AgeN=5 then age2=1;
If usage='4* or less' then use1=0;If usage='5* or more' then use1=1 ;
If ID<199 then location = 'KS'; If ID>199 then location='NJ';
If location= 'KS' then loc1=1; if location='NJ' then loc1=0;

********** SELF-MONITORING ANALYSIS **********;

If Q501=1 then SM01=-1; If Q501=2 then SM01=1;
If Q502=1 then SM02=-1; If Q502=2 then SM02=1;
If Q503=1 then SM03=-1; If Q503=2 then SM03=1;
If Q504=1 then SM04=1; If Q504=2 then SM04=-1;
If Q505=1 then SM05=1; If Q505=2 then SM05=-1;
```

```
If Q506=1 then SM06=1; If Q506=2 then SM06=-1;
If Q507=1 then SM07=-1; If Q507=2 then SM07=1;
If Q508=1 then SM08=1; If Q508=2 then SM08=-1;
If Q509=1 then SM09=-1; If Q509=2 then SM09=1;
If Q510=1 then SM10=1; If Q510=2 then SM10=-1;
If Q511=1 then SM11=-1; If Q511=2 then SM11=1;
If Q512=1 then SM12=1; If Q512=2 then SM12=-1;
If Q513=1 then SM13=-1; If Q513=2 then SM13=1;
If Q514=1 then SM14=-1; If Q514=2 then SM14=1;
If Q515=1 then SM15=-1; If Q515=2 then SM15=1;
If Q516=1 then SM16=-1; If Q516=2 then SM16=1;
If Q517=1 then SM17=1; If Q517=2 then SM17=-1;
If Q518=1 then SM18=1; If Q518=2 then SM18=-1;

********* REVERSE SCALE FOR NEGATIVE MINIMARKERS **********;

IF Shy=1 then ShyR=9; IF Shy=2 then ShyR=8; IF Shy=3 then ShyR=7;
IF Shy=4 then ShyR=6; IF Shy=5 then ShyR=5; IF Shy=6 then ShyR=4;
IF Shy=7 then ShyR=3; IF Shy=8 then ShyR=2; IF Shy=9 then ShyR=1;
IF Quiet=1 then QuietR=9; IF Quiet=2 then QuietR=8;
IF Quiet=3 then QuietR=7; IF Quiet=4 then QuietR=6;
IF Quiet=5 then QuietR=5;IF Quiet=6 then QuietR=4;
IF Quiet=7 then QuietR=3; IF Quiet=8 then QuietR=2;
IF Quiet=9 then QuietR=1;
IF Bash=1 then BashR=9; IF Bash=2 then BashR=8; IF Bash=3 then BashR=7; IF Bash=4 then BashR=6;
IF Bash=5 then BashR=5; IF Bash=6 then BashR=4; IF Bash=7 then BashR=3; IF Bash=8 then BashR=2;
IF Bash=9 then BashR=1;
IF Withdrawn=1 then WithdrawnR=9; IF Withdrawn=2 then WithdrawnR=8;
IF Withdrawn=3 then WithdrawnR=7; IF Withdrawn=4 then WithdrawnR=6;
IF Withdrawn=5 then WithdrawnR=5; IF Withdrawn=6 then WithdrawnR=4;
IF Withdrawn=7 then WithdrawnR=3; IF Withdrawn=8 then WithdrawnR=2;
IF Withdrawn=9 then WithdrawnR=1;
IF Cold=1 then ColdR=9; IF Cold=2 then ColdR=8; IF Cold=3 then ColdR=7; IF Cold=4 then ColdR=6; IF
Cold=5 then ColdR=5; IF Cold=6 then ColdR=4; IF Cold=7 then ColdR=3; IF Cold=8 then ColdR=2; IF
Cold=9 then ColdR=1;
IF UnSymp=1 then UnSympR=9; IF UnSymp=2 then UnSympR=8;
IF UnSymp=3 then UnSympR=7; IF UnSymp=4 then UnSympR=6;
IF UnSymp=5 then UnSympR=5; IF UnSymp=6 then UnSympR=4;
IF UnSymp=7 then UnSympR=3; IF UnSymp=8 then UnSympR=2;
IF UnSymp=9 then UnSympR=1;
IF Rude=1 then RudeR=9; IF Rude=2 then RudeR=8; IF Rude=3 then RudeR=7; IF Rude=4 then
RudeR=6; IF Rude=5 then RudeR=5; IF Rude=6 then RudeR=4; IF Rude=7 then RudeR=3; IF Rude=8
then RudeR=2; IF Rude=9 then RudeR=1;
IF Harsh=1 then HarshR=9; IF Harsh=2 then HarshR=8;
IF Harsh=3 then HarshR=7; IF Harsh=4 then HarshR=6;
IF Harsh=5 then HarshR=5; IF Harsh=6 then HarshR=4;
IF Harsh=7 then HarshR=3; IF Harsh=8 then HarshR=2;
IF Harsh=9 then HarshR=1;
IF Disorg=1 then DisorgR=9; IF Disorg=2 then DisorgR=8;
IF Disorg=3 then DisorgR=7; IF Disorg=4 then DisorgR=6;
IF Disorg=5 then DisorgR=5; IF Disorg=6 then DisorgR=4;
IF Disorg=7 then DisorgR=3; IF Disorg=8 then DisorgR=2;
IF Disorg=9 then DisorgR=1;
IF Sloppy=1 then SloppyR=9; IF Sloppy=2 then SloppyR=8;
IF Sloppy=3 then SloppyR=7; IF Sloppy=4 then SloppyR=6;
IF Sloppy=5 then SloppyR=5; IF Sloppy=6 then SloppyR=4;
```

```
IF Sloppy=7 then SloppyR=3; IF Sloppy=8 then SloppyR=2;
IF Sloppy=9 then SloppyR=1;
IF Ineff=1 then IneffR=9; IF Ineff=2 then IneffR=8;
IF Ineff=3 then IneffR=7; IF Ineff=4 then IneffR=6;
IF Ineff=5 then IneffR=5; IF Ineff=6 then IneffR=4;
IF Ineff=7 then IneffR=3; IF Ineff=8 then IneffR=2;
IF Ineff=9 then IneffR=1;
IF Carl=1 then CarlR=9; IF Carl=2 then CarlR=8; IF Carl=3 then CarlR=7; IF Carl=4 then CarlR=6; IF
Carl=5 then CarlR=5; IF Carl=6 then CarlR=4; IF Carl=7 then CarlR=3; IF Carl=8 then CarlR=2; IF
Carl=9 then CarlR=1;
IF Moody=1 then MoodyR=9; IF Moody=2 then MoodyR=8;
IF Moody=3 then MoodyR=7; IF Moody=4 then MoodyR=6;
IF Moody=5 then MoodyR=5; IF Moody=6 then MoodyR=4;
IF Moody=7 then MoodyR=3; IF Moody=8 then MoodyR=2;
IF Moody=9 then MoodyR=1;
IF Jealous=1 then JealousR=9; IF Jealous=2 then JealousR=8;
IF Jealous=3 then JealousR=7; IF Jealous=4 then JealousR=6;
IF Jealous=5 then JealousR=5; IF Jealous=6 then JealousR=4;
IF Jealous=7 then JealousR=3; IF Jealous=8 then JealousR=2;
IF Jealous=9 then JealousR=1;
IF Temper=1 then TemperR=9; IF Temper=2 then TemperR=8;
IF Temper=3 then TemperR=7; IF Temper=4 then TemperR=6;
IF Temper=5 then TemperR=5; IF Temper=6 then TemperR=4;
IF Temper=7 then TemperR=3; IF Temper=8 then TemperR=2;
IF Temper=9 then TemperR=1;
IF Envious=1 then EnviousR=9; IF Envious=2 then EnviousR=8;
IF Envious=3 then EnviousR=7; IF Envious=4 then EnviousR=6;
IF Envious=5 then EnviousR=5; IF Envious=6 then EnviousR=4;
IF Envious=7 then EnviousR=3; IF Envious=8 then EnviousR=2;
IF Envious=9 then EnviousR=1;
IF Touchy=1 then TouchyR=9; IF Touchy=2 then TouchyR=8;
IF Touchy=3 then TouchyR=7; IF Touchy=4 then TouchyR=6;
IF Touchy=5 then TouchyR=5; IF Touchy=6 then TouchyR=4;
IF Touchy=7 then TouchyR=3; IF Touchy=8 then TouchyR=2;
IF Touchy=9 then TouchyR=1;
IF Fretful=1 then FretfulR=9; IF Fretful=2 then FretfulR=8;
IF Fretful=3 then FretfulR=7; IF Fretful=4 then FretfulR=6;
IF Fretful=5 then FretfulR=5; IF Fretful=6 then FretfulR=4;
IF Fretful=7 then FretfulR=3; IF Fretful=8 then FretfulR=2;
IF Fretful=9 then FretfulR=1;
IF Uncrea=1 then UncreaR=9; IF Uncrea=2 then UncreaR=8;
IF Uncrea=3 then UncreaR=7; IF Uncrea=4 then UncreaR=6;
IF Uncrea=5 then UncreaR=5; IF Uncrea=6 then UncreaR=4;
IF Uncrea=7 then UncreaR=3; IF Uncrea=8 then UncreaR=2;
IF Uncrea=9 then UncreaR=1;
IF Unint=1 then UnintR=9; IF Unint=2 then UnintR=8;
IF Unint=3 then UnintR=7; IF Unint=4 then UnintR=6;
IF Unint=5 then UnintR=5; IF Unint=6 then UnintR=4;
IF Unint=7 then UnintR=3; IF Unint=8 then UnintR=2;
IF Unint=9 then UnintR=1;
;

**********COMPUTE MINIMARKERS and SM SCORES **********;
;
Data Demo1; set demo;
extraversion=(Bold+Ener+Extravert+Talk+BashR+QuietR+ShyR+WithdrawnR)/8;
```

```
agreeableness=(Coop+Kind+Symp+Warm+ColdR+HarshR+RudeR+UnsympR)/8;
conscientiousnss=(Eff+Org+Practic+Syst+CarlR+DisorgR+IneffR+SloppyR)/8;
stability=(Relaxed+Unenv+EnviousR+JealousR+MoodyR+FretfulR+TemperR+TouchyR)/8;
intellect=(Complex+Crea+Deep+Imagin+Intel+Philos+UncreaR+UnintR)/8;
selfmonitoring=SM01+SM02+SM03+SM04+SM05+SM06+SM07+SM08+SM09+SM10+SM11+SM12+S
M13+SM14+SM15+SM16+SM17+SM18;

*** FIND OUT THE RANGE AND DISTRIBUTION OF PERSONALITY CONSTRUCTS ****;

proc freq data=demo1;
        tables extraversion agreeableness conscientiousnss stability intellect selfmonitoring
age*selfmonitoring gender*location age1 age2 loc1 use1;
        run;

** ASSIGN HIGH - MEDIUM - LOW RATINGS FOR EACH PERSONALITY CONSTRUCT *;
Data Demo2; set demo1;
If extraversion >=6.7 then extravertHML='High  ';
If extraversion<=5.4 then extravertHML = 'Low   ';
If extraversion<6.7 and extraversion>5.4 then extravertHML='Medium';
If agreeableness>=7.9 then agreeableHML = 'High  ';
If agreeableness <=7.1 then agreeableHML = 'Low   ';
If agreeableness<7.9 and agreeableness>7.1 then agreeableHML='Medium';
If conscientiousnss >=7.4 then ConscientiousHML = 'High  ';
If conscientiousnss <=6.3 then ConscientiousHML = 'Low   ';
If conscientiousnss< 7.4 and conscientiousness>6.3 then ConscientiousHML = 'Medium';
If stability >=6.4 then StableHML = 'High  ';
If stability <=5.3 then StableHML = 'Low   ';
If stability < 6.4 and stability > 5.3 then StableHML = 'Medium';
If intellect >= 7.1 then OpenHML = 'High  ';
If intellect <=5.8 then OpenHML = 'Low   ';
If intellect < 7.1 and intellect > 5.8 then OpenHML = 'Medium';
If selfmonitoring >= 3 then SMHML = 'High  ';
If selfmonitoring <=-3 then SMHML = 'Low   ';
If selfmonitoring < 3 and selfmonitoring > -3 then SMHML = 'Medium';

*FREQUENCY DISTRIBUTION BETWEEN PERSONALITY AND DEMOGRAPHIC VARIABLES*;
proc freq data=demo2;
tables extravertHML agreeableHML ConscientiousHML StableHML OpenHML
        SMHML extravertHML agreeableHML ConscientiousHML StableHML OpenHML
        SMHML)*age (extravertHML agreeableHML ConscientiousHML StableHML OpenHML
        SMHML)*gender (extravertHML agreeableHML ConscientiousHML StableHML OpenHML
        SMHML)*age*gender;
run;

Data demo3; set demo2; keep ID Age Age1 Age2 Gender Gend1 Location Loc1
        Usage Use1 Bash Bold Carl Cold Complex Coop Crea Deep Disorg Eff Ener Envious Extravert
        Fretful Harsh Imagin Ineff Intel Jealous Kind Moody Org Philos Practic Quiet Relaxed Rude Shy
        Sloppy Symp Syst Talk Temper Touchy Uncrea Unenv Unint Unsymp Warm Withdrawn
        Q601 Q602 Q603 Q604 Q605 Q606 Q607 Q608 Q609 Q610 Q611 Q612 Q613
        Q614 Q615 Q616 Q617 Q618 Q619 Q620 Q621 Q622 Q623 Q624 Q625 Q626
        Q627 Q628 Q629 Q630 Q631 Q632 Q633 Q634 fragName FragLik Fashion
        SpouseLike Packaging OtherLike OnSale LastLong FitsPerso Sexy
        Smell Ads Price BrandName
        extraversion agreeableness conscientiousness stability intellect
        selfmonitoring extravertHML agreeableHML ConscientiousHML
        StableHML OpenHML SMHML;
```

```
proc print data=demo3; run;

** RECALL RESULTS FROM THE FACTOR ANALYSIS OF THE SURVEY VARIABLE****;
******** Factor analysis was performed using SYSTAT ************;

data factorsurvey;
infile "Y:\Research\Fragrance and personality\Consumer Experiment\Consumer Experiment
March04\Data\Demographics and Survey analysis\SurveyFactor.csv" delimiter=',';
input ID F1Att F2Att F3Att F4Att F5Att F6Att F7Att
        F1Choice F2Choice        F3Choice F4Choice        F5Choice;
data demoall; merge demo3 factorsurvey;

************** ANALYSIS WITH AN A PRIORI HYPOTHESIS:
Influence of individual characteristics on attitudes and behavior for fragrance use ***********;

Proc glm data = demoall;
        Class gender age usage extravertHML agreeableHML conscientiousHML StableHML OpenHML
        SMHML;
        Model F1Att--F5Choice = gender age usage extravertHML
        agreeableHML conscientiousHML StableHML OpenHML SMHML;
        Means gender age usage extravertHML agreeableHML conscientiousHML StableHML
        OpenHML SMHMLcluster / lsd lines;
run;
quit;

                ANALYSIS WITHOUT ANY PRIORI HYPOTHESIS:
            Clustering based on survey responses, then analysis of the demographic
                and psychographic makeup of the clusters ;

********** Cluster the population based on attitude patterns;
proc fastclus data=demoall out=cluster maxcluster=5;
        var Q601 Q602 Q603 Q604 Q605 Q606 Q607 Q608 Q609 Q610 Q611 Q612 Q613 Q614 Q615
        Q616 Q617 Q618 Q619 Q620 Q621 Q622 Q623 Q626 Q627 Q628 Q629 Q630 Q631 Q632 Q633
        Q634 FragName FragLik Fashion SpouseLike Packaging OtherLike OnSale LastLong FitsPerso
        Sexy
        Smell Ads Price BrandName; run;
proc means USS; var distance; proc print data =cluster;

*Compute the means by Attitude cluster for the personality and survey variables;
proc sort data=cluster; by cluster;
proc means data=cluster; by cluster;
        var extraversion--selfmonitoring F1Att--F5Choice Q601 Q602 Q603 Q604 Q605 Q606 Q607
        Q608 Q609 Q610 Q611 Q612 Q613 Q614 Q615 Q616 Q617 Q618 Q619 Q620 Q621 Q622 Q623
        Q626 Q627 Q628 Q629 Q630 Q631 Q632 Q633 Q634 FragName FragLik Fashion SpouseLike
        Packaging OtherLike OnSale LastLong FitsPerso Sexy
        Smell Ads Price BrandName;
        output out=meansout;run;
        data meansall; set meansout;if _stat_='MEAN';run;
        proc print; run;

**Generate frequency tables for all individual variables by clsuter;
proc freq data=cluster;
        table (age gender extravertHML agreeableHML ConscientiousHML StableHML OpenHML
        SMHML Q601 Q602 Q603 Q604 Q605 Q606 Q607 Q608 Q609 Q610 Q611 Q612 Q613 Q614
        Q615 Q616 Q617 Q618 Q619 Q620 Q621 Q622 Q623 Q626 Q627 Q628 Q629 Q630 Q631 Q632
```

```
        Q633 Q634 FragName FragLik Fashion SpouseLike Packaging OtherLike OnSale LastLong
        FitsPerso Sexy Smell Ads Price BrandName)*cluster / all ;run;

*************************************************************************
Conduct a discriminant analysis to generate a discrimant rule based on psychographic
and demographic characteristics to classify the population into clusters

