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Impact of ambient odors on mall shoppers' emotions, cognition, and spending
A test of competitive causal theories

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Abstract

The authors tested the effect of ambient scents in a shopping mall environment. Two competing models were used. The first model is derived from the environmental psychology research stream by Mehrabian and Russel (1974) and Donovan and Rossiter (1982) where atmospheric cues generate pleasure and arousal, and, in turn, an approach/avoidance behavior. The emotion–cognition model is supported by Zajonc and Markus (1984). The second model to be tested is based on Lazarus' (1991) cognitive theory of emotions. In this latter model, shoppers' perceptions of the retail environment and product quality mediate the effects of ambient scent cues on emotions and spending behaviors. Positive affect is enhanced from shoppers' evaluations. Using structural equation modeling the authors conclude that the cognitive theory of emotions better explains the effect of ambient scent. Managerial implications are discussed.

Keywords: Store atmospherics; Scent; Emotion; Cognition; Expenses

1. The ambient fragrance industry

1.1. From air fresheners to aromatherapy, to environment conditioning

Until recently, the fragrance industry was described as an "embryonic industry" (Anonymous, 1998). Originally, it was limited to air fresheners designed to remove unpleasant odors. Today, the home fragrance market is claiming relaxation and revitalization benefits. Over the years, the Fragrance Foundation says the industry has grown into a billion dollar business (Dunn, 1997). More and more products are scented, from sanitizing agents and toilet paper to toothpick and toothbrushes (Hunter, 1995). Coty introduced its Healing Garden aromatherapy lines while Shiseido launched its Relaxing fragrance (Butcher, 1998a).

Drug and Cosmetic Industry, a trade publication, reports that the fragrance industry is also moving into the conditioning of indoor environments using aroma technology. Natural and chemical substances are released into the ambient environment to improve feelings of well-being and even increase human performance. Environmental conditioning systems are now found in homes, hotels, resorts, healthcare institutions, and retail stores. Aroma diffusion systems have been developed for the Mirage, Treasure Island, Monte Carlo and Bally's Resort Hotels in Las Vegas, The Biscayne Bay Marriott and Marriott Airport Hotels in Miami. At Walt Disney World in Florida, the Magic House at Epcot Center includes a room with the fresh-baked smell of chocolate chip cookies to induce feelings of relaxation and comfort (Butcher, 1998a,b). Some in-house bakeries have been releasing synthetic scents to increase sales of bakery products. Dunkin' Donut recognized the importance of fresh coffee smell in attracting customers. Other companies such as Starbucks coffee chains and Mrs. Field Cookies have followed suit (Hunter 1995).

1.2. Myth or reality?

How effective are the aromatherapy and environment conditioning fragrances? It has been said that aromas from lavender, basil, cinnamon and citrus flavor aid relax, whereas peppermint, thyme and rosemary invigorate. Gin-

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ger, cardamom, licorice and chocolate are supposed to arouse a sense of romance, while rose combat depression (Hunter, 1995; Amodio, 1998). For some industry representatives, the scientific evidence of aromatherapy may be less important than the ritualistic exercise based on feelings rather than science (Butcher, 1998a,b). If the consumer buys the concept of aromatherapy, he may get the effect he wants regardless of what's in the bottle. Much of the benefit of aromatherapy may be people's faith that it evokes (Amodio, 1998). In the scientific literature, faith is replaced by the placebo effect. Knasko et al. (1990) have shown that some people are emotionally and physically affected by the imaginary presence of an odor.

The fragrance industry believes that the effect of scent on humans is more than just folklore. It founded the Olfactory Research Fund, "a nonprofit charitable organization dedicated to the study of the sense of smell and the positive effects of odor on human behavior" (www.olfactory.org). The ORF financed at least partially several scientific university research projects on the fundamentals of odor perceptions; fragrance and psychology; olfactory conditioning; scent and social behavior; and mood. The Olfactory Research Fund developed and "service marked" the concept of aromachology. The latter is said to be to aromatherapy what astronomy is to astrology.