New category variables
Age1=1 if less than 25, 0 otherwise
Age2=1 if more than 41, 0 otherwise
Use1=1 if usage='5* or more', 0 if usage='4* or less'
Gend1=1 if gender='men', 0 if gender=women
Loc1=1 if Kansas, 0 if NewJersey

*************************************************************************;
proc sort data=cluster;
PROC DISCRIM LIST CROSSLIST data=cluster;
        CLASS Cluster1;
        VAR use1 loc1 age1 age2 gend1 extraversion agreeableness conscientiousness stability intellect
        selfmonitoring;
 RUN;

**** Analysis of variance based on survey factors;
proc glm data=cluster;
        class cluster;
        model F1Att--F5Choice = cluster;
        means cluster / lsd lines;
run;
quit;

**** Analysis of variance for personality variables;
proc glm data=cluster;
        class cluster;
        model extraversion agreeableness conscientiousness stability intellect selfmonitoring = clusterN;
        means cluster / lsd lines;
run;
quit;

**** Frequency tables for the demographic variables;
proc sort data=cluster; by cluster;
proc freq data=cluster; by cluster;
        table age gender usage age*gender SMHML\all;
run; quit;
```

APPENDIX 3F.
SAS CODE FOR THE ANALYSIS OF THE FRAGRANCE VARIABLES FOR THE TOTAL RESPONDENT BASE AND BY LIKING CLUSTER FOR PANEL 3

```
******* ANALYSIS OF THE FRAGRANCE QUESTIONNAIRE RESULTS FOR THE TOTAL
RESPONDENT BASE ***********;

**Recall the questionnaires' data file from its original location ****;
data qre;

infile "Y:\Research\Fragrance and personality\Consumer Experiment\Consumer Experiment
March04\Data\csv\qre.csv" delimiter=',';

input ID Sample Order Like Strength
        Citrusy Classic CoolMint Empowering Energizing Fashionable
        Feminine Floral Fresh Fruity Green Herbal Masculine Memorable
        Modern MyType Natural Relaxing Romantic Sensual Spicy Sweet Warm
        Woody  EvdayWork QuietWEHome EveHome ExcitgEveOut
        Fall Winter Spring Summer AnxTense AttracAppeal ColdRude ConfdtAssured ConscienOrg
        CreatCompl DisorgCarl EnerAct Fem Folksy Masc MoodyIrr QuietCalm
        Relax RoughTough SensualSexy ShyReserved SympWarm TalkExtrav UncreIntel
;
****** Compute frequencies tables and merge demo, survey and qre;
proc freq data= qre;
table ID sample order sample*order;

proc sort data=cluster; by ID;
proc sort data=qre;by ID;run;
data fragrance; merge cluster qre; by ID;
run;

**** Compute liking scores for the fragrances *****;
data allfrag; set fragrance; where Sample ne .;
data fragrance; set allfrag; where clusterN ne .;

proc sort data=fragrance; by Sample;
proc means data=fragrance; by Sample;
        var Like Citrusy Classic CoolMint Empowering Energizing Fashionable Feminine Floral Fresh
        Fruity Green Herbal Masculine Memorable Modern MyType Natural Relaxing Romantic Sensual
        Spicy Sweet Warm Woody EvdayWork QuietWEHome EveHome ExcitgEveOut Fall
        Winter Spring Summer AnxTense AttracAppeal ColdRude ConfdtAssured
        ConscienOrg CreatCompl DisorgCarl EnerAct Fem Folksy Masc MoodyIrr QuietCalm Relax
        RoughTough SensualSexy ShyReserved SympWarm TalkExtrav UncreIntel;
output out=meansout;run;
data MsFragbyAttClus; set meansout;if _stat_='MEAN';run;
        proc print; run;
quit;
```

```
*****************************************************************
*fragrance  Analysis*
Mixed model on all variables
        Sensory descriptors
        Fragrance descriptors - image
        Situations
        Personality
Treatments: sample order
Interactions: order*sample
*****************************************************************;
%macro models(var);
ods rtf file="&location.\&var.rtf";
proc mixed data=fragrance cl covtest;
        CLASSES Sample order ID;
        model &var = Sample order order*sample /DDFM=SATTERTH;
        random ID;
        lsmeans Sample order /diff;
        ods output lsmeans=lsm;
        ods output diffs=dif;
        ods rtf exclude diffs;
        ods rtf exclude lsmeans;
run;
proc print data=lsm;
        var  Sample order Estimate  StdErr   DF   tValue   Probt;
        format estimate stderr 6.2;
run;

proc sort data=dif; by Sample;
proc print data=dif ; where effect='Sample';
        title2 'Compares fragrances';
        var  Sample   _Sample  Estimate  StdErr   DF   tValue   Probt;
        format estimate stderr 6.2;
proc sort data=dif; by Order;
proc print data=dif ; where effect='Order';
        title2 'Compares order of presentation';
        var  Order   _Order  Estimate  StdErr   DF   tValue   Probt;
        format estimate stderr 6.2;

run;
ods  rtf close;
%Mend;
run;
;
%models (Like);
%models (Citrusy);          %models (Classic);          %models (CoolMint);
%models (Empowering);       %models (Energizing);       %models (Fashionable);
%models (Feminine);         %models (Floral);           %models (Fresh);
%models (Fruity);           %models (Green);            %models (Masculine);
%models (Herbal);           %models (Memorable);        %models (Modern);
%models (MyType);           %models (Natural);          %models (Relaxing);
%models (Romantic);         %models (Sensual);          %models (Spicy);
%models (Sweet);            %models (Warm);             %models (Woody);

%models (EvdayWork);            %models (QuietWEHome);          %models (EveHome);
%models (ExcitgEveOut);         %models (Fall);                 %models (Winter);
%models (Spring);               %models (Summer);
```

```
%models (AnxTense);      %models (AttracAppeal);  %models (ColdRude);
%models (ConfdtAssured);%models (ConscienOrg);  %models (CreatCompl);
%models (DisorgCarl);    %models (EnerAct);       %models (Fem);
%models (Folksy);        %models (Masc);          %models (MoodyIrr);
%models (QuietCalm);     %models (Relax);         %models (RoughTough);
%models (SensualSexy);   %models (ShyReserved);   %models (SympWarm);
%models (TalkExtrav);    %models (UncreIntel);
run;
quit;
```

**** ANALYSIS OF THE FRAGRANCE QUESTIONNAIRE RESULTS BY LIKING CLUSTER ****;

```
**********************************************************************
*Liking cluster were generated in SYSTAT based on respondents' patterns of liking and the data was
imported in SAS
**********************************************************************;

%let location=C:\Documents and Settings\retiveau\My Documents\Results by cluster Liking;

*** Frequency tables by liking cluster for demographic and personality;

ods rtf file="&location.\demo..rtf";
proc sort data=demo3; by ClusterLiking;
proc freq data=demo3;
        table (Age gender usage extravertHML agreeableHML ConscientiousHML StableHML
        OpenHML SMHML)*clusterliking /chisq;
        run;
proc sort data=demo3; by ClusterLiking;
proc freq data=demo3;
table age*gender*ClusterLiking  /chisq;
run;
;

* Means table by liking cluster for all attitude, liking and personality variables;

proc means data=demo3; by clusterLiking;
        var Like122 Like196 Like211 Like219 Like237 Like316 Like318 like359 Like412 Like420
        Like492 Like513 Like517 Like549 Like621 Like638 Like715 Like759 Like814 Like861 Like910
        Like947
        F1Att    F2Att    F3Att    F4Att    F5Att    F6Att    F7Att
        F1Choice F2Choice F3Choice F4Choice F5Choice
        Bash Bold Carl Cold Complex Coop Crea Deep Disorg Eff Ener
        Envious Extravert Fretful Harsh Imagin Ineff Intel Jealous Kind Moody Org Philos Practic Quiet
        Relaxed Rude Shy Sloppy Symp Syst  Talk Temper Touchy Uncrea Unenv Unint Unsymp Warm
        Withdrawn
        Q601 Q602 Q603 Q604 Q605 Q606 Q607 Q608 Q609 Q610 Q611 Q612 Q613 Q614 Q615 Q616
        Q617 Q618 Q619 Q620 Q621 Q622 Q623 Q624 Q625 Q626 Q627 Q628 Q629 Q630 Q631 Q632
        Q633 Q634
        FragName FragLik Fashion SpouseLike Packaging OtherLike OnSale LastLong FitsPerso Sexy
        Smell Ads Price BrandName
        extraversion agreeableness conscientiousness stability intellect selfmonitoring;
output out=meansout;run;
        data demobycluster; set meansout;if _stat_='MEAN';run;
        proc print; run;
quit;
```

```
****************** ANOVA for attitudes and personality variables;
Proc glm data = demo3;
        class clusterliking;
        model   F1Att F2Att F3Att F4Att F5Att F6Att F7Att F1Choice F2Choice F3Choice F4Choice
                F5Choice extraversion agreeableness conscientiousness stability intellect selfmonitoring
                Q601 Q602 Q603 Q604 Q605 Q606 Q607 Q608 Q609 Q610 Q611 Q612 Q613 Q614
                Q615 Q616 Q617 Q618 Q619 Q620 Q621 Q622 Q623 Q624 Q625 Q626 Q627 Q628
                Q629 Q630 Q631 Q632 Q633 Q634 FragName FragLik Fashion SpouseLike Packaging
                OtherLike OnSale LastLong FitsPerso Sexy Smell Ads Price BrandName = clusterliking;
        means clusterliking /duncan lines ;
        means clusterliking /duncan lines alpha=0.1;
run;quit;
ods  rtf close;

**** ANALYSIS OF THE FRAGRANCE QUESTIONNAIRE RESULTS ***************;

* Recall the questionnaires' data file from its original location ****;
data qre;

infile "Y:\Research\Fragrance and personality\Consumer Experiment\Consumer Experiment
March04\Analysis by Liking Cluster\Csv\qre.csv" delimiter=',';

input ID Sample Order Like Strength Citrusy Classic CoolMint Empowering Energizing Fashionable
Feminine Floral Fresh Fruity Green Herbal Masculine Memorable Modern MyType Natural Relaxing
Romantic Sensual Spicy Sweet Warm Woody EvdayWork QuietWEHome EveHome ExcitgEveOut Fall
Winter Spring Summer AnxTense AttracAppeal ColdRude ConfdtAssured ConscienOrg CreatCompl
DisorgCarl EnerAct Fem Folksy Masc MoodyIrr QuietCalm Relax RoughTough SensualSexy
ShyReserved SympWarm TalkExtrav UncreIntel
;

**** Merge Demographic, survey and questionnaire data files *****;
proc sort data=demo3; by ID;
proc sort data=qre;by ID;run;
data fragrance; merge demo3 qre; by ID;
run;

*proc print data=fragrance; run;

data allfrag; set fragrance; where Sample ne .;
data fragrance; set allfrag; where clusterliking ne .;

*****************************************************************
Conduct a discriminant analysis to generate a discriminant rule based on psychographic and demographic
characteristics to classify the population into clusters

New category variables
Age1=1 if less than 25, 0 otherwise
Age2=1 if more than 41, 0 otherwise
Use1=1 if usage='5* or more', 0 if usage='4* or less'
Gend1=1 if gender='men', 0 if gender=women
Loc1=1 if Kansas, 0 if NewJersey

*****************************************************************;

proc sort data=fragrance; by sample clusterliking;
```

```
PROC DISCRIM LIST CROSSLIST data=fragrance; where sample=219;
        CLASS ClusterLiking;
        VAR use1 loc1 age1 age2 gend1 extraversion agreeableness conscientiousness stability intellect
        selfmonitoring;
 RUN;

proc sort data=fragrance; by sample clusterliking;
PROC DISCRIM LIST CROSSLIST data=fragrance; where sample=219;
        CLASS ClusterLiking;
        VAR F1Att F2Att F3Att F4Att F5Att F6Att F7Att F1Choice F2Choice F3Choice F4Choice
F5Choice;
 RUN;

proc sort data=fragrance; by sample clusterliking;
PROC DISCRIM LIST CROSSLIST data=fragrance; where sample=219;
        CLASS ClusterLiking;
         VAR use1 loc1 age1 age2 gend1 F1Att F2Att F3Att  F4Att     F5Att     F6Att     F7Att
;
 RUN;


proc sort data=fragrance; by ClusterLiking Sample;
proc means data=fragrance; by clusterLiking Sample;
        var like Citrusy Classic CoolMint Empowering Energizing Fashionable Feminine Floral Fresh
        Fruity Green Herbal Masculine Memorable Modern MyType Natural Relaxing Romantic Sensual
        Spicy Sweet Warm Woody EvdayWork QuietWEHome EveHome ExcitgEveOut Fall Winter
        Spring Summer AnxTense AttracAppeal ColdRude ConfdtAssured ConscienOrg CreatCompl
        DisorgCarl EnerAct Fem Folksy Masc MoodyIrr QuietCalm Relax RoughTough SensualSexy
        ShyReserved SympWarm TalkExtrav UncreIntel;
output out=meansout;run;
        data meanslike; set meansout;if _stat_='MEAN';run;
        proc print; run;
quit;

proc sort data=fragrance; by order Sample;
proc means data=fragrance; by order Sample;
        var like Citrusy Classic CoolMint Empowering Energizing Fashionable Feminine Floral Fresh
        Fruity Green Herbal Masculine Memorable Modern MyType Natural Relaxing Romantic Sensual
        Spicy Sweet Warm Woody EvdayWork QuietWEHome EveHome ExcitgEveOut Fall Winter
        Spring Summer AnxTense AttracAppeal ColdRude ConfdtAssured ConscienOrg CreatCompl
        DisorgCarl EnerAct Fem Folksy Masc MoodyIrr QuietCalm Relax RoughTough SensualSexy
        ShyReserved SympWarm TalkExtrav UncreIntel;
output out=meansout;run;

        data meansorderbysample; set meansout;if _stat_='MEAN';run;
        proc print; run;
quit;

proc sort data=fragrance; by order;
proc means data=fragrance; by order;
        var like Citrusy Classic CoolMint Empowering Energizing Fashionable Feminine Floral Fresh
        Fruity Green Herbal Masculine Memorable Modern MyType Natural Relaxing Romantic Sensual
        Spicy Sweet Warm Woody EvdayWork QuietWEHome EveHome ExcitgEveOut Fall Winter
        Spring Summer AnxTense AttracAppeal ColdRude ConfdtAssured ConscienOrg CreatCompl
        DisorgCarl EnerAct Fem Folksy Masc MoodyIrr QuietCalm Relax RoughTough SensualSexy
        ShyReserved SympWarm TalkExtrav UncreIntel;
```

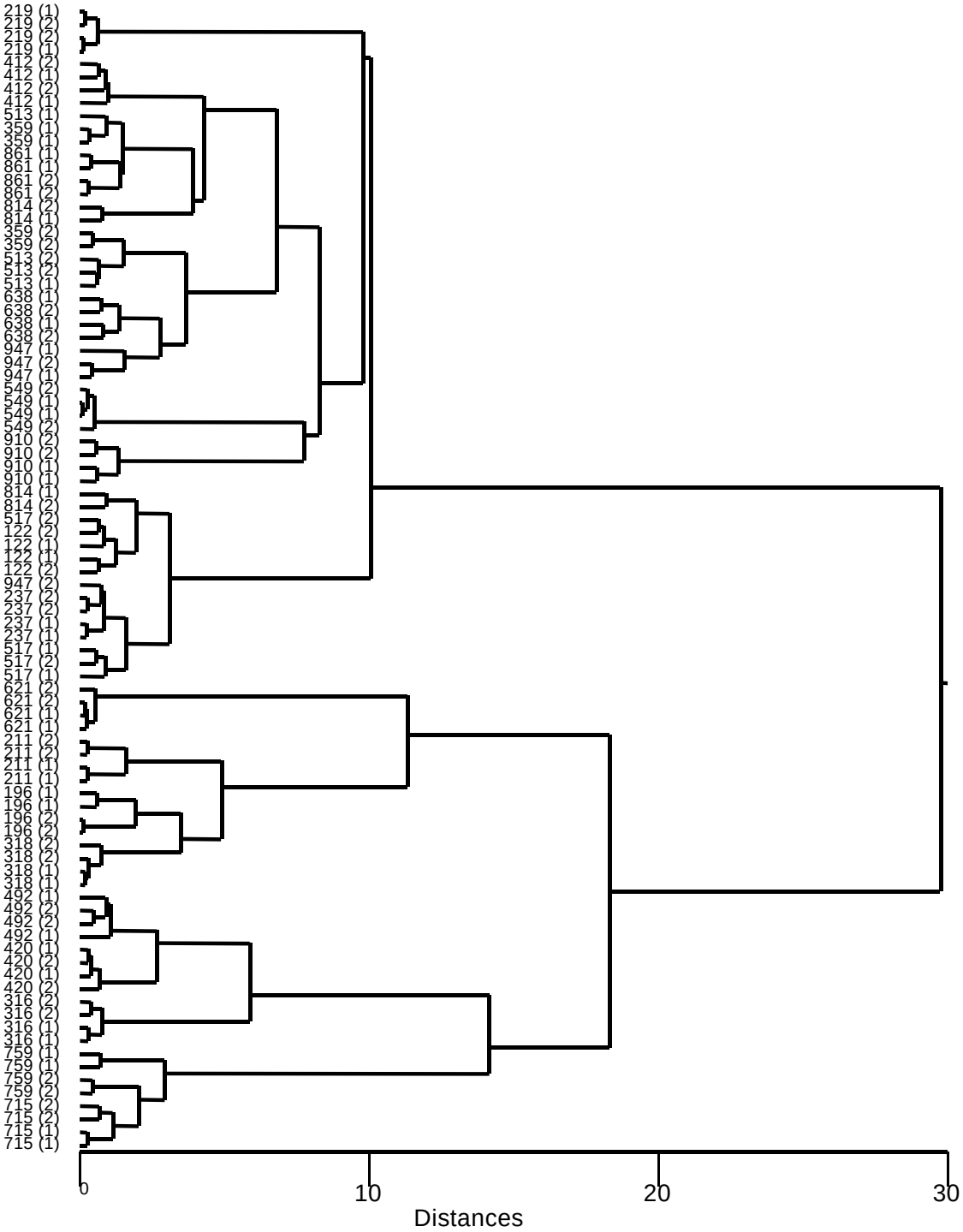
```
output out=meansout;run;

        data meansorder; set meansout;if _stat_='MEAN';run;
        proc print; run;

*****************************************************************
*fragrance  Analysis*
Mixed model on all variables
        Sensory descriptors
        Fragrance descriptors - image
        Situations
        Personality
Treatments: Clusterliking
                frag
                order
Interactions:   frag*clusterliking
                        frag*order
Block by session resp(clusterliking)
*****************************************************************
;

%macro models(var);
ods rtf file="&location.\&var.rtf";
proc mixed data=fragrance cl covtest;
CLASSES ClusterLiking Sample order ID;
 model &var = ClusterLiking Sample order order*Sample ClusterLiking*Sample /DDFM=SATTERTH;
 RANDOM ID(ClusterLiking);
lsmeans ClusterLiking Sample ClusterLiking*Sample /diff;
ods output lsmeans=lsm;
ods output diffs=dif;
ods rtf exclude diffs;
ods rtf exclude lsmeans;
run;

proc print data=lsm;
var  ClusterLiking Sample Estimate  StdErr   DF   tValue   Probt;
format estimate stderr 6.2;
run;

proc sort data=dif; by Sample;
proc print data=dif ; where effect='Sample';
title2 'Compares fragrances';
var  Sample   _Sample  Estimate  StdErr   DF   tValue   Probt;
format estimate stderr 6.2;
run;

proc sort data=dif; by ClusterLiking;
proc print data=dif ; where effect='ClusterLiking';
title2 'Compares ClusterLiking';
var  ClusterLiking   _ClusterLiking  Estimate  StdErr   DF   tValue   Probt;
format estimate stderr 6.2;
run;

proc sort data=dif; by ClusterLiking;
proc print data=dif; where ClusterLiking=_ClusterLiking and effect='ClusterLiking*Sample';
by ClusterLiking;
```

```
title2 'Compares fragrances for each ClusterLiking';
var  Sample _Sample  Estimate   StdErr   DF   tValue   Probt;
format estimate stderr 6.2;
run;
proc sort data=dif; by Sample;
proc print; where Sample=_Sample  and effect='ClusterLiking*Sample'; by Sample;
title2 'Compares ClusterLiking for each fragrance';
var ClusterLiking  _ClusterLiking   Estimate   StdErr   DF   tValue   Probt;
format estimate stderr 6.2;
run;

ods  rtf close;
%Mend;
run;

%models (Like);

%models (Citrusy);          %models (Classic);          %models (CoolMint);
%models (Empowering);       %models (Energizing);       %models (Fashionable);
%models (Feminine);         %models (Floral);           %models (Fresh);
%models (Fruity);           %models (Green);            %models (Masculine);
%models (Herbal);           %models (Memorable);        %models (Modern);
%models (MyType);           %models (Natural);          %models (Relaxing);
%models (Romantic);         %models (Sensual);          %models (Spicy);
%models (Sweet);            %models (Warm);             %models (Woody);

%models (EvdayWork);        %models (QuietWEHome);      %models (EveHome);
%models (ExcitgEveOut);     %models (Fall);             %models (Winter);
%models (Spring);           %models (Summer);

%models (AnxTense);         %models (AttracAppeal);     %models (ColdRude);
%models (ConfdtAssured);    %models (ConscienOrg);      %models (CreatCompl);
%models (DisorgCarl);       %models (EnerAct);          %models (Fem);
%models (Folksy);           %models (Masc);             %models (MoodyIrr);
%models (QuietCalm);        %models (Relax);            %models (RoughTough);
%models (SensualSexy);      %models (ShyReserved);      %models (SympWarm);
%models (TalkExtrav);       %models (UncreIntel);