While there is a significant body of scientific research on the effects of odors on human physiology and psychology, the research corpus on the effect of ambient scent on consumer behavior is much more limited (Morrin and Ratneshwar, 2000; Spangenberg et al., 1996; Gulas and Bloch, 1995; Bone and Scholder, 1994). Retailers and service organizations have not waited for consumer behavior research before going ahead with environment conditioning. One is reminded of Paul Dukas' *Sorcerer's Apprentice*. The use of ambient scent in the retail environment can be beneficial if congruent with the shopping environment. However, the same fragrance can become totally inefficient, or worst, have negative effects if used inappropriately. If ambient scents are to be included in the retail marketing toolbox, researchers and managers alike should try to understand how they work on consumers. This paper is one step into that direction.

2. Ambient scent and marketing

2.1. The processing of store atmospheric cues

In the marketing literature, odors have been mentioned in passing among the many retail/service atmospherics (Kotler, 1973; Bitner, 1992, Baker et al., 1992, 1994). Some marketing scholars have studied the effect of premises clutter and cleanliness on consumers (Bitner, 1990; Garder and Siomkos, 1985), the effect of music (e.g., Yalch and Spangenberg, 1990; Dubé et al., 1995), the effect of colors (Bellizzi et al., 1983; Crowley, 1993), the effect of lighting (Golden and Zimmerman, 1986), the effect of crowding (Eroglu and Machleit, 1990; Hui and Bateson, 1991; Eroglu and Harrel, 1986) and the effect of ambient odor (Spangenberg et al., 1996).

Store atmospherics are a subset of the more general research stream on the physical environment in service businesses (Baker, 1986; Bitner, 1986; Booms and Bitner, 1982). For an extensive and recent literature review, see Turley and Milliman (2000). The retail environment has been found to influence both shoppers and personnel's behavior, and to increase sales (Milliman 1982, 1986; Smith and Curnow, 1966; Stanley and Sewall 1976). Retail atmospherics can mediate product evaluation (Bitner 1986; Rappoport 1982; Wheatly and Chiu 1977) and customer satisfaction (Bitner 1990; Harrell et al., 1980). Attitudes toward the store environment may be shown to be more important in determining store choice than are attitudes toward the merchandise (Darden et al., 1983).

2.2. The pleasure/arousal research tradition: the mediating effect of mood on cognition and behavior

Most marketing scholars studying retail atmospherics followed Mehrabian and Russell's pleasure/arousal research tradition in which mood is a mediating factor between environmental cues and behavior. Mehrabian and Russel (1974) examined ambient (lighting and music) and social cues (number and friendliness of employees) on respondents' pleasure and arousal, and willingness to buy. Environmental psychologists propose that individuals react to their environment with two contrasting forms of behavior: approach and avoidance (Mehrabian and Russel, 1974), where approach is a desire to stay, explore and affiliate, and avoidance is the opposite. Much of the research on store atmospherics has presumed a mediating effect of mood on consumers' cognition and behavior. Obermiller and Bitner (1984) showed that respondents who viewed retail products in an emotionally pleasing environment evaluated products more positively than subjects who viewed the same products in an unpleasant environment.

Hui and Bateson (1991) found that in a crowded environment, enhanced perceptions of personal control were related to increased pleasure. Negative affect associated with crowding increases consumers' desire to leave (Eroglu and Machleit, 1990). Positive affect encourages shoppers to stay longer and interact with other employees (Babin and Darden, 1995; Dawson et al., 1990; Donovan and Rossiter, 1982; Hui and Bateson, 1991). Positive affect simplifies consumers' decision-making style (Babin et al., 1992), builds a positive store image (Darden and Babin, 1994) and improves merchandise and service quality perceptions (Baker et al., 1994). Positive affect induced by background music stimulates the desire to affiliate (Dubé et al., 1995). Although a number of studies focus on store atmospherics, the process through which cues are channeled remains unclear.

2.3. Olfactory cues follow a different path

Yet, the emotional route does not always emerge clearly. Spangenberg et al. (1996) who studied how ambient scent influenced store and product evaluations found no main or interactive effects regarding scent on mood. Researching the impact of ambient scent on evaluation and memory for familiar and unfamiliar brands, Morrin and Ratneshwar (2000) concluded that ambient odors did not affect subjects' mood or arousal levels. This suggests that olfactory cues may be processed through an alternate cognitive path. Consumers commonly look for cues about the firm's capabilities and quality (Berry and Clark, 1986; Shostack, 1977). These cues are found in the immediate physical firm's environment (Rappoport, 1982).