run;      quit;
```

APPENDIX 4.

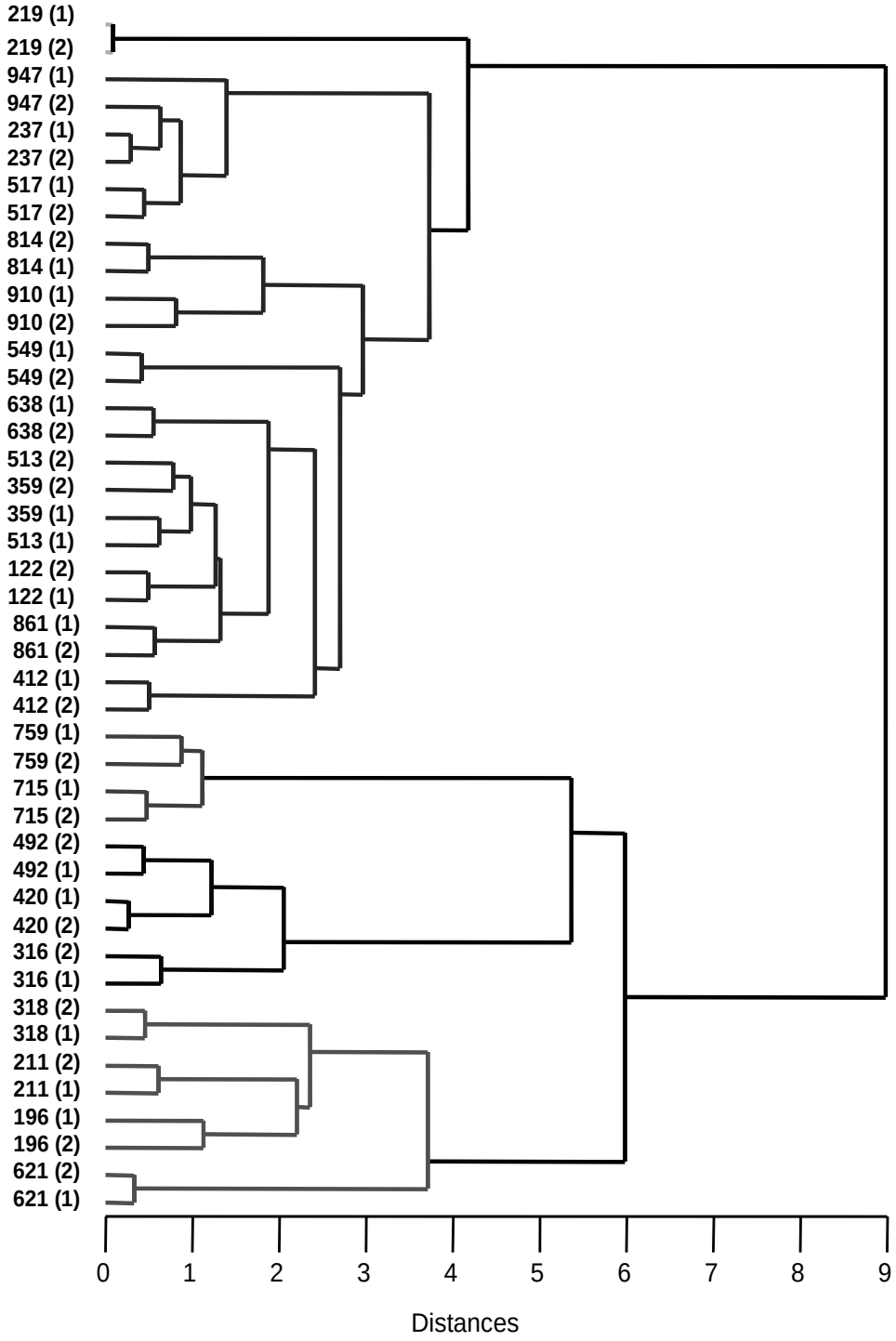
ASSESSING DIFFERENCES IN SENSORY PROFILES OBTAINED FROM PANEL 1 WITH TWO SAMPLE PREPARATION METHODS (1-MIN VS. 15-MIN DRY-DOWN)

APPENDIX 4A.
TREE DIAGRAM: RESULT FROM CLUSTER ANALYSIS PERFORMED ON THE FRAGRANCE PROFILES FOR OVERALL INTENSITY AND MAIN FRAGRANCE CATEGORIES USING TWO DRY-DOWN INTERVALS



Note: The 3-digit codes represent the 22 fragrances in the test. The numbers into parenthesis represent the methods used: 1 stands for 15-min dry-down; 2 stands for 1-min dry-down. There were 2 replications in the test per fragrance and method.

APPENDIX 4B.
TREE DIAGRAM: RESULT FROM CLUSTER ANALYSIS PERFORMED ON THE FRAGRANCE MEANS FOR ALL ATTRIBUTES OBTAINED USING METHODS 1 AND 2.



Note: The 3-digit codes represent the 22 fragrances in the test. The numbers in parentheses represent the method used for that data subset: 1 stands for the 15-min dry-down; 2 stands for the1-min dry-down

APPENDIX 4C.
SENSORY PROFILES AND OVERALL DESCRIPTION / CATEGORIZATION OF THE 22 FRAGRANCES STUDIED UNDER THE TWO PREPARATION METHODS (1 MIN DRY-DOWN VS. 15 MIN DRY-DOWN).

TABLE 1.
Descriptive profiles of the fragrances with Fruity and / or Floral notes as main categories

	Feminine Accord		**Feminine Accord**		**Feminine**		**Feminine Accord**	
Overall Description	**Fruity (Sweet)**		**Floral Green Fruity**		**Floral Fruity**		**Floral Green (Animal)**	
Code	**621**		**196**		**211**		**318**	
Method	**1min**	**15min**	**1min**	**15min**	**1min**	**15min**	**1min**	**15min**
INTENSITY	**10.0**	**9.3**	**12.7**	**11.0**	**10.5**	**9.4**	**10.0**	**9.3**
FLORAL	**0.0**	**0.0**	**6.0**	**9.0**	**6.0**	**7.5**	**7.7**	**6.4**
White Flower	0.0	0.0	4.5	6.0	4.0	4.5	5.3	4.8
Jasmine	0.0	0.0	0.0	0.0	0.0	0.0	5.3	4.8
Rose	0.0	0.0	0.0	0.0	2.0	4.0	1.0	0.0
Muguet	0.0	0.0	0.0	0.0	0.0	0.0	3.5	3.0
Lily of the Valley	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0
Violet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Floral	0.0	0.0	0.0	4.5	0.0	0.0	1.0	0.0
Carnation	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
Hyacinth	0.0	0.0	0.0	4.5	0.0	0.0	0.0	0.0
ALDEHYDIC	**0.0**	**0.0**	**1.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
FRUITY	**8.0**	**7.9**	**2.7**	**4.5**	**6.0**	**3.0**	**0.0**	**0.0**
Peach	0.0	0.0	0.0	0.0	4.0	2.8	0.0	0.0
Berry	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Melon	4.2	4.8	0.0	0.0	2.5	1.3	0.0	0.0
Tropical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Green Apple	3.3	3.8	2.7	4.5	0.0	0.0	0.0	0.0
DMA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SWEET	**2.0**	**2.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Amber	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Caramelized	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vanillin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GREEN	**0.8**	**0.0**	**6.0**	**4.5**	**0.0**	**0.0**	**3.8**	**4.0**
Triplal	0.0	0.0	5.0	4.5	0.0	0.0	0.0	1.0
Green Leaves	0.0	0.0	0.0	0.0	0.0	0.0	2.0	2.0
Stems	0.0	0.0	1.5	0.0	0.0	0.0	2.0	2.0
Fermented Green	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ANIMAL	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.2**	**1.3**
Leather	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Musk	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cat urine	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.3

Note: Characters in bold represents the main fragrance categories, under which subcategories are listed in normal characters. Italics represent additional subcategories (e.g., *pepper* is a subcategory of black spice, which is a subcategory of the main fragrance category **spice**). For a given fragrance, shaded cells correspond to the presence of the sensory characteristic in the sensory profile (intensity > 0.0).

TABLE 2.
Descriptive profiles of the fragrances with Powdery Floral Sweet notes and of the fragrances with Musky notes as main categories

	Feminine		Feminine Accord		Feminine		Masculine		Feminine	
Overall description	**Powdery Floral Sweet**		**Powdery Floral Sweet**		**Powdery Floral Sweet**		**Musky Sweet Floral**		**Musky Powdery**	
Code	**420**		**492**		**316**		**759**		**715**	
Method (min)	**1min**	**15min**	**1min**	**15min**	**1min**	**15min**	**1min**	**15min**	**1min**	**15min**
INTENSITY	**11.0**	**9.9**	**11.8**	**11.5**	**9.5**	**10.0**	**9.4**	**8.0**	**10.5**	**12.0**
FLORAL	**5.3**	**4.5**	**3.5**	**2.0**	**7.9**	**8.5**	**2.0**	**2.7**	**0.0**	**0.0**
White Flower	0.0	0.0	0.0	0.0	3.8	0.0	0.0	0.0	0.0	0.0
Rose	3.5	2.5	3.5	2.0	3.5	4.0	0.0	0.0	0.0	0.0
Muguet	2.3	2.0	0.0	0.0	2.5	3.0	0.0	0.0	0.0	0.0
Lily of the Valley	2.3	2.0	0.0	0.0	2.5	3.0	0.0	0.0	0.0	0.0
Violet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Floral	0.0	0.0	0.0	0.0	2.5	4.0	0.0	0.0	0.0	0.0
Carnation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hyacinth	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CITRUS	**0.0**	**0.0**	**0.0**	**0.9**	**0.0**	**0.0**	**1.5**	**0.0**	**0.0**	**0.0**
Lime	0.0	0.0	0.0	0.5	0.0	0.0	1.5	0.0	0.0	0.0
Orange	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bergamot	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lemon	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
Grapefruit	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tangerine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SWEET	**5.0**	**5.5**	**4.4**	**4.0**	**2.8**	**3.0**	**3.8**	**3.5**	**1.2**	**2.0**
Amber	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Caramelized	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vanillin	5.0	5.5	2.2	4.0	2.8	3.0	3.8	0.0	0.0	0.0
POWDER	**7.4**	**8.0**	**6.3**	**6.8**	**4.0**	**4.0**	**4.3**	**0.0**	**4.0**	**3.5**
WOODY	**0.0**	**0.0**	**2.5**	**2.0**	**0.0**	**0.0**	**0.0**	**1.1**	**1.8**	**0.5**
Sandalwood	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GREEN	**0.0**	**0.0**	**1.5**	**1.0**	**0.5**	**2.3**	**0.0**	**0.0**	**0.0**	**0.0**
Triplal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Green Leaves	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stems	0.0	0.0	0.0	0.0	0.5	1.3	0.0	0.0	0.0	0.0
Fermented Green	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ANIMAL	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**6.5**	**6.7**	**6.3**	**8.0**
Leather	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	2.0
Musk	0.0	0.0	0.0	0.0	0.0	0.0	6.5	6.7	4.8	6.8
Cat urine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: Characters in bold represents the main fragrance categories, under which subcategories are listed in normal characters. Italics represent additional subcategories (e.g., *pepper* is a subcategory of black spice, which is a subcategory of the main fragrance category **spice**). For a given fragrance, shaded cells correspond to the presence of the sensory characteristic in the sensory profile (intensity > 0.0).

TABLE 3.
Descriptive profiles of the fragrances with Floral Citrus Powder or Citrus Woody notes as main categories

	Masculine		**Feminine**		**Feminine**		**Shared**		**Shared**	
Overall description	**Floral Citrus (Sweet Powdery)**		**Floral Citrus Powder Woody**		**Citrus Spice Powder Woody (Floral)**		**Citrus Fougère Woody (Pine)**		**Citrus Woody (Green)**	
Code	**638**		**513**		**359**		**122**		**861**	
Method	**1min**	**15min**	**1min**	**15min**	**1min**	**15min**	**1min**	**15min**	**1min**	**15min**
INTENSITY	**8.8**	**7.9**	**8.0**	**7.3**	**7.4**	**6.5**	**6.7**	**6.0**	**6.5**	**5.9**
FLORAL	**3.7**	**3.5**	**4.0**	**1.5**	**3.3**	**0.0**	**1.8**	**0.0**	**0.0**	**0.8**
White Flower	1.3	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rose	0.0	0.0	3.0	1.0	1.5	0.0	1.8	0.0	0.0	0.0
Muguet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Violet	0.8	1.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
Other Floral	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
Carnation	*0.0*	*0.0*	*0.0*	*0.0*	*2.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
CITRUS	**3.5**	**4.5**	**2.7**	**4.0**	**2.3**	**3.7**	**2.9**	**2.0**	**4.0**	**4.0**
Lime	0.0	1.3	0.0	4.0	0.8	2.0	2.9	2.0	0.0	0.0
Orange	2.3	3.5	0.0	0.0	0.8	0.0	0.0	0.0	2.0	2.5
Bergamot	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
Lemon	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grapefruit	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	1.8
FRUITY	**2.5**	**1.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
DMA	2.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FOUGERE	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**3.2**	**3.5**	**0.0**	**0.0**
Lavender	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0
PINE	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.0**	**1.0**	**0.0**	**0.0**
SPICE	**0.0**	**0.0**	**0.0**	**0.0**	**3.0**	**2.4**	**0.0**	**0.0**	**0.0**	**0.0**
Black Spice	0.0	0.0	0.0	0.0	1.0	0.5	0.0	0.0	0.0	0.0
Anise	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Brown Spice	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0
SWEET	**2.5**	**2.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Amber	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Caramelized	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vanillin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
POWDER	**1.3**	**1.0**	**3.5**	**3.2**	**2.8**	**2.0**	**0.6**	**0.0**	**1.8**	**0.0**
WOODY	**0.0**	**0.0**	**3.0**	**2.9**	**2.5**	**2.0**	**2.0**	**1.9**	**2.0**	**2.0**
Sandalwood	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GREEN	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**2.5**	**0.0**
Green Leaves	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0
Stems	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0
Fermented Green	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
OZONE MARINE	**0.0**	**0.0**	**0.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Note: Characters in bold represents the main fragrance categories, under which subcategories are listed in normal characters. Italics represent additional subcategories (e.g., *pepper* is a subcategory of black spice, which is a subcategory of the main fragrance category **spice**). For a given fragrance, shaded cells correspond to the presence of the sensory characteristic in the sensory profile (intensity > 0.0).

TABLE 4.
Descriptive profiles of the fragrances with Citrus Woody Spice; Green Floral Citrus and Fougère Citrus notes as main categories

	Shared Accord		**Shared Accord**		**Masculine**		**Masculine**		**Masculine**	
Overall description	**Woody Citrus (Spice)**		**Green Floral Citrus**		**Fougère Citrus Floral**		**Fougère Citrus Woody**		**Fougère Citrus Woody**	
Code	**412**		**549**		**947**		**517**		**237**	
Method	**1 min**	**15 min**	**1 min**	**15 min**	**1 min**	**15 min**	**1 min**	**15 min**	**1 min**	**15 min**
INTENSITY	**8.3**	**8.3**	**8.3**	**8.2**	**8.8**	**8.5**	**8.8**	**8.8**	**8.7**	**8.8**
FLORAL	**0.0**	**0.0**	**2.5**	**2.0**	**4.0**	**5.5**	**0.0**	**0.0**	**2.0**	**2.3**
White Flower	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
Rose	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Muguet	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Violet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Floral	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
Hyacinth	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*3.0*	*0.0*	*0.0*	*0.0*	*0.0*
CITRUS	**3.5**	**2.8**	**2.5**	**2.0**	**3.8**	**3.8**	**3.3**	**5.0**	**4.3**	**4.8**
Lime	1.0	1.5	0.0	0.0	3.8	3.8	3.3	4.8	4.3	4.8
Orange	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bergamot	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lemon	1.0	0.8	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Grapefruit	0.0	1.3	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0
FOUGERE	**0.0**	**0.0**	**0.0**	**0.0**	**4.3**	**2.0**	**5.0**	**5.8**	**5.0**	**4.0**
Lavender	0.0	0.0	0.0	0.0	3.0	2.0	3.5	4.0	2.0	1.5
Moss	0.0	0.0	0.0	0.0	1.0	0.0	1.5	0.8	3.0	2.5
SPICE	**0.0**	**0.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Black Spice	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Anise	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brown Spice	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SWEET	**0.0**	**1.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Amber	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Caramelized	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vanillin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
POWDER	**0.0**	**0.0**	**0.0**	**0.0**	**0.5**	**2.0**	**1.0**	**0.0**	**0.0**	**0.0**
WOODY	**6.8**	**5.3**	**0.0**	**0.0**	**0.0**	**0.0**	**2.4**	**2.2**	**1.8**	**2.1**
Sandalwood	6.8	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RESINOUS	**1.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
GREEN	**0.0**	**0.0**	**6.0**	**6.0**	**0.0**	**1.0**	**0.0**	**0.0**	**0.0**	**0.0**
Green Leaves	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stems	0.0	0.0	1.5	3.0	0.0	0.0	0.0	0.0	0.0	0.0
Fermented Green	0.0	0.0	3.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0
OZONE MARINE	**0.8**	**0.0**	**0.0**	**0.0**	**1.3**	**2.3**	**1.1**	**0.5**	**0.0**	**1.5**

Note: Characters in bold represents the main fragrance categories, under which subcategories are listed in normal characters. Italics represent additional subcategories (e.g., *pepper* is a subcategory of black spice, which is a subcategory of the main fragrance category **spice**). For a given fragrance, shaded cells correspond to the presence of the sensory characteristic in the sensory profile (intensity > 0.0).

TABLE 5.
Descriptive profiles of the fragrances with Aldehyde Citrus Spice;
Citrus Fougère Spice Wood and Citrus notes as main categories

	Masculine Accord		**Masculine**		**Masculine Accord**	
Overall description	**Aldehyde Citrus Spice (Ozone)**		**Citrus Fougère Spice Fruity**		**Citrus (Sweet)**	
Code	**910**		**814**		**219**	
Method	**1min**	**15min**	**1min**	**15min**	**1min**	**15min**
INTENSITY	**9.8**	**8.8**	**7.9**	**8.3**	**10.3**	**10.3**
CITRUS	**3.2**	**1.3**	**3.3**	**2.5**	**9.5**	**9.5**
Lime	3.2	1.3	3.3	2.5	1.0	0.5
Orange	0.0	0.0	0.0	0.0	7.5	7.5
Bergamot	0.0	0.0	0.0	0.0	0.0	0.0
Lemon	0.0	0.0	0.0	0.0	0.0	0.0
Grapefruit	0.0	0.0	0.0	0.0	0.0	0.0
Tangerine	0.0	0.0	0.0	0.0	2.8	2.6
ALDEHYDIC	**6.0**	**5.0**	**0.0**	**0.0**	**0.0**	**0.0**
FRUITY	**0.0**	**0.0**	**2.0**	**2.3**	**0.0**	**0.0**
Peach	0.0	0.0	0.0	0.0	0.0	0.0
Berry	0.0	0.0	0.0	0.0	0.0	0.0
Melon	0.0	0.0	0.0	0.0	0.0	0.0
Tropical	0.0	0.0	3.5	2.3	0.0	0.0
Green Apple	0.0	0.0	0.0	0.0	0.0	0.0
DMA	0.0	0.0	0.0	0.0	0.0	0.0
FOUGERE	**0.0**	**0.0**	**2.5**	**1.3**	**0.0**	**0.0**
Lavender	0.0	0.0	0.5	0.0	0.0	0.0
Moss	0.0	0.0	0.5	1.3	0.0	0.0
SPICE	**2.3**	**4.3**	**2.8**	**3.8**	**0.0**	**0.0**
Black Spice	1.0	4.3	2.8	3.8	0.0	0.0
Pepper	*0.0*	*0.0*	*2.8*	*3.8*	*0.0*	*0.0*
Anise	1.3	4.3	0.0	0.0	0.0	0.0
Brown Spice	0.0	0.0	0.0	0.0	0.0	0.0
SWEET	**0.0**	**0.0**	**0.0**	**0.0**	**2.3**	**2.0**
Amber	0.0	0.0	0.0	0.0	0.0	0.0
Caramelized	0.0	0.0	0.0	0.0	2.3	2.0
Vanillin	0.0	0.0	0.0	0.0	0.0	0.0
POWDER	**0.0**	**0.0**	**1.2**	**0.0**	**0.0**	**0.0**
GREEN	**1.0**	**0.0**	**0.5**	**0.0**	**0.0**	**0.0**
OZONE MARINE	**1.8**	**0.8**	**0.0**	**1.8**	**0.0**	**0.0**

Note: Characters in bold represents the main fragrance categories, under which subcategories are listed in normal characters. Italics represent additional subcategories (e.g., *pepper* is a subcategory of black spice, which is a subcategory of the main fragrance category **spice**). For a given fragrance, shaded cells correspond to the presence of the sensory characteristic in the sensory profile (intensity > 0.0).

APPENDIX 5.

SENSORY PROFILES GENERATED BY THREE PANELS DIFFERING IN LEVEL OF TRAINING

APPENDIX 5A
DESCRIPTIVE SENSORY PROFILES GENERATED BY PANEL 1 (HIGHLY TRAINED PANEL WITH PRIOR EXPERIENCE IN DESCRIPTIVE ANALYSIS OF FRAGRANCES

TABLE 1.
Descriptive sensory profiles of the olfactory accords

	SAMPLE CODE							
ATTRIBUTES	**621**	**196**	**318**	**492**	**412**	**549**	**910**	**219**
INTENSITY	**10.0**	**12.7**	**10.0**	**11.8**	**8.3**	**8.3**	**9.8**	**10.3**
FLORAL	**0.0**	**6.0**	**7.7**	**3.5**	**0.0**	**2.5**	**0.0**	**0.0**
White Flower	0.0	4.5	5.3	0.0	0.0	0.0	0.0	0.0
Rose	0.0	0.0	1.0	3.5	0.0	1.0	0.0	0.0
Muguet	0.0	0.0	3.5	0.0	0.0	1.0	0.0	0.0
Violet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Floral	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
CITRUS	**0.0**	**0.0**	**0.0**	**0.0**	**3.5**	**2.5**	**3.2**	**9.5**
Lime	0.0	0.0	0.0	0.0	1.0	0.0	3.2	1.0
Orange	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.5
Bergamot	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
Lemon	0.0	0.0	0.0	0.0	1.0	2.0	0.0	0.0
Grapefruit	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tangerine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8
ALDEHYDIC	**0.0**	**1.0**	**0.0**	**0.0**	**0.0**	**0.0**	**6.0**	**0.0**
FRUITY	**8.0**	**2.7**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Peach	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Berry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Melon	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tropical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Green Apple	3.3	2.7	0.0	0.0	0.0	0.0	0.0	0.0
DMA*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FOUGERE	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Lavender	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PINE	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
SPICE	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**2.3**	**0.0**
Black Spice	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
Anise	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0
Brown Spice	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SWEET	**2.0**	**0.0**	**0.0**	**4.4**	**0.0**	**0.0**	**0.0**	**2.3**
Amber	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Caramelized	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3
Vanillin	0.0	0.0	0.0	2.2	0.0	0.0	0.0	0.0
POWDER	**0.0**	**0.0**	**0.0**	**6.3**	**0.0**	**0.0**	**0.0**	**0.0**
WOODY	**0.0**	**0.0**	**0.0**	**2.5**	**6.8**	**0.0**	**0.0**	**0.0**
Sandalwood	0.0	0.0	0.0	0.0	6.8	0.0	0.0	0.0
RESINOUS	**0.0**	**0.0**	**0.0**	**0.0**	**1.0**	**0.0**	**0.0**	**0.0**

TABLE 1. (continued)

	SAMPLE CODE							
ATTRIBUTES	**621**	**196**	**318**	**492**	**412**	**549**	**910**	**219**
GREEN	**0.8**	**6.0**	**3.8**	**1.5**	**0.0**	**6.0**	**1.0**	**0.0**
Triplal	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0
Green Leaves	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0
Stems	0.0	1.5	2.0	0.0	0.0	1.5	0.0	0.0
Fermented Greens	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0
OZONE MARINE	**0.0**	**0.0**	**0.0**	**0.0**	**0.8**	**0.0**	**1.8**	**0.0**
ANIMAL	**0.0**	**0.0**	**1.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Leather	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Musk	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cat urine	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0

Note: Main attributes categories are identified by bold and upper case characters and subcategories of descriptive attributes are identified by lower case characters.
All intensities are measured on a 15-point numerical scale with 0.5-point increments (0 = none, 15 = extremely strong) and all values are panel means averaged across replications.
* DMA = dimethyl-anthranilate

TABLE 2.
Descriptive sensory profiles of the fine feminine / shared fragrances

	SAMPLE CODE							
ATTRIBUTES	**420**	**316**	**211**	**715**	**513**	**359**	**122**	**861**
INTENSITY	**11.0**	**9.5**	**10.5**	**10.5**	**8.0**	**7.4**	**6.7**	**6.5**
FLORAL	**5.3**	**7.9**	**6.0**	**0.0**	**4.0**	**3.3**	**1.8**	**0.0**
White Flower	0.0	3.8	4.0	0.0	0.0	0.0	0.0	0.0
Rose	3.5	3.5	2.0	0.0	3.0	1.5	1.8	0.0
Muguet	2.3	2.5	0.0	0.0	0.0	0.0	0.0	0.0
Violet	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0
Other Floral	0.0	2.5	0.0	0.0	0.0	2.0	0.0	0.0
CITRUS	**0.0**	**0.0**	**0.0**	**0.0**	**2.7**	**2.3**	**2.9**	**4.0**
Lime	0.0	0.0	0.0	0.0	0.0	0.8	2.9	0.0
Orange	0.0	0.0	0.0	0.0	0.0	0.8	0.0	2.0
Bergamot	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Lemon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grapefruit	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
Tangerine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ALDEHYDIC	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
FRUITY	**0.0**	**0.0**	**6.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Peach	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0
Berry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Melon	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0
Tropical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Green Apple	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DMA*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FOUGERE	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**3.2**	**0.0**
Lavender	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PINE	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.0**	**0.0**
SPICE	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**3.0**	**0.0**	**0.0**
Black Spice	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
Anise	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brown Spice	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0
SWEET	**5.0**	**2.8**	**0.0**	**1.2**	**0.0**	**0.0**	**0.0**	**0.0**
Amber	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Caramelized	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vanillin	5.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0
POWDER	**7.4**	**4.0**	**0.0**	**4.0**	**3.5**	**2.8**	**0.6**	**1.8**
WOODY	**0.0**	**0.0**	**0.0**	**1.8**	**3.0**	**2.5**	**2.0**	**2.0**
Sandalwood	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RESINOUS	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
GREEN	**0.0**	**0.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**2.5**
Triplal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Green Leaves	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
Stems	0.0	0.5	0.0	0.0	0.0	0.0	0.0	1.8
Fermented Greens	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5

TABLE 2. (continued)

	SAMPLE CODE							
ATTRIBUTES	**420**	**316**	**211**	**715**	**513**	**359**	**122**	**861**
OZONE MARINE	**0.0**	**0.0**	**0.0**	**0.0**	**0.9**	**0.0**	**0.0**	**0.0**
ANIMAL	**0.0**	**0.0**	**0.0**	**6.3**	**0.0**	**0.0**	**0.0**	**0.0**
Leather	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0
Musk	0.0	0.0	0.0	4.8	0.0	0.0	0.0	0.0
Cat urine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: Main attributes categories are identified by bold and upper case characters and subcategories of descriptive attributes are identified by lower case characters.
All intensities are measured on a 15-point numerical scale with 0.5-point increments (0 = none, 15 = extremely strong) and all values are panel means averaged across replications.
* DMA=dimethyl-anthranilate

TABLE 3.
Descriptive sensory profiles of the fine masculine fragrances

	SAMPLE CODE					
ATTRIBUTES	**759**	**517**	**638**	**814**	**237**	**947**
INTENSITY	**9.4**	**8.8**	**8.8**	**7.9**	**8.7**	**8.8**
FLORAL	**2.0**	**0.0**	**3.7**	**0.0**	**2.0**	**4.0**
White Flower	0.0	0.0	1.3	0.0	1.0	0.0
Rose	0.0	0.0	0.0	0.0	0.0	0.0
Muguet	0.0	0.0	0.0	0.0	0.0	0.0
Violet	0.0	0.0	0.8	0.0	0.0	0.0
Other Floral	0.0	0.0	0.0	0.0	0.0	0.0
CITRUS	**1.5**	**3.3**	**3.5**	**3.3**	**4.3**	**3.8**
Lime	1.5	3.3	0.0	3.3	4.3	3.8
Orange	0.0	0.0	2.3	0.0	0.0	0.0
Bergamot	0.0	0.0	0.0	0.0	0.0	0.0
Lemon	0.0	0.0	1.5	0.0	0.0	0.0
Grapefruit	0.0	1.5	0.0	0.0	0.0	0.0
Tangerine	0.0	0.0	0.0	0.0	0.0	0.0
ALDEHYDIC	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
FRUITY	**0.0**	**0.0**	**2.5**	**2.0**	**0.0**	**0.0**
Peach	0.0	0.0	0.0	0.0	0.0	0.0
Berry	0.0	0.0	0.0	0.0	0.0	0.0
Melon	0.0	0.0	0.0	0.0	0.0	0.0
Tropical	0.0	0.0	0.0	3.5	0.0	0.0
Green Apple	0.0	0.0	0.0	0.0	0.0	0.0
DMA*	0.0	0.0	2.5	0.0	0.0	0.0
FOUGERE	**0.0**	**5.0**	**0.0**	**2.5**	**5.0**	**4.3**
Lavender	0.0	3.5	0.0	0.5	2.0	3.0
Moss	0.0	1.5	0.0	0.5	3.0	1.0
PINE	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
SPICE	**0.0**	**0.0**	**0.0**	**2.8**	**0.0**	**0.0**
Black Spice	0.0	0.0	0.0	2.8	0.0	0.0
Anise	0.0	0.0	0.0	0.0	0.0	0.0
Brown Spice	0.0	0.0	0.0	0.0	0.0	0.0
SWEET	**3.8**	**0.0**	**2.5**	**0.0**	**0.0**	**0.0**
Amber	0.0	0.0	0.8	0.0	0.0	0.0
Caramelized	0.0	0.0	2.0	0.0	0.0	0.0
Vanillin	3.8	0.0	0.0	0.0	0.0	0.0
POWDER	**4.3**	**1.0**	**1.3**	**1.2**	**0.0**	**0.5**
WOODY	**0.0**	**2.4**	**0.0**	**0.0**	**1.8**	**0.0**
Sandalwood	0.0	0.0	0.0	0.0	0.0	0.0
RESINOUS	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
GREEN	**0.0**	**0.0**	**0.0**	**0.5**	**0.0**	**0.0**
Triplal	0.0	0.0	0.0	0.0	0.0	0.0
Green Leaves	0.0	0.0	0.0	0.0	0.0	0.0
Stems	0.0	0.0	0.0	0.0	0.0	0.0
Fermented Greens	0.0	0.0	0.0	0.0	0.0	0.0

TABLE 3. (continued)

	SAMPLE CODE					
ATTRIBUTES	**759**	**517**	**638**	**814**	**237**	**947**
OZONE MARINE	**0.0**	**1.1**	**0.0**	**0.0**	**0.0**	**1.3**
ANIMAL	**6.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Leather	0.0	0.0	0.0	0.0	0.0	0.0
Musk	6.5	0.0	0.0	0.0	0.0	0.0
Cat urine	0.0	0.0	0.0	0.0	0.0	0.0

Note: Main attributes categories are identified by bold and upper case characters and subcategories of descriptive attributes are identified by lower case characters.
All intensities are measured on a 15-point numerical scale with 0.5-point increments (0 = none, 15 = extremely strong) and all values are panel means averaged across replications.
* DMA = dimethyl-anthranilate

APPENDIX 5B.
DESCRIPTIVE SENSORY PROFILES GENERATED BY PANEL 2 (HIGHLY TRAINED, WITH LIMITED EXPERIENCE WITH FRAGRANCES)

TABLE 1.
Descriptive sensory profiles of the olfactory accords

	SAMPLE CODES							
ATTRIBUTES	**621**	**196**	**318**	**492**	**412**	**549**	**910**	**219**
INTENSITY	**10.4**	**10.6**	**11.0**	**10.6**	**9.5**	**9.0**	**10.3**	**8.4**
FLORAL	**2.6**	**4.0**	**4.6**	**4.2**	**1.5**	**2.4**	**1.7**	**1.0**
Rose	50%	65%	65%	10%	45%	15%	0%	20%
White Flower	40%	60%	85%	75%	10%	35%	25%	5%
Muguet	45%	65%	35%	30%	40%	60%	55%	20%
Sweet Floral	50%	25%	30%	60%	20%	35%	5%	15%
Violet	10%	25%	10%	15%	5%	40%	0%	0%
Spicy Floral	5%	35%	30%	45%	30%	20%	15%	5%
Other Floral	40%	35%	70%	45%	0%	5%	40%	10%
CITRUS	**1.1**	**0.7**	**1.8**	**0.4**	**2.8**	**1.9**	**1.4**	**4.9**
Lemon	35%	30%	15%	10%	10%	30%	35%	90%
Lime	5%	0%	30%	5%	50%	35%	30%	45%
Bergamot	30%	35%	80%	25%	60%	70%	55%	15%
Grapefruit	5%	0%	0%	0%	45%	0%	10%	0%
Orange	10%	5%	0%	0%	30%	5%	10%	95%
Peel	0%	0%	0%	0%	40%	0%	15%	60%
ALDEHYDIC	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**1.6**	**0.0**
FRUITY	**4.7**	**3.0**	**0.5**	**0.5**	**0.2**	**1.2**	**0.1**	**0.7**
Berry	65%	15%	25%	15%	10%	45%	10%	30%
Tree Fruit	70%	75%	10%	25%	0%	50%	5%	30%
Melon	70%	55%	0%	0%	5%	0%	5%	0%
Tropical Fruit	60%	55%	10%	0%	0%	5%	0%	15%
HERBACEOUS	**0.4**	**0.2**	**1.0**	**0.2**	**0.6**	**0.7**	**1.0**	**0.1**
RESIN PINE	**0.0**	**0.0**	**0.0**	**0.1**	**0.3**	**0.1**	**0.9**	**0.1**
CAMPHOR MINT	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
SPICY	**0.1**	**0.1**	**0.4**	**1.0**	**0.4**	**0.2**	**0.1**	**0.0**
Black Spice	0%	0%	5%	0%	15%	0%	5%	0%
Brown Spice	5%	10%	35%	70%	25%	20%	5%	0%
SWEET	**1.3**	**1.6**	**1.3**	**1.9**	**0.8**	**0.9**	**0.3**	**1.3**
Vanilla	0%	25%	5%	40%	0%	10%	5%	10%
Coumarin	50%	70%	80%	65%	55%	55%	25%	30%
Brown Sweet	30%	15%	15%	40%	25%	0%	5%	0%
Fruity Sweet	40%	55%	0%	20%	5%	20%	0%	60%
WOODY NUTTY	**0.2**	**0.1**	**0.5**	**0.6**	**2.7**	**1.2**	**0.7**	**0.0**
Nutty	5%	5%	5%	0%	5%	0%	0%	0%
Dry Wood	0%	5%	15%	10%	20%	10%	20%	0%
Oriental Wood	10%	0%	30%	30%	95%	75%	20%	0%
GREEN	**0.3**	**0.9**	**0.0**	**0.0**	**0.1**	**0.4**	**0.2**	**0.2**
OZONE MARINE	**0.1**	**0.2**	**1.1**	**0.1**	**0.2**	**0.3**	**2.6**	**0.5**
LEATHER MUSK	**0.0**	**0.0**	**0.3**	**1.9**	**0.2**	**0.0**	**0.1**	**0.0**

Note: Main attributes categories are identified by bold and upper case characters. Intensities are measured on a 15-point numerical scale with 0.5-point increments (0 = none, 15 = extremely strong). All values are panel means averaged across panelists and replications. Subcategories of descriptive attributes are identified by lower case characters. The frequency of identification of the character by the panel is indicated as a percentage.

TABLE 2.
Descriptive sensory profiles of the fine feminine / shared fragrances

	SAMPLE CODES							
ATTRIBUTES	**420**	**316**	**211**	**715**	**513**	**359**	**122**	**861**
INTENSITY	**10.6**	**10.7**	**10.6**	**9.2**	**11.1**	**11.0**	**9.1**	**8.9**
FLORAL	**4.9**	**4.8**	**3.5**	**3.2**	**3.1**	**3.1**	**2.2**	**2.1**
Rose	55%	40%	65%	5%	10%	30%	5%	70%
White Flower	80%	90%	60%	70%	65%	60%	60%	25%