3. Effects of odors on mood and cognition

3.1. Pleasant or unpleasant odors

Odors appear difficult to identify. They are thus significantly different from visual and audio cues. (Schab, 1991). Consumers must depend on neighboring cues to identify odors (Davis, 1981): for example, individuals are more likely to recognize a lemon-scented product if presented in a yellow container (Ellen and Bone 1998). Odors are primarily perceived in terms of their pleasantness or unpleasantness (Ehrlichman and Halpern, 1988; Buck and Axel, 1991). The affective dimension is commonly found in odor perceptions (Engen, 1982; Moskowitz, 1979; Schiffman, 1979). One possible reason for this is that odors enter the limbic system, i.e., that part of the brain at the center of emotions (Spangenberg et al., 1996).

3.2. Arousing odors

Odors also have the capacity to induce arousal. Lorig and Schwartz (1988) mention that the effects of odors are observed by electroencephalographs (EEG). In the case of odors, the relationship between arousal and pleasantness is not linear: as odors get more intense, reactions tend to become more negative (Richardson and Zucco, 1989). Even if they have not been tested for odors, olfactory stimuli should follow an inverted U-shape function (Spangenberg et al., 1996). However, the affective response to odors should not obliterate the arguments in favor of the cognitive effects of odors (Gulas and Bloch, 1995).

3.3. Effects of odors on cognitive processing

The link between odors and cognition dates back to 1932, when Laird investigated how scented hosiery influenced women's perceptions of quality. Scents that are congruent with specific product actually improved product evaluation (Bone and Jantrania, 1992). Mitchell et al. (1995) conducted an experiment in computer-aided product selection in scented rooms. Product congruent odors influenced information processing. Spangenberg et al. (1996) tested if an ambient, nonoffensive scent affects store and product evaluations.

Odors are often associated with objects, events and persons. They stir up happy or sad memories. Perhaps, the most famous example comes from French novelist Marcel Proust's *Remembrance of Things Past*. In this monumental work, sensory cues arouse pleasant or melancholic feelings by retrieving deeply entrenched, if not almost forgotten, memories. People's reactions to odors may be tied to evoked associations (Kirk-Smith, 1994).

Is mood a necessary mediator of cognition? Bone and Scholder (1998) report several research papers in which odor effect may occur in the absence of a mood shift: (Cann and Ross, 1989; Ehrlichman and Halpern, 1988; Knasko, 1992; Spangenberg et al., 1996). They conclude that the consumer does not experience a mood shift, but simply transfer the pleasantness/unpleasantness of the scent to the object.

3.4. The interplay between mood and cognition

Few empirical studies on store atmospherics include both affect and cognition as mediators to shoppers' behavior. Retail atmospheric research focused on the effect of environmental cues on mood and approach avoidance. The way cues are processed through the maze of emotion/cognition or cognition/emotion remains unclear. In the field of ambient scent, studies combining emotion and cognition failed to show a mood shift (Spangenberg et al., 1996; Morrin and Ratneshwar, 2000). There is a definite need to further understand the interplay and the hierarchy of cognition and emotion in the study of environmental cues.

Potential managerial implications are important. Should retailers try to modify shoppers' mood? Should they concentrate their effort on shoppers' perceptions of the store environment or on product quality? One is easier done than the other. The dichotomy is between entertainment and information. Are mood shifts caused by entertainment efforts or by informational cues? Two schools of thought may contribute to our comprehension of these relationships. On one hand, there is the emotion–cognition approach. The Servicescapes model (Bitner, 1992) was constructed on the emotion–cognition theory. Zajonc and Markus (1984) contend that emotion can take place without antecedent cognitive processes. They argue that an emotion can be generated by biological, sensory or cognitive events. Arousal and motor activities are the hard representations of emotions. The experience of emotion, that requires a cognitive input, is the soft representation of affect. Only arousal is a necessary consequence of the generation of emotion. The cognitive experience is not required to be part of the emotion process. For Zajonc and Markus, "the experience of emotion is simply the cognition of having one." Izard et

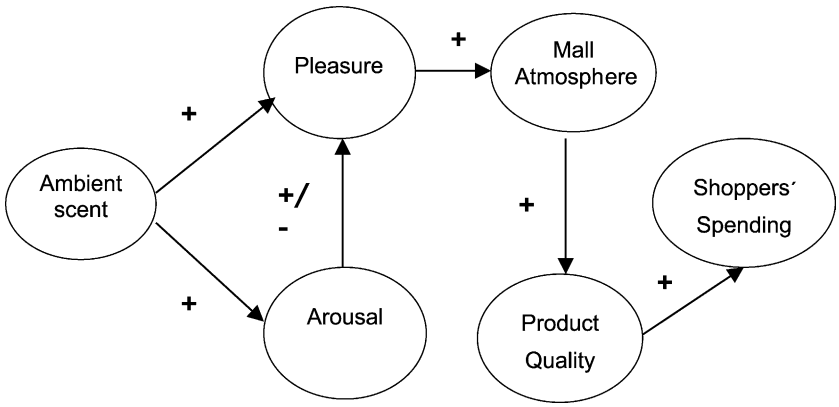

Fig. 1. Proposed model for Hypotheses 1a–c and 2a–c. (Arrows represent primary paths.)

al. (1984) do not challenge that cognition may be a sufficient condition to produce emotions. "The question is whether it is a necessary cause" (p. 5).

On the other hand, the cognition–emotion school of thought (Lazarus, 1991) posits the causal role of cognition as a necessary but not sufficient condition to elicit emotions. External and internal cues must be appraised in terms of one's own experience and goals. "*Appraisal* of the significance of the person–environment relationship, therefore, is both *necessary and sufficient*; without a personal appraisal (i.e., of harm or benefit) there will be no emotion; when such an appraisal is made, an emotion of some kind is inevitable" (p. 177).

Two competing models combining emotions and cognition are being tested. In the first model, olfactory ambient cues stimulate positive emotions influencing shoppers' perceptions of their environment and product quality. The alternate model hypothesizes that ambient scents mediate the perceptions of the shopping environment and product quality, thus enhancing shoppers' mood.

4. Hypotheses and model building

Figs. 1 and 2 present the two competing models with primary and secondary path effects. In the first model (see Fig. 1), it is assumed that ambient scent influences consumers' mood through the arousal and pleasure dimensions. Russell and Pratt (1980) found that pleasure and arousal were independent dimensions. Berlyne (1971, 1974) hypothesized that arousal influences pleasure. The path from arousal to pleasure is verified in a number of marketing studies (Wakefield and Baker, 1998; Babin and Attaway, 2000; Eroglu et al., 1998).

Pleasant feelings are not necessarily correlated with strong arousal (Dubé et al., 1995; Spangenberg et al., 1998; Richardson and Zucco, 1989). Therefore, the primary path between scent and mood may transit by both affective dimensions. Considering the inverted U-shape effect of scent intensity (Richardson and Zucco, 1989), the influence of arousal over pleasure may either be positive or negative. Assuming a light pleasant scent, the effect of arousal should

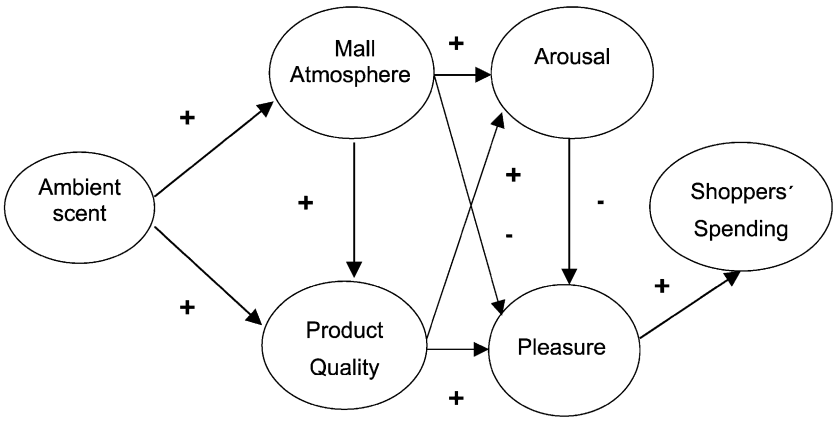

Fig. 2. Alternate model for Hypotheses 3a and b and 4a and b. (Arrows represent primary paths.)

be positive. The first set of hypotheses is derived from Mehrabian and Russel (1974):

Hypothesis 1a: A light and pleasing ambient scent arouses consumers.

Hypothesis 1b: A light and pleasing ambient scent increases consumers' positive affect.