Muguet	30%	50%	65%	50%	50%	30%	50%	55%
Sweet Floral	55%	70%	35%	50%	50%	35%	40%	15%
Violet	5%	5%	10%	25%	15%	5%	25%	35%
Spicy Floral	15%	30%	0%	40%	30%	50%	5%	15%
Other Floral	85%	50%	55%	20%	45%	40%	5%	0%
CITRUS	**0.7**	**0.7**	**0.9**	**0.4**	**2.1**	**2.2**	**2.1**	**2.5**
Lemon	10%	10%	40%	0%	10%	25%	30%	50%
Lime	0%	15%	15%	0%	30%	40%	15%	15%
Bergamot	30%	45%	30%	15%	85%	70%	80%	60%
Grapefruit	0%	0%	0%	0%	0%	0%	0%	0%
Orange	0%	0%	20%	15%	5%	10%	10%	55%
Peel	0%	0%	0%	5%	5%	0%	0%	0%
ALDEHYDIC	**0.0**	**0.1**	**0.1**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**
FRUITY	**1.5**	**1.7**	**3.0**	**1.5**	**1.0**	**1.9**	**0.8**	**2.2**
Berry	60%	20%	65%	45%	30%	50%	20%	65%
Tree Fruit	60%	80%	80%	45%	25%	50%	50%	70%
Melon	0%	15%	50%	0%	10%	0%	0%	0%
Tropical Fruit	0%	10%	5%	15%	5%	5%	0%	10%
HERBACEOUS	**0.3**	**0.4**	**1.0**	**0.5**	**1.2**	**1.1**	**1.1**	**0.3**
RESIN PINE	**0.0**	**0.0**	**0.0**	**0.0**	**0.2**	**0.0**	**0.0**	**0.0**
CAMPHOR MINT	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**0.0**	**0.2**
SPICY	**0.2**	**0.1**	**0.3**	**0.6**	**0.7**	**0.7**	**0.4**	**0.2**
Black Spice	0%	0%	0%	0%	0%	0%	0%	0%
Brown Spice	10%	10%	25%	55%	60%	65%	30%	20%
SWEET	**1.8**	**2.0**	**1.5**	**2.1**	**1.3**	**1.5**	**0.8**	**0.9**
Vanilla	25%	5%	15%	55%	5%	0%	20%	0%
Coumarin	75%	85%	65%	75%	70%	70%	50%	50%
Brown Sweet	35%	40%	25%	25%	40%	10%	20%	5%
Fruity Sweet	0%	30%	30%	35%	25%	45%	5%	30%
WOODY NUTTY	**0.7**	**0.7**	**0.2**	**0.6**	**1.0**	**0.4**	**0.7**	**0.1**
Nutty	0%	0%	0%	10%	10%	10%	0%	5%
Dry Wood	15%	10%	10%	15%	20%	10%	10%	5%
Oriental Wood	35%	55%	10%	25%	55%	15%	60%	5%
GREEN	**0.1**	**0.1**	**0.2**	**0.0**	**0.1**	**0.0**	**0.2**	**0.1**
OZONE MARINE	**0.4**	**0.3**	**0.2**	**0.2**	**0.0**	**0.2**	**0.9**	**0.5**
LEATHER MUSK	**0.4**	**0.1**	**0.0**	**0.4**	**0.8**	**0.4**	**0.4**	**0.1**

Note: Main attributes categories are identified by bold and upper case characters. Intensities are measured on a 15-point numerical scale with 0.5-point increments (0 = none, 15 = extremely strong). All values are panel means averaged across panelists and replications. Subcategories of descriptive attributes are identified by lower case characters. The frequency of identification of the character by the panel is indicated as a percentage.

TABLE 3.
Descriptive sensory profiles of the fine masculine fragrances

	SAMPLE CODE					
ATTRIBUTES	**759**	**517**	**638**	**814**	**237**	**947**
INTENSITY	**11.1**	**10.2**	**11.2**	**10.6**	**10.9**	**9.9**
FLORAL	**3.8**	**2.6**	**2.8**	**1.9**	**2.1**	**1.6**
Rose	5%	15%	35%	15%	35%	15%
White Flower	90%	50%	60%	70%	55%	35%
Muguet	40%	70%	40%	15%	25%	60%
Sweet Floral	20%	15%	30%	5%	20%	0%
Violet	10%	20%	0%	25%	10%	5%
Spicy Floral	60%	40%	45%	40%	25%	40%
Other Floral	25%	20%	15%	30%	15%	0%
CITRUS	**2.1**	**2.5**	**2.9**	**2.4**	**2.9**	**2.0**
Lemon	5%	35%	45%	15%	40%	15%
Lime	10%	60%	55%	60%	45%	40%
Bergamot	95%	75%	90%	90%	60%	90%
Grapefruit	10%	10%	0%	0%	15%	0%
Orange	0%	30%	10%	5%	10%	15%
Peel	0%	5%	0%	0%	5%	0%
ALDEHYDIC	**0.0**	**0.1**	**0.0**	**0.1**	**0.5**	**0.1**
FRUITY	**0.5**	**0.3**	**0.4**	**0.2**	**0.6**	**0.6**
Berry	0%	10%	15%	15%	35%	30%
Tree Fruit	20%	10%	15%	0%	10%	20%
Melon	0%	0%	0%	0%	0%	0%
Tropical Fruit	10%	0%	5%	0%	5%	0%
HERBACEOUS	**1.5**	**1.4**	**1.3**	**1.9**	**1.8**	**2.2**
RESIN PINE	**0.0**	**0.0**	**0.7**	**0.3**	**0.1**	**0.1**
CAMPHOR MINT	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
SPICY	**0.3**	**0.2**	**0.7**	**1.0**	**0.6**	**0.4**
Black Spice	0%	0%	5%	35%	5%	0%
Brown Spice	20%	20%	50%	60%	30%	30%
SWEET	**1.4**	**0.9**	**0.9**	**0.5**	**0.9**	**0.9**
Vanilla	35%	5%	0%	0%	5%	0%
Coumarin	80%	50%	65%	45%	50%	75%
Brown Sweet	15%	25%	10%	5%	5%	10%
Fruity Sweet	5%	10%	5%	0%	15%	10%
WOODY NUTTY	**0.6**	**0.9**	**1.1**	**1.9**	**1.0**	**1.6**
Nutty	0%	0%	0%	0%	5%	10%
Dry Wood	5%	65%	20%	75%	25%	45%
Oriental Wood	40%	10%	65%	40%	35%	65%
GREEN	**0.0**	**0.0**	**0.1**	**0.2**	**0.0**	**0.1**
OZONE MARINE	**0.3**	**0.2**	**0.0**	**0.0**	**0.3**	**0.1**
LEATHER MUSK	**0.9**	**1.4**	**1.0**	**1.0**	**0.5**	**0.7**

Note: Main attributes categories are identified by bold and upper case characters. Intensities are measured on a 15-point numerical scale with 0.5-point increments (0 = none, 15 = extremely strong). All values are panel means averaged across panelists and replications. Subcategories of descriptive attributes are identified by lower case characters. The frequency of identification of the character by the panel is indicated as a percentage.

APPENDIX 5C.
DESCRIPTIVE SENSORY PROFILES GENERATED BY PANEL 3 (UNTRAINED CONSUMER PANEL)

TABLE 1.
Descriptive sensory profiles of the olfactory accords

	SAMPLE CODES							
ATTRIBUTE	**621**	**196**	**318**	**492**	**412**	**549**	**910**	**219**
Panel 3A (n=156 women)								
Floral	3.0	3.3	2.8	2.0	1.5	2.7	1.7	1.4
Citrusy	2.9	2.1	0.9	0.7	2.6	2.7	2.4	4.6
Fruity	3.5	2.7	0.9	0.7	1.9	2.0	1.9	4.1
Spicy	0.6	0.9	1.1	1.6	1.5	1.1	1.3	0.7
Sweet	3.7	3.2	2.1	2.3	1.9	2.6	1.9	3.2
Green	1.5	2.2	1.5	1.1	1.7	2.0	1.8	1.3
Woody	0.4	1.1	1.1	1.4	1.7	1.2	1.0	0.4
Herbal	1.8	2.1	1.9	1.3	2.2	2.2	2.0	1.4
Cool Minty	1.5	1.2	1.2	1.3	1.5	1.7	1.6	1.4
Panel 3B (n=158 men)								
Floral	3.1	3.4	3.0	2.5	2.1	3.2	2.5	2.2
Citrusy	3.2	2.8	1.4	1.4	2.5	2.5	2.5	4.5
Fruity	3.8	3.3	1.5	1.6	2.4	2.5	2.4	4.3
Spicy	1.3	1.2	1.2	1.7	1.7	1.5	1.4	1.4
Sweet	3.4	3.1	2.2	2.3	2.1	2.8	2.5	3.2
Green	2.0	2.5	1.9	1.5	1.9	1.9	2.0	1.7
Woody	0.9	1.3	1.4	1.5	1.7	1.3	1.3	0.8
Herbal	2.1	2.6	2.2	1.7	2.2	2.2	1.9	1.9
Cool Minty	2.1	1.6	1.9	2.0	2.0	2.0	2.2	1.9
Random subset of Panel 3A (n=10 women)								
Floral	3.7	3.4	3.8	1.7	2.3	3.1	2.3	1.7
Citrusy	2.5	2.1	0.6	0.5	3.4	2.7	3.1	4.6
Fruity	2.6	2.7	1.0	0.9	3.1	2.3	2.0	4.1
Spicy	0.3	0.9	1.0	1.1	1.8	0.8	1.4	0.9
Sweet	3.7	2.7	2.3	2.0	2.6	2.9	2.4	3.0
Green	1.3	1.9	1.9	1.2	1.4	1.4	1.2	1.8
Woody	0.3	1.2	1.1	1.3	1.2	0.8	0.8	0.8
Herbal	1.7	1.5	2.0	0.6	1.6	1.6	1.3	1.8
Cool Minty	1.4	1.3	1.2	1.3	2.8	2.5	2.6	2.1
Random subset of Panel 3B (n=10men)								
Floral	3.1	3.7	1.7	1.9	1.3	3.3	3.0	1.6
Citrusy	3.3	2.9	1.2	1.5	2.6	3.8	0.9	4.7
Fruity	4.0	3.6	1.2	1.2	2.1	3.3	1.5	3.9
Spicy	1.5	0.7	1.9	2.6	1.1	1.0	1.3	1.4
Sweet	3.4	4.3	2.1	1.7	1.6	2.9	1.4	3.3
Green	2.2	2.4	1.3	1.7	2.0	2.2	3.0	1.6
Woody	0.5	1.6	1.6	1.2	1.8	1.1	1.7	0.4
Herbal	2.5	2.5	1.1	1.5	2.4	2.6	2.0	1.9
Cool Minty	2.0	1.1	1.3	2.0	1.7	2.3	2.4	1.6

Note: Intensities are measured on a 5-point numerical scale with 1-point increments (0 = none, 5 = extremely strong) and all values are panels means averaged across panelists.

TABLE 2.
Descriptive sensory profiles of the fine feminine / shared fragrances

	SAMPLE CODES							
ATTRIBUTE	**420**	**316**	**211**	**715**	**513**	**359**	**122**	**861**
Panel 3A (n=156 women)								
Floral	2.6	3.3	2.9	2.2	1.5	2.0	2.0	2.2
Citrusy	0.6	1.3	2.5	0.9	1.4	1.4	1.7	3.3
Fruity	1.1	1.3	2.7	1.2	1.0	1.3	1.3	2.7
Spicy	0.7	1.0	0.8	1.4	1.9	1.6	1.3	0.9
Sweet	2.7	2.6	3.3	2.7	2.0	2.3	2.2	2.8
Green	0.9	1.2	1.5	1.2	1.7	1.5	1.6	1.7
Woody	0.6	0.8	0.6	1.3	1.8	1.5	1.1	0.7
Herbal	1.0	1.5	1.7	1.5	1.8	1.8	1.8	2.0
Cool Minty	1.2	1.4	1.5	1.2	1.6	1.5	1.9	1.4
Panel 3B (n=158 men)								
Floral	2.8	3.0	3.2	2.3	2.2	2.6	2.3	2.7
Citrusy	1.2	1.7	3.0	1.6	1.8	2.0	1.9	2.9
Fruity	1.6	1.8	3.4	1.7	2.0	2.2	1.9	3.0
Spicy	1.1	1.5	1.4	1.5	1.9	1.7	1.4	1.2
Sweet	2.3	2.4	3.3	2.7	2.6	2.8	2.6	2.9
Green	1.3	1.6	2.0	1.4	1.7	1.9	1.5	1.7
Woody	0.9	1.0	0.9	1.2	1.5	1.3	1.1	1.0
Herbal	1.6	1.9	2.0	1.8	1.8	2.0	1.8	2.0
Cool Minty	1.9	1.9	2.0	2.0	2.3	2.0	2.2	1.9
Random subset of Panel 3A (n=10 women)								
Floral	2.5	3.4	3.1	2.9	1.6	2.1	2.1	2.0
Citrusy	0.3	1.1	2.8	0.5	2.2	1.7	2.9	4.3
Fruity	0.7	1.5	2.5	1.2	1.7	1.1	1.8	3.5
Spicy	0.4	0.8	0.8	0.4	2.6	1.0	0.7	0.9
Sweet	2.9	3.2	3.5	2.8	1.8	2.3	1.8	2.4
Green	0.6	1.2	1.3	1.3	2.2	1.8	1.6	1.3
Woody	0.7	0.5	0.6	1.1	2.0	0.9	0.9	0.6
Herbal	0.8	1.5	1.7	1.4	2.3	1.6	1.3	1.4
Cool Minty	1.3	1.4	2.0	1.2	2.7	2.0	2.4	2.4
Random subset of Panel 3B (n=10 men)								
Floral	3.4	3.4	3.2	3.0	2.7	2.1	1.6	2.9
Citrusy	1.2	2.0	3.5	2.2	2.1	2.4	2.3	3.1
Fruity	1.6	1.9	4.0	2.3	2.4	2.0	1.9	2.8
Spicy	0.8	1.4	0.8	1.7	2.1	1.6	1.8	1.2
Sweet	1.5	2.7	3.8	3.4	2.8	2.6	2.3	2.9
Green	1.1	1.3	1.9	1.6	1.7	2.0	1.2	1.5
Woody	1.0	0.4	0.3	1.4	0.9	0.9	1.0	0.7
Herbal	1.4	2.1	2.0	1.8	1.9	2.2	1.6	1.3
Cool Minty	1.1	1.4	1.6	1.8	2.0	2.6	2.0	2.1

Note: Intensities are measured on a 5-point numerical scale with 1-point increments (0 = none, 5 = extremely strong) and all values are panel means averaged across panelists.

TABLE 3.
Descriptive sensory profiles of the fine masculine fragrances

	SAMPLE CODES					
ATTRIBUTE	**759**	**517**	**638**	**814**	**237**	**947**
Panel 3A (n=156 women)						
Floral	1.9	1.8	1.2	1.0	1.1	1.2
Citrusy	0.8	1.3	1.3	1.5	1.0	1.3
Fruity	0.8	1.3	0.8	0.9	0.7	0.9
Spicy	1.2	1.7	2.0	2.2	2.2	2.1
Sweet	2.3	2.1	1.7	1.5	1.6	1.8
Green	1.4	1.6	1.6	1.8	1.7	1.6
Woody	1.2	1.6	1.9	2.1	1.9	2.0
Herbal	1.6	1.9	1.8	2.0	1.7	1.7
Cool Minty	1.7	1.8	2.0	2.0	2.0	2.1
Panel 3B (n=158 men)						
Floral	2.4	2.3	2.1	2.1	2.1	2.1
Citrusy	1.5	2.2	1.9	1.8	1.8	2.0
Fruity	1.9	2.2	1.9	1.8	1.8	1.9
Spicy	1.6	1.7	1.7	2.0	1.8	1.8
Sweet	2.5	2.7	2.2	2.1	2.5	2.4
Green	1.4	1.6	1.8	1.7	1.6	1.6
Woody	1.1	1.2	1.4	1.5	1.3	1.4
Herbal	1.7	1.8	1.7	1.8	1.7	1.7
Cool Minty	2.1	2.5	2.3	2.4	2.2	2.6
Random subset of Panel 3A (n=10 women)						
Floral	1.8	2.1	1.2	1.2	1.0	1.7
Citrusy	0.3	1.9	1.5	2.0	1.7	2.0
Fruity	0.8	1.1	0.8	0.8	0.6	1.6
Spicy	1.4	1.1	1.3	0.9	0.9	1.2
Sweet	1.7	1.9	1.3	1.5	0.9	2.2
Green	1.2	1.6	2.2	1.8	1.8	1.9
Woody	0.6	1.5	1.1	1.2	1.3	1.4
Herbal	1.1	1.5	1.7	2.0	1.2	1.5
Cool Minty	1.8	1.9	2.3	1.9	2.0	2.8
Random subset of Panel 3B (n=10 men)						
Floral	2.0	1.8	1.3	1.5	2.2	1.9
Citrusy	2.3	2.7	2.1	1.5	1.9	2.7
Fruity	2.1	2.1	2.1	1.0	1.6	1.9
Spicy	1.3	1.6	2.1	2.2	2.2	2.6
Sweet	2.4	2.3	1.5	1.2	1.7	1.8
Green	1.5	2.0	1.9	1.5	2.2	1.8
Woody	0.6	0.4	1.4	1.6	1.2	1.5
Herbal	1.6	2.0	1.5	1.8	2.1	1.7
Cool Minty	2.1	1.6	2.3	2.0	2.3	2.9

Note: Intensities are measured on a 5-point numerical scale with 1-point increments (0 = none, 5 = extremely strong) and all values are panel means averaged across panelists.

APPENDIX 6.

MEASURING ATTITUDES TOWARD FRAGRANCES:

RESULTS FROM A PRELIMINARY STUDY

Factor Analysis – Attitudes and beliefs

- A factor analysis was run on the attitudes and beliefs towards fragrances statements
- 34 variables were considered for factor analysis
- Method
  - Extraction method: Principal axis factoring
  - Rotation: varimax

Attitudes and Beliefs - Solution

- A five-factor solution was found that explain 46.2% of the total variability
  - Factor 1: Fragrances enhance mood and self-confidence explained 16.9% of the variability
  - Factor 2: Fragrances as a tool for social acceptability explained 10.5% of the variability
  - Factor 3: Fragrances as a tool for interpersonal attraction explained 7.7% of the variability
  - Factor 4: Fragrances as part of personal grooming explained 7.2% of the variability
  - Factor 5: Olfactory characteristics and fragrance awareness explained 4.0% of the variability

Factor 1: Fragrances enhance mood, and self-confidence.

	F1	F2	F3	F4	F5
The fragrance I wear enhances my personality	0.774	0.166	0.095	-0.040	0.256
When I wear a fragrance, I am in a better mood	0.762	0.025	0.164	0.067	0.084
Fragrances enhance my self-esteem	0.720	0.197	0.380	0.035	-0.053
When I wear a fragrance, I feel more confident about myself	0.674	0.040	0.423	0.087	0.028
Wearing a fragrance enhances my individuality	0.661	0.278	0.088	0.130	-0.040
I wear different fragrances depending on the season	0.649	0.177	-0.224	0.134	0.073
The fragrance I wear makes me feel good about myself	0.635	-0.288	-0.009	0.258	0.291
Wearing a fragrance makes me feel more attractive	0.594	0.049	0.582	0.037	-0.101
Wearing a fragrance makes me feel more feminine / masculine (as gender)	0.535	-0.115	0.260	0.172	0.014
I choose the fragrance I am going to wear based on my schedule and activities	0.522	0.203	-0.021	0.135	-0.115
My fragrance completes my outfit	0.455	0.208	0.181	0.337	0.089
I wear fragrances for my own satisfaction	0.378	-0.262	-0.318	0.259	0.124
I like to wear different fragrances when I am at home, at work or during an evening out	0.325	-0.044	0.000	0.160	0.021

Factor 2: Fragrances as a tool for social acceptability

	F1	F2	F3	F4	F5
I don't care much about how the fragrance smells as long as people around me like it	-0.082	0.721	0.210	-0.055	-0.069
I wear fragrance because it reflects my status	0.357	0.664	-0.018	0.023	0.102
I wear fragrance/ cologne because everybody else does	0.052	0.615	0.090	-0.051	0.013
I wear a fragrance because it is more socially acceptable	0.131	0.586	-0.040	-0.055	0.089
I wear fragrances to better fit in social settings	0.293	0.558	0.302	-0.046	-0.019
I wear my current fragrance / cologne because I received it as a gift	0.021	0.529	0.062	0.080	-0.259
Wearing a fragrance satisfies my need for fantasy	0.421	0.438	0.110	-0.135	0.121
I really pay attention to how the fragrance smells when selecting a fragrance	0.175	-0.411	-0.008	0.180	-0.122
When I wear a fragrance, it makes me feel more professional	0.293	0.377	0.368	0.190	0.022
Wearing a fragrance makes me feel more feminine / masculine (Contrary to gender)	0.028	0.297	-0.186	0.015	0.001

Factor 3: Fragrances as a tool for interpersonal attraction

	F1	F2	F3	F4	F5
I wear fragrance/ cologne because I want to appeal to the opposite sex	-0.023	0.172	0.721	-0.061	0.177
Wearing a fragrance makes me feel more attractive	**0.594**	**0.049**	**0.582**	**0.037**	**-0.101**
I like other people to notice my fragrance	0.217	0.026	0.538	0.293	0.248
I wear fragrances to please my spouse / significant other	0.091	0.083	0.449	0.085	-0.063
I don't like to wear fragrances that everybody notices	-0.098	0.214	-0.306	-0.051	-0.182

Factor 4: Fragrances as part of personal grooming

	F1	F2	F3	F4	F5
Wearing a fragrance is part of my daily routine	0.101	-0.017	-0.154	0.844	0.442
Wearing a fragrance makes me feel fresh and clean	0.221	0.052	0.265	0.688	-0.119
I wear fragrances because I like to smell good	0.259	-0.228	0.260	0.625	-0.146
I only wear fragrances on special occasions	-0.130	0.324	0.078	-0.474	-0.388

Factor 5: Olfactory characteristics and fragrance awareness

	F1	F2	F3	F4	F5
I don't care much about the fragrance I wear as long as it smells good	-0.157	-0.042	-0.054	-0.013	-0.486
Wearing a fragrance is part of my daily routine	0.101	-0.017	-0.154	0.844	0.442