Hypothesis 1c: Arousal induced by a light and pleasing ambient scent should positively influence consumers' mood.

The positive affect is expected to provoke a favorable perception of the shopping environment, under the approach/avoidance model (Mehrabian and Russel, 1974; Donovan and Rossiter, 1982). There is also theoretical support for linking pleasure with the perception of product quality, through transfer (Obermiller and Bitner, 1984).

Hypothesis 2a: Consumers' mood improves perceptions of the shopping environment.

Hypothesis 2b: Consumers' mood improves perceptions of product quality.

Hypothesis 2c: Consumers' perceptions of the shopping environment impact the perception of product quality.

The third hypothesis is congruent with the approach/avoidance model (e.g., Mehrabian and Russel, 1974) and findings by Donovan and Rossiter (1982). It is believed that consumers who are in a favorable mood are more likely to want to affiliate with others, stay longer in the stores, and make more purchases.

Hypothesis 3a: A positive perception of the shopping environment influences consumer spending.

Hypothesis 3b: A positive perception of product quality influences consumer spending.

Fig. 1 underscores the interplay between research hypotheses. Through this network of influences, our intention is to stress the mediating effect of ambient scent on mood, on perceptions and on behavior. In the first model, mood (affect) is an antecedent to perception (cognition).

In the competing model (see Fig. 2), ambient scent is perceived by consumers without a mood shift (Bone and Scholder, 1998; Morrin and Ratneshwar, 2000; Spangenberg et al., 1996; Knasko, 1992; Ehrlichman and Halpern, 1988). Consumers use ambient scent as an environmental cue that impacts on product evaluation (Bitner, 1986, 1990; Rappoport, 1982).

The fourth set of hypotheses is based on the environmental cue theory (Berry and Clark, 1986; Rappoport, 1982; Shostack, 1977), and is in line with the findings of Spangenberg et al. (1996):

Hypothesis 4a: A light and pleasing ambient scent directly affects consumers' perception of the shopping environment.

Hypothesis 4b: A light and pleasing ambient scent influences consumer's perception of product quality.

The competing model presupposes that the perceptions of the retail environment and of product quality are antecedents to consumers' affect. Marketing scholars such as Bagozzi and Moore (1994) and Bagozzi et al. (1999) have relied on the cognitive theory of emotions to explain consumers' behaviors. The fifth hypothesis is derived from this literature and the findings by Baker et al. (1994).

Hypothesis 5: Consumers' perceptions of the retail environment and of product quality foster a more favorable shopping mood resulting in more money being spent.

The first two hypotheses posit that affect is an antecedent to cognition (e.g., Zajonc and Markus, 1984), whereas the last two assume that cognitive processes influence mood (e.g., Lazarus, 1991).

5. Method

The proposed models were tested in a mall intercept with a two-factor experiment. Until now, other ambient scent experiments had not been conducted on actual retail location. For instance, the study by Morrin and Ratneshwar (2000) was conducted in a laboratory, and the study by Spangenberg et al. (1996) in a simulated store. In our case, the experiment was conducted in a community shopping mall located on the western outskirts of the Montreal metropolitan area. The shopping mall is owned and operated by one of Canada's largest commercial property developer. Data were collected in two waves.

The experiments were conducted in two consecutive weeks: the last week of February 1998 for the control group and the first week of March 1998 for the experimental group. These two weeks are known by the shopping mall owners to be identical in terms of sales volume and shoppers traffic. Special care was taken by the mall director to cancel all special promotions by the retailers during the two weeks of the experiment.

In the control wave, the shopping mall ambient olfactory atmosphere was not modified. There were no aggressive exogenous odors emanating say from food outlets or fragrance stores. During the second wave, a light pleasing scent was vaporized in the mall's main corridor. The ambient scent was diffused in the shopping mall's main corridor located between two major retailers. Some 10 diffusers released a citrus scent for 3 s every six min, thus, maintaining a continuous scent intensity. Special care was taken to ensure that the odor intensity reached perceptual thresholds without bothering people. Exposed subjects and controls had similar response patterns about the pleasing [$F(1,568) = 0.267$, $P = .601$] or the unpleasing [$F(1,565) = 2.103$, $P = .148$] ambient odors in the shopping mall. However, exposed subjects were more likely to believe the odors in the shopping mall were appropriate [$F(1,560) = 4.914$, $P = .027$].