I only wear fragrances on special occasions	-0.130	0.324	0.078	-0.474	-0.388
I usually receive a lot of compliments about my fragrance	0.354	-0.115	0.171	0.274	0.373
I prefer subtle fragrances	0.249	-0.135	-0.104	-0.023	-0.344

Factor Analysis – Fragrance choice

- A factor analysis was run on the questions about the importance of different factors for personal fragrance choice
- 22 variables were considered for factor analysis
- Method
  - Extraction method: Principal axis factoring
  - Rotation: varimax

Fragrance choice - Solution

- A five-factor solution was found that explain 50.1% of the total variability
  - Factor 1: Fragrance choice driven by external cues (brand, name, package…) explained 18.1% of the variability
  - Factor 2: Fragrance choice driven by interpersonal attractiveness explained 10.4% of the variability
  - Factor 3: Fragrance choice driven by olfactory characteristics and hedonic value explained 7.8% of the variability
  - Factor 4: Fragrance choice driven by cost explained 7.6% of the variability
  - Factor 5: Fragrance choice driven by personality fit explained 6.2% of the variability

Factor 1: Fragrance choice driven by external cues (brand, name, package…)

	F1	F2	F3	F4	F5
Importance of the brand name	0.801	0.254	-0.021	0.071	-0.115
Importance of the appearance of the fragrance	0.719	0.180	0.088	0.044	0.192
Importance of the name of the fragrance	0.692	0.263	0.025	0.086	0.073
Importance of advertising	0.669	0.135	0.007	0.180	0.191
Importance of the fact that celebrities wear it	0.611	0.160	0.032	0.075	0.090
Importance of the attractiveness of the packaging	0.565	0.232	0.103	0.191	0.099
Importance of your knowledge of the fragrance characteristics	0.484	-0.122	0.045	0.054	0.153
Importance of the accessories with which it is sold	0.450	0.288	0.110	0.219	0.086
Importance of the recommendations from a store-attendant	0.403	0.268	-0.051	0.282	0.020

Factor 2: Fragrance choice driven by interpersonal attractiveness

	F1	F2	F3	F4	F5
Importance that it is fashionable	***0.440***	***0.744***	***-0.047***	***0.020***	***0.160***
Importance of believing that other people will like it	0.139	0.685	-0.086	0.027	-0.060
Importance that your spouse / significant other likes it	0.090	0.590	-0.047	0.095	-0.023
Importance of the fragrance's sexiness	0.088	0.416	0.081	-0.132	0.399
Importance of a friend's recommendation	0.184	0.412	0.024	0.165	-0.019

Factor 3: Fragrance choice driven by olfactory characteristics and hedonic value

	F1	F2	F3	F4	F5
Importance of your liking of the fragrance	0.073	-0.003	0.871	-0.046	0.049
Importance of the fragrance smell	-0.004	-0.039	0.805	0.049	0.062
Importance of the lastingness of the scent	0.087	-0.046	0.427	-0.121	0.366

Factor 4: Fragrance choice driven by cost

	F1	F2	F3	F4	F5
Importance of the fact that it is on sale	0.230	0.146	-0.006	0.860	-0.061
Importance of the fragrance price	0.345	0.011	-0.088	0.779	-0.117

Factor 5: Fragrance choice driven by personality fit

	F1	F2	F3	F4	F5
Importance that it fits your personality	0.160	-0.212	0.191	-0.074	0.774
Importance of the occasions for which you will use the fragrance	0.334	0.149	-0.045	0.039	0.513

Note: “Importance of having worn the fragrance previously” has low loadings on all factors

Fragrance choice and attitudes and beliefs by consumer groups

By demographics segments – Frequency

	N	Frequency
Gender		
Male	42	37.5%
Female	70	62.5%
Age		
18-25 years old	32	28.6%
26-40 years old	33	29.5%
41-55 years old	47	42.0%
Usage		
2-4 times a week	48	42.9%
5 -7 times a week	57	50.9%
*More than once a day**	*7*	6.3%

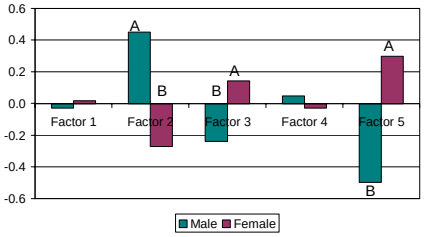
*** was excluded from the analysis of variance because of the small sample size**

Note: Age and gender are confounded

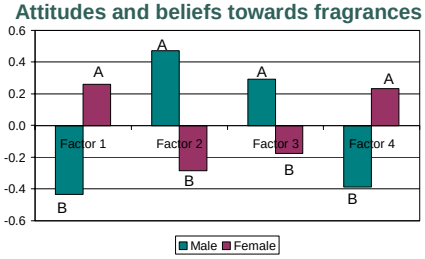
	Male	Female
18-25 years old	23	9
26-40 years old	8	25
41-55 years old	11	36

Gender influences fragrance choice and attitudes towards fragrances

Fragrance Choice



Attitudes and beliefs towards fragrances



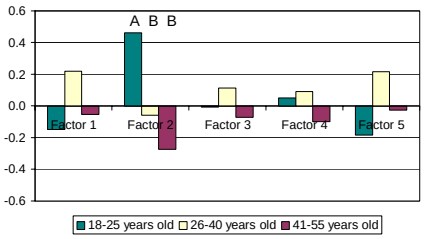
- Fragrance choice
  - For males, fragrance choice is more driven by interpersonal attractiveness i.e. by the belief that others will like their fragrance than for females.
  - Females, on the contrary, base their fragrance choice on their own liking of the fragrance and its olfactory characteristics
  - Additionally, females choice is more driven by their perception of the fragrance as fitting their own personality and as being sexy
- Attitudes and beliefs towards fragrances
  - Females believe more firmly than males that fragrances enhance mood, self-esteem and confidence and are a tool for interpersonal /sexual attraction than males
  - Males consider fragrances as part of personal grooming and as a tool for social acceptability. They more often receive fragrances as a gift than females.

Fragrance choice
Factor 1: driven by external cues
Factor 2: driven by interpersonal attractiveness
Factor 3: driven by olfactory characteristics and hedonic value
Factor 4: driven by cost
Factor 5: driven by personality fit and fragrance's sexiness

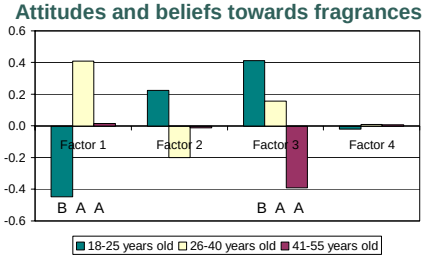
Attitudes and beliefs
Factor 1: Fragrances enhance mood and self-confidence
Factor 2: Fragrances as a gift and a tool for social acceptability
Factor 3: Fragrances as part of personal grooming
Factor 4: Fragrances as a tool for interpersonal/sexual attraction

Age: caution to the confounding effect of gender

Fragrance Choice



Attitudes and beliefs towards fragrances



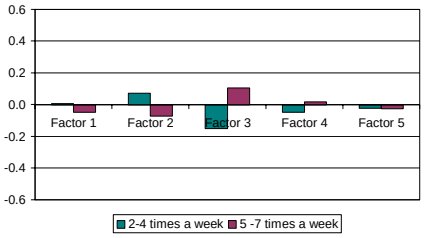
- For 18 to 25-year-olds,
  - fragrance choice is more driven by interpersonal attractiveness i.e. by the belief that others will like their fragrance than for the two older groups.
  - Additionally, 18-25-year old are less likely to believe that fragrances enhance their mood and consider fragrances as part of their personal grooming more than respondents in the two other groups.
- However, caution should be paid here to the fact that males were more represented than females in this age group. Therefore, there might be a confounding effect of gender and age in that category.

Fragrance choice
Factor 1: driven by external cues
Factor 2: driven by interpersonal attractiveness
Factor 3: driven by olfactory characteristics and hedonic value
Factor 4: driven by cost
Factor 5: driven by personality fit and fragrance's sexiness

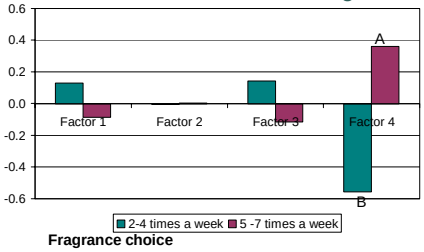
Attitudes and beliefs
Factor 1: Fragrances enhance mood and self-confidence
Factor 2: Fragrances as a gift and a tool for social acceptability
Factor 3: Fragrances as part of personal grooming
Factor 4: Fragrances as a tool for interpersonal/sexual attraction

Fragrance usage: marginal influence on attitudes towards fragrances

Fragrance Choice



Attitudes and beliefs towards fragrances



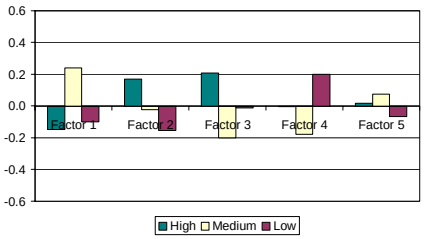
- Fragrance usage does not seem to play a large role in fragrance choice and attitudes and beliefs towards fragrances
- High fragrance users consider that fragrances are a tool for interpersonal / sexual attraction to a greater extent than medium users. This finding is enhanced by the fact that higher fragrance users (more than 7* per week), although not included in the analysis (n=7), score even higher than the high fragrance user on that factor with a score of F4 {>7times} = 0.86).

Fragrance choice
Factor 1: driven by external cues
Factor 2: driven by interpersonal attractiveness
Factor 3: driven by olfactory characteristics and hedonic value
Factor 4: driven by cost
Factor 5: driven by personality fit and fragrance's sexiness

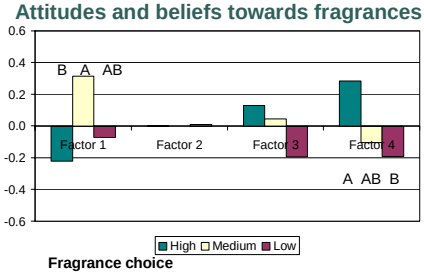
Attitudes and beliefs
Factor 1: Fragrances enhance mood and self-confidence
Factor 2: Fragrances as a gift and a tool for social acceptability
Factor 3: Fragrances as part of personal grooming
Factor 4: Fragrances as a tool for interpersonal/sexual attraction

Extraversion – trends in attitudes and beliefs

Fragrance Choice



Attitudes and beliefs towards fragrances



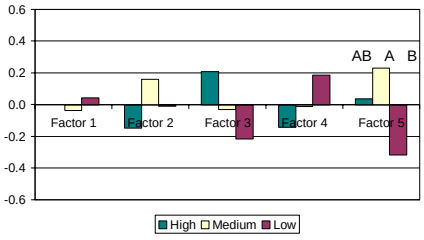
Fragrance choice
Factor 1: driven by external cues
Factor 2: driven by interpersonal attractiveness
Factor 3: driven by olfactory characteristics and hedonic value
Factor 4: driven by cost
Factor 5: driven by personality fit and fragrance's sexiness

- No significant difference was found in fragrance choice on the extraversion dimension of personality
- For attitudes and beliefs
  - High extraverts considered fragrances as a tool for interpersonal / sexual attraction more than high introverts
  - Medium extraverts considered fragrances as a mood and confidence enhancer to a greater extent than high extraverts

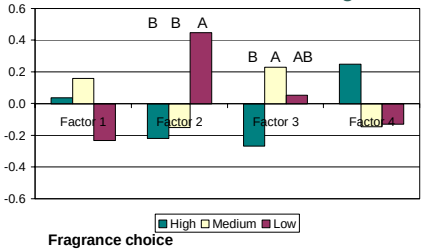
Attitudes and beliefs
Factor 1: Fragrances enhance mood and self-confidence
Factor 2: Fragrances as a gift and a tool for social acceptability
Factor 3: Fragrances as part of personal grooming
Factor 4: Fragrances as a tool for interpersonal/sexual attraction

Agreeableness

Fragrance Choice



Attitudes and beliefs towards fragrances



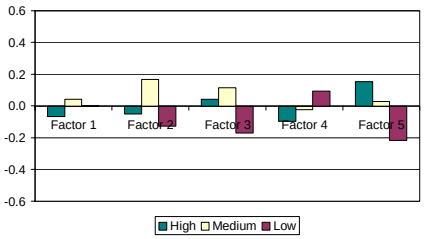
Fragrance choice
Factor 1: driven by external cues
Factor 2: driven by interpersonal attractiveness
Factor 3: driven by olfactory characteristics and hedonic value
Factor 4: driven by cost
Factor 5: driven by personality fit and fragrance's sexiness

- People with lower scores on agreeableness consider fragrances as a tool for social acceptability
- Respondents with medium scores for agreeableness gave
  - higher ratings for fragrance choice driven by personality fit and sexiness than respondents with low scores for agreeableness
  - higher ratings for fragrances as part of personal grooming than respondents with high scores for agreeableness

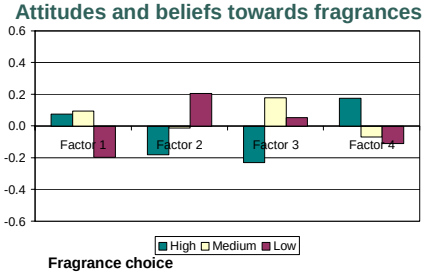
Attitudes and beliefs
Factor 1: Fragrances enhance mood and self-confidence
Factor 2: Fragrances as a gift and a tool for social acceptability
Factor 3: Fragrances as part of personal grooming
Factor 4: Fragrances as a tool for interpersonal/sexual attraction

Conscientiousness: not a player

Fragrance Choice



Attitudes and beliefs towards fragrances



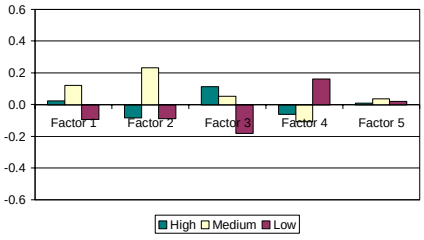
- No significant difference was found in fragrance choice nor in attitudes and beliefs towards fragrances on the conscientiousness dimension of personality

Fragrance choice
Factor 1: driven by external cues
Factor 2: driven by interpersonal attractiveness
Factor 3: driven by olfactory characteristics and hedonic value
Factor 4: driven by cost
Factor 5: driven by personality fit and fragrance's sexiness

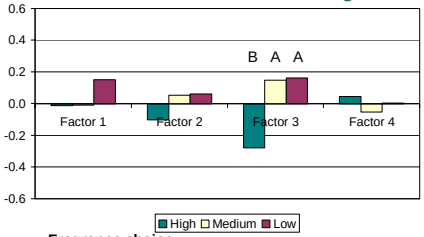
Attitudes and beliefs
Factor 1: Fragrances enhance mood and self-confidence
Factor 2: Fragrances as a gift and a tool for social acceptability
Factor 3: Fragrances as part of personal grooming
Factor 4: Fragrances as a tool for interpersonal/sexual attraction

Emotional Stability

Fragrance Choice



Attitudes and beliefs towards fragrances



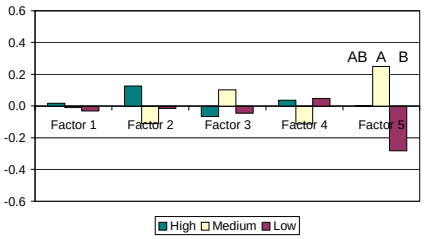
- No significant difference was found in fragrance choice on the emotional stability dimension of personality
- For attitudes and beliefs
  - Respondents with higher emotional stability consider fragrances as part of personal grooming to a greater extent than respondents with medium-low scores.

Fragrance choice
Factor 1: driven by external cues
Factor 2: driven by interpersonal attractiveness
Factor 3: driven by olfactory characteristics and hedonic value
Factor 4: driven by cost
Factor 5: driven by personality fit and fragrance's sexiness

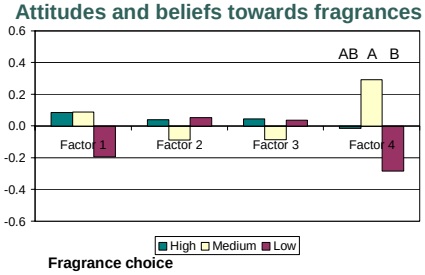
Attitudes and beliefs
Factor 1: Fragrances enhance mood and self-confidence
Factor 2: Fragrances as a gift and a tool for social acceptability
Factor 3: Fragrances as part of personal grooming
Factor 4: Fragrances as a tool for interpersonal/sexual attraction

Intellect / Openness to experience

Fragrance Choice



Attitudes and beliefs towards fragrances



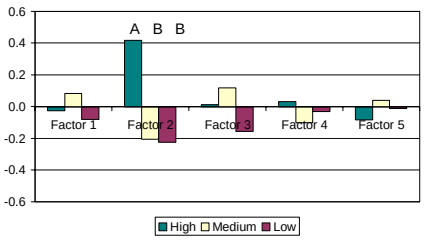
Fragrance choice
Factor 1: driven by external cues
Factor 2: driven by interpersonal attractiveness
Factor 3: driven by olfactory characteristics and hedonic value
Factor 4: driven by cost
Factor 5: driven by personality fit and fragrance's sexiness

- Compared to respondents with high intellect / openness to experience, respondents with medium intellect
  - Are more likely to choose their fragrance based on fragrance's sexiness and personality fit
  - Are more inclined to believe that fragrances are a tool for interpersonal / sexual attraction

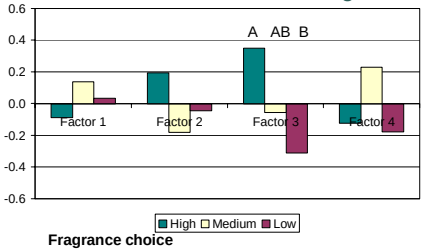
Attitudes and beliefs
Factor 1: Fragrances enhance mood and self-confidence
Factor 2: Fragrances as a gift and a tool for social acceptability
Factor 3: Fragrances as part of personal grooming
Factor 4: Fragrances as a tool for interpersonal/sexual attraction

Self-monitoring – Social chameleons motivated by interpersonal attractiveness

Fragrance Choice



Attitudes and beliefs towards fragrances



Fragrance choice
Factor 1: driven by external cues
Factor 2: driven by interpersonal attractiveness
Factor 3: driven by olfactory characteristics and hedonic value
Factor 4: driven by cost
Factor 5: driven by personality fit and fragrance's sexiness

- While choosing a fragrance, high self-monitors are more highly motivated by interpersonal attractiveness than medium and low self-monitors.
- Low self-monitors are less inclined to consider fragrances as part of personal grooming than high self-monitors

Attitudes and beliefs
Factor 1: Fragrances enhance mood and self-confidence
Factor 2: Fragrances as a gift and a tool for social acceptability
Factor 3: Fragrances as part of personal grooming
Factor 4: Fragrances as a tool for interpersonal/sexual attraction

APPENDIX 7.

ANALYSIS OF VARIANCE TABLES FOR ASSESSING DIFFERENCES AMONG FRAGRANCES FOR SENSORY PROPERTIES, SITUATION FIT, IMAGE AND PERSONALITY ASSOCIATIONS FOR THE TOTAL RESPONDENT BASE

TABLE 1.
Consumer scores[1,2] for sensory properties

Sample	Floral	Sweet	Fruity	Citrus	Spicy	Woody	Green	Herbal	Cool-mint
517	2.03	2.38	1.69	1.72	1.71	1.40	1.61	1.86	2.14
237	1.55	2.03	1.24	1.41	1.97	1.62	1.64	1.70	2.10
947	1.70	2.07	1.39	1.61	1.92	1.71	1.61	1.68	2.34
122	2.15	2.40	1.61	1.82	1.37	1.11	1.54	1.78	2.00
621	3.07	3.54	3.65	3.05	0.94	0.66	1.72	1.95	1.76
211	3.08	3.29	3.02	2.77	1.09	0.77	1.72	1.87	1.75
638	1.69	1.97	1.35	1.57	1.82	1.61	1.68	1.78	2.17
513	1.90	2.25	1.51	1.59	1.91	1.66	1.66	1.78	1.98
359	2.31	2.53	1.73	1.73	1.67	1.36	1.68	1.91	1.76
759	2.15	2.37	1.33	1.14	1.40	1.15	1.38	1.66	1.89
715	2.26	2.73	1.49	1.25	1.48	1.27	1.32	1.63	1.62
814	1.53	1.80	1.35	1.70	2.09	1.84	1.71	1.93	2.21
861	2.44	2.83	2.83	3.08	1.09	0.88	1.73	2.02	1.64
549	2.96	2.71	2.22	2.58	1.26	1.22	1.94	2.18	1.86
316	3.19	2.46	1.50	1.49	1.27	0.92	1.37	1.70	1.67
420	2.69	2.48	1.32	0.86	0.91	0.77	1.10	1.26	1.52
492	2.24	2.31	1.15	1.04	1.62	1.44	1.26	1.49	1.62
219	1.79	3.21	4.21	4.60	1.02	0.57	1.45	1.64	1.63
196	3.34	3.12	3.03	2.45	1.02	1.16	2.32	2.34	1.42
318	2.91	2.13	1.22	1.14	1.11	1.25	1.70	2.04	1.52
910	2.07	2.17	2.14	2.43	1.30	1.15	1.89	1.98	1.92
412	1.75	1.96	2.12	2.51	1.61	1.69	1.76	2.19	1.73
p-value	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**
LSD[3]	**0.24**	**0.23**	**0.22**	**0.23**	**0.20**	**0.21**	**0.20**	**0.21**	**0.21**
Range	**1.81**	**1.74**	**3.06**	**3.74**	**1.18**	**1.27**	**1.22**	**1.08**	**0.92**

[1] Means are reported on a 5-point scale (5 = extremely; 0 = not at all).
[2] Different letters within a column indicate mean values that are significantly different at $p<0.05$.
[3] LSD: stands for Least Significant Difference (evaluated for alpha = 0.5).

TABLE 2.
Consumer scores[1,2] for situation fit

Sample	Weekend @ home	Evening @ home	Everyday @ work	Exciting evening out	Spring	Summer	Fall	Winter
517	3.17	3.19	3.55	3.60	3.70	3.47	3.66	3.50
237	3.14	3.18	3.41	3.79	3.59	3.44	3.80	3.69
947	3.07	3.12	3.36	3.53	3.46	3.26	3.70	3.61
122	3.24	3.23	3.31	2.97	3.53	3.43	3.40	3.27
621	3.51	3.39	3.33	3.14	3.94	3.86	3.11	2.90
211	3.46	3.37	3.35	3.08	3.94	3.79	3.10	2.97
638	3.10	3.11	3.32	3.59	3.54	3.40	3.75	3.71
513	3.12	3.15	3.37	3.40	3.52	3.40	3.61	3.54
359	3.07	3.04	3.11	3.05	3.38	3.21	3.41	3.28
759	3.39	3.19	3.28	3.06	3.50	3.32	3.43	3.27
715	3.30	3.23	3.24	2.96	3.48	3.27	3.47	3.35
814	2.94	2.99	3.05	3.17	3.24	3.05	3.52	3.50
861	3.09	2.97	2.97	2.39	3.47	3.39	2.87	2.70
549	3.13	2.99	3.10	2.68	3.51	3.40	3.03	2.88
316	3.08	3.08	3.14	2.93	3.42	3.29	3.30	3.22
420	3.35	3.32	2.96	2.39	3.40	3.31	3.13	3.11
492	2.95	2.92	2.91	2.69	2.97	2.88	3.20	3.22
219	2.81	2.65	2.45	2.15	3.57	3.55	2.40	2.24
196	2.89	2.74	2.35	2.08	3.28	3.19	2.44	2.29
318	2.75	2.61	2.50	2.17	3.01	2.85	2.75	2.66
910	2.73	2.62	2.49	2.30	3.10	3.00	2.75	2.72
412	2.58	2.46	2.26	1.93	2.70	2.63	2.65	2.50
p-value	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**
LSD[3]	**0.18**	**0.19**	**0.19**	**0.21**	**0.18**	**0.19**	**0.18**	**0.19**
Range	**0.93**	**0.93**	**1.29**	**1.86**	**1.24**	**1.23**	**1.40**	**1.47**

[1] Means are reported on a 5-point scale (5 = agree strongly; 3 = neither agree nor disagree; 1 = disagree strongly).
[2] Different letters within a column indicate mean values that are significantly different at $p<0.05$.
[3] LSD: stands for Least Significant Difference (evaluated for alpha = 0.5).

TABLE 3.
Consumer scores[1,2] for image associated with fragrances

Sample	Feminine	Masculine	Warm	Fresh	Natural	Classic	Modern
517	2.49	2.65	2.55	3.49	2.88	3.08	3.43
237	1.90	3.29	2.62	3.28	2.64	3.11	3.38
947	2.02	3.14	2.38	3.21	2.4	2.86	3.29
122	2.89	1.96	2.30	3.36	2.67	2.65	2.79
621	4.11	0.87	2.43	3.83	3.06	2.25	3.08
211	3.85	0.95	2.40	3.74	2.89	2.27	3.01
638	1.97	3.13	2.47	3.29	2.59	3.01	3.31
513	2.48	2.57	2.56	3.33	2.53	2.90	3.22
359	2.92	1.98	2.30	3.04	2.59	2.71	2.88
759	3.04	1.96	2.64	3.41	2.71	2.83	2.95
715	3.38	1.51	2.81	3.21	2.66	2.78	2.87
814	2.00	2.98	2.33	2.92	2.53	2.68	2.94
861	3.42	1.10	1.99	3.16	2.56	1.91	2.44
549	3.54	1.28	2.24	3.37	2.78	2.32	2.71
316	3.81	0.95	2.28	3.30	2.56	2.77	2.73
420	3.77	0.90	2.62	3.57	2.73	2.71	2.32
492	2.93	1.77	2.50	2.86	2.31	2.63	2.41
219	3.34	0.95	1.85	3.48	3.00	1.78	2.33
196	3.37	0.79	1.86	3.12	2.70	1.58	2.20
318	3.16	1.27	2.00	2.93	2.35	2.17	2.09
910	2.55	1.58	1.74	2.97	2.27	1.73	2.38
412	2.37	1.65	1.73	2.47	2.23	1.64	2.06
p-value	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**
LSD[3]	**0.25**	**0.24**	**0.20**	**0.21**	**0.21**	**0.21**	**0.20**
Range	**2.21**	**2.50**	**1.08**	**1.36**	**0.83**	**1.53**	**1.37**

[1] Means are reported on a 5-point scale (5 = extremely; 0 = not at all).
[2] Different letters within a column indicate mean values that are significantly different at $p<0.05$.
[3] LSD: stands for Least Significant Difference (evaluated for alpha = 0.5).

TABLE 3.
Consumer scores[1,2] for image associated with fragrances (cont.)

Sample	Sensual	Romantic	Energizing	Relaxing	Empowering	Fashionable	Memorable
517	3.08	3.08	3.27	2.82	3.05	3.49	3.39
237	3.11	3.13	3.26	2.71	3.12	3.52	3.48
947	2.95	2.94	3.25	2.59	3.12	3.3	3.24
122	2.69	2.64	2.70	2.85	2.31	2.92	2.72
621	2.82	2.84	3.24	3.14	2.64	3.25	3.14
211	2.83	2.80	3.17	2.88	2.62	3.15	3.04
638	2.95	2.93	3.25	2.68	3.07	3.38	3.26
513	2.96	2.93	3.02	2.65	2.93	3.26	3.22
359	2.63	2.58	2.70	2.50	2.68	2.89	2.90
759	2.77	2.78	2.65	2.94	2.38	3.04	3.04
715	2.74	2.74	2.58	2.85	2.38	3.03	2.91
814	2.60	2.56	2.85	2.38	2.72	2.95	3.00
861	2.03	2.00	2.55	2.40	2.11	2.43	2.30
549	2.44	2.44	2.81	2.61	2.36	2.74	2.67
316	2.62	2.77	2.69	2.54	2.56	2.91	3.00
420	2.35	2.34	2.29	3.05	2.12	2.37	2.80
492	2.20	2.25	2.33	2.47	2.40	2.50	2.82
219	1.53	1.41	3.03	2.30	2.37	2.22	2.84
196	1.75	1.70	2.39	2.23	2.35	2.07	2.76
318	1.80	1.80	2.12	2.13	2.16	2.05	2.46
910	1.78	1.69	2.40	2.08	2.33	2.01	2.36
412	1.36	1.35	2.04	1.89	2.08	1.84	2.15
p-value	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**
LSD[3]	**0.21**	**0.22**	**0.20**	**0.21**	**0.21**	**0.20**	**0.20**
Range	**1.75**	**1.78**	**1.23**	**1.25**	**1.04**	**1.68**	**1.33**

[1] Means are reported on a 5-point scale (5 = agree strongly; 3 = neither agree nor disagree; 1 = disagree strongly).
[2] Different letters within a column indicate mean values that are significantly different at $p<0.05$.
[3] LSD: stands for Least Significant Difference (evaluated for alpha = 0.5).

TABLE 4.
Consumer scores[1,2] for personality associations

Sample	Talkative Extraverted	Shy Reserved	Relaxed	Anxious Tense	Moody Irritable	Sympathetic Warm	Cold Rude
517	3.27	2.32	3.26	2.12	2.07	3.16	1.89
237	3.41	2.17	3.16	2.14	2.07	3.06	1.92
947	3.27	2.22	3.09	2.30	2.09	2.99	1.99
122	3.06	2.59	3.37	2.10	2.02	3.27	1.93
621	3.26	2.51	3.36	1.88	1.83	3.43	1.69
211	3.23	2.50	3.39	2.01	1.90	3.38	1.81
638	3.37	2.19	3.11	2.21	2.04	3.10	1.99
513	3.19	2.36	3.20	2.20	2.12	3.22	1.98
359	3.01	2.45	3.10	2.24	2.18	3.07	2.04
759	2.95	2.56	3.34	2.06	2.01	3.29	1.89
715	2.94	2.62	3.40	2.07	2.01	3.38	1.87
814	3.14	2.32	3.07	2.35	2.30	2.95	2.18
861	2.89	2.62	3.12	2.21	2.07	3.18	2.04
549	3.01	2.59	3.17	2.16	2.12	3.16	1.98
316	3.14	2.53	3.23	2.22	2.10	3.28	1.97
420	2.73	2.96	3.58	1.93	1.93	3.56	1.73
492	2.77	2.44	3.09	2.37	2.32	3.01	2.24
219	3.14	2.36	2.97	2.34	2.06	2.98	1.99
196	2.87	2.61	2.98	2.38	2.17	3.08	2.09
318	2.70	2.54	2.97	2.49	2.33	2.90	2.31
910	2.84	2.51	2.85	2.47	2.36	2.80	2.29
412	2.75	2.55	2.77	2.68	2.56	2.70	2.45
p-value	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**
LSD[3]	**0.16**	**0.16**	**0.16**	**0.17**	**0.15**	**0.15**	**0.15**
Range	**0.71**	**0.79**	**0.81**	**0.80**	**0.73**	**0.86**	**0.76**

[1] Means are reported on a 5-point scale (5 = agree strongly; 3 = neither agree nor disagree; 1 = disagree strongly).
[2] Different letters within a column indicate mean values that are significantly different at $p<0.05$.
[3] LSD: stands for Least Significant Difference (evaluated for alpha = 0.5).

TABLE 4.
Consumer scores[1,2] for personality associations (cont.)

Sample	Conscientious Organized	Disorganized Careless	Attractive Appealing	Sensual Sexy	Confident Assured	Quiet Calm	Energetic Active
517	3.43	1.86	3.76	3.47	3.72	2.85	3.63
237	3.46	1.93	3.76	3.50	3.85	2.75	3.64
947	3.30	1.98	3.66	3.33	3.68	2.67	3.58
122	3.36	1.99	3.44	3.14	3.49	3.02	3.24
621	3.33	1.96	3.63	3.25	3.57	2.91	3.66
211	3.41	1.89	3.62	3.25	3.51	2.96	3.56
638	3.43	1.94	3.68	3.35	3.78	2.74	3.72
513	3.36	1.94	3.57	3.32	3.62	2.91	3.50
359	3.28	2.03	3.39	3.11	3.39	2.79	3.33
759	3.39	1.92	3.39	3.13	3.46	3.14	3.22
715	3.38	1.98	3.42	3.18	3.43	3.18	3.21
814	3.30	2.09	3.35	3.13	3.54	2.86	3.40
861	3.07	2.09	3.02	2.66	3.10	2.92	3.20
549	3.23	2.07	3.25	2.96	3.25	3.00	3.32
316	3.32	1.96	3.30	3.11	3.39	2.98	3.27
420	3.34	2.06	3.11	2.81	3.06	3.53	2.96
492	3.21	2.15	3.09	2.83	3.25	2.98	2.95
219	3.03	2.17	2.95	2.43	3.05	2.67	3.49
196	2.88	2.33	2.75	2.52	2.96	2.79	3.09
318	3.06	2.24	2.70	2.46	2.94	2.89	2.92
910	2.92	2.16	2.73	2.51	3.02	2.71	3.17
412	2.84	2.43	2.57	2.24	2.81	2.81	2.83
p-value	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**
LSD[3]	**0.14**	**0.15**	**0.17**	**0.18**	**0.15**	**0.16**	**0.16**
Range	**0.62**	**0.57**	**1.19**	**1.26**	**1.04**	**0.86**	**0.89**

[1] Means are reported on a 5-point scale (5 = agree strongly; 3 = neither agree nor disagree; 1 = disagree strongly).
[2] Different letters within a column indicate mean values that are significantly different at $p<0.05$.
[3] LSD: stands for Least Significant Difference (evaluated for alpha = 0.5).

TABLE 4.
Consumer scores[1,2] for personality associations (cont.)

Sample	Creative Complex	Uncreative Unintellectual	Feminine	Masculine	Rough Tough	Folksy Down-to-earth
517	3.41	1.85	2.81	3.04	2.54	2.80
237	3.34	1.90	2.37	3.56	2.87	2.72
947	3.22	2.01	2.43	3.38	2.78	2.70
122	3.17	2.03	3.14	2.49	2.11	2.79
621	3.42	1.87	4.19	1.56	1.56	3.04
211	3.38	1.85	4.04	1.61	1.68	3.08
638	3.33	1.89	2.39	3.46	2.75	2.74
513	3.37	1.96	2.84	3.02	2.55	2.84
359	3.16	1.97	3.24	2.43	2.15	2.87
759	3.18	1.99	3.35	2.43	2.06	2.94
715	3.25	1.90	3.63	2.14	1.94	3.02
814	3.15	2.03	2.45	3.29	2.78	2.80
861	3.08	2.10	3.67	1.79	1.79	2.96
549	3.19	2.02	3.72	1.92	1.90	2.93
316	3.16	1.98	4.05	1.62	1.72	2.82
420	3.06	2.13	3.98	1.61	1.56	3.26
492	2.91	2.07	3.18	2.38	2.26	2.89
219	3.08	2.11	3.62	1.58	1.78	2.92
196	3.01	2.23	3.71	1.54	1.83	2.97
318	2.84	2.24	3.46	1.86	1.98	2.85
910	2.87	2.25	3.01	2.13	2.21	2.78
412	2.77	2.27	2.81	2.38	2.29	2.84
p-value	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**
LSD[3]	**0.15**	**0.15**	**0.22**	**0.21**	**0.18**	**0.17**
Range	**0.65**	**0.42**	**1.82**	**2.02**	**1.31**	**0.56**

[1] Means are reported on a 5-point scale (5 = agree strongly; 3 = neither agree nor disagree; 1 = disagree strongly).
[2] Different letters within a column indicate mean values that are significantly different at $p<0.05$.
[3] LSD: stands for Least Significant Difference (evaluated for alpha = 0.5).

APPENDIX 8.

ANALYSIS OF VARIANCE TABLES ASSESSING THE EFFECT OF CLUSTER OF LIKING, FRAGRANCE AND ORDER ON CONSUMER EVALUATION OF FRAGRANCES

TABLE 1.
Significance (reported as a p-value) of the effect of Cluster, Sample, Cluster*Sample, Order and Sample*Order on the consumer evaluation of sensory variables

	Floral	**Sweet**	**Fruity**	**Citrus**	**Spicy**	**Woody**	**Green**	**Herbal**	**Cool-mint**
Cluster	0.488	0.104	0.120	0.262	0.749	0.775	0.613	0.677	0.766
Sample	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**
Cluster*Sample	0.955	0.340	**0.014**	0.788	0.214	**0.001**	**0.002**	0.082	**0.004**
Order	0.190	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**
Sample*Order	0.208	**0.022**	**<.001**	**0.013**	0.089	**0.042**	0.973	0.879	**0.001**

TABLE 2.
Significance (reported as a p-value) of the effect of Cluster, Sample, Cluster*Sample, Order and Sample*Order on the consumer evaluation of image variables

	Warm	**Fresh**	**Natural**	**Feminine**	**Masculine**	**Classic**	**Modern**
Cluster	0.243	**0.028**	0.065	0.451	0.951	0.080	**0.014**
Sample	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**
Cluster*Sample	**<.001**	**<.001**	**<.001**	0.265	0.270	**<.001**	**<.001**
Order	**0.001**	**0.044**	0.135	**0.007**	**<.001**	**<.001**	**0.012**
Sample*Order	0.850	0.062	0.852	0.219	**0.021**	0.192	0.359

	Energizing	**Relaxing**	**Empowering**	**Sensual**	**Romantic**	**Fashionable**	**Memorable**
Cluster	0.060	**0.009**	0.112	**0.003**	**0.001**	**0.001**	**0.005**
Sample	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**
Cluster*Sample	**<.001**	**<.001**	**0.015**	**<.001**	**<.001**	**<.001**	**<.001**
Order	**<.001**	**0.001**	**<.001**	0.319	0.838	0.187	**<.001**
Sample*Order	**0.001**	**0.027**	0.060	**0.015**	0.237	0.072	0.656

TABLE 3.
Significance (reported as a p-value) of the effect of Cluster, Sample, Cluster*Sample, Order and Sample*Order on the consumer evaluation of personality variables

	Feminine	Masculine	Folksy Down-to-earth	Quiet Calm	Rough Tough	Shy Reserved	Talkative Extraverted
Cluster	0.725	0.956	0.595	0.103	0.997	0.730	0.287
Sample	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**
Cluster*Sample	0.380	0.572	0.440	0.125	0.447	0.188	**0.046**
Order	**0.006**	**0.008**	**<.001**	**<.001**	**<.001**	0.159	0.990
Sample*Order	**0.007**	**0.010**	0.112	0.391	**0.009**	0.531	0.584

	Anxious Tense	Sympathetic Warm	Cold Rude	Conscientious Organized	Disorganized Careless	Creative Complex	Uncreative Unintellectual
Cluster	0.669	0.181	0.146	0.150	0.763	**0.036**	0.509
Sample	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**
Cluster*Sample	**<.001**	**<.001**	**<.001**	**0.006**	**0.001**	**0.039**	0.002
Order	**<.001**	**<.0001**	**<.001**	0.289	**0.028**	0.102	0.782
Sample*Order	0.480	0.927	0.447	0.301	0.465	**0.003**	0.751

	Attractive Appealing	Confident Assured	Sensual Sexy	Energetic Active	Relaxed	Moody Irritable
Cluster	**<.001**	**0.010**	**0.005**	0.053	**0.014**	0.142
Sample	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**
Cluster*Sample	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**0.001**
Order	**0.039**	0.380	0.180	0.673	**<.001**	**<.001**
Sample*Order	**0.021**	**0.017**	0.276	0.143	0.419	0.159

TABLE 4.
Significance (reported as a p-value) of the effect of Cluster, Sample, Cluster*Sample, Order and Sample*Order on the consumer evaluation of situation variables

	On a week-end at home	On a quiet evening at home	Everyday at work	On an exciting evening out	In the Spring	In the Summer	In the Fall	In the Winter
Cluster	0.115	0.166	**0.007**	**0.029**	**0.002**	**0.024**	**0.007**	**0.049**
Sample	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**
Cluster*Sample	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**	**0.001**
Order	0.125	0.085	0.072	0.891	**0.003**	**0.007**	0.184	**0.034**
Sample*Order	0.104	0.080	0.532	0.174	**0.005**	0.133	**0.009**	**0.014**