Table 1
Sociodemographic profiles of control and experimental groups

Sample size		Control group, $N=447$ (%)	Experimental group, $N=145$ (%)
Gender ($\chi^2=2.99$, $df=1$, $P=.10$)	Females	55	63
	Males	45	37
Age ($\chi^2=7.32$, $df=5$, $P=.20$)	18–24	10	13
	25–34	19	21
	35–44	29	22
	45–54	23	19
	55–65	11	17
	65+	8	8
Education ($\chi^2=1.37$, $df=3$, $P=.71$)	Primary	3	1
	High school	33	31
	College	35	35
	University	29	33
Household income ($\chi^2=5.22$, $df=8$, $P=.73$)	Under US$30,000	24	28
	US$30,000–49,000	29	31
	US$50,000–79,000	25	26
	US$80,000+	13	9
	Refusals	8	6
Language ($\chi^2=0.44$, $df=1$, $P=.60$)	French	83	85
	English	17	15

The scent selection was based on Spangenberg et al. (1996) experimentation. They tested a series of 26 non-offensive odors on the affective and activation (arousal) scales originally developed by Fisher's (1974) and used by Crowley (1993) in environmental research. Scent categories included floral, spice, wood, citrus and mint. The affective dimension comprised five items (positive, attractive, relaxed, and good). The activation scale (i.e., arousal) was also made up of five attributes (stimulating, lively, bright, motivating and interesting). Ginger and lavender were identified as effectively neutral, while orange and mint were found effectively pleasing.

For the mall intercept experiment, a citrus scent (a combination of orange, lemon and grape) was chosen. The scent category scored well with Spangenberg et al. (1996) pretest, and was also available from vendors. Citrus is significantly different from lemon. People readily associate the smell of lemon with cleaning products (Bone and Jantrania, 1992). Furthermore, the scent was not congruent with any specific products sold in the shopping center, as recommended by Spangenberg, Crowley and Henderson.

Graduate marketing students, who were asked not to wear perfume, were responsible for the administration of questionnaires. Sampled individuals were not aware of the research objectives. They were simply invited to fill-in a self-administered questionnaire on their shopping trip. Data collection covered all weekdays and day parts for adequate representation. Some 145 subjects exposed to the scent treatment completed the questionnaire. The control group included 447 individuals. (The larger size of the control group was required for other experiments).

The experimental sample contains marginally more women than normally anticipated. Yet, the chi-square statistics are reassuring. Randomly selected participants in the control and the experimental groups had similar sociodemographic profiles (Table 1). The distribution of participants is somewhat similar to that in the Province of Quebec. The median age of the Quebec adult population is 43 years while that of the control and the experimental sample is 42 and 43 years old, respectively. The median household income is 47,000 dollars for the control group, 43,000 for the experimental group and 47,000 dollars for the general population. There are no concentrations of young or old participants with different olfactory sensitivities.

Subjects and controls were probed on their perceptions of product quality, using the three-item scale developed by Bellizi et al. (1983). The three product quality scale items have a Cronbach's alpha coefficient of .87. Scale items are

Table 2
Scale items, with alpha coefficients and factor loadings

Items	Factor 1	Factor 2	Factor 3	Factor 4
Product quality (α=.87; Bellizi et al., 1983)				
Outdated/up to date	−.040	.292	**.831**	.031
Inadequate/adequate	−.095	.266	**.870**	−.000
Low/high quality	−.071	.290	**.816**	−.020
Shopping environment (α=.90; Fisher, 1974)				
Boring/stimulating	−.084	**.873**	.224	−.069
Unlively/lively	−.074	**.828**	.201	−.119
Uninteresting/interesting	−.050	**.835**	.274	−.079
Pleasure (α=.96; Mehrabian and Russel, 1974)				
Unhappy/happy	**.926**	−.114	−.069	−.045
Annoyed/pleased	**.923**	−.134	−.059	.024
Unsatisfied/satisfied	**.916**	−.137	−.055	−.023
Melancholic/contended	**.905**	−.122	−.033	.018
Arousal (α=.76; Mehrabian and Russel, 1974)				
Relaxed/stimulated	**.579**	−.129	−.049	**.630**
Calm/excited	.232	−.098	−.017	**.847**

The alpha coefficients are for the selected items only. The factor loadings refer to the full scale, not just selected items.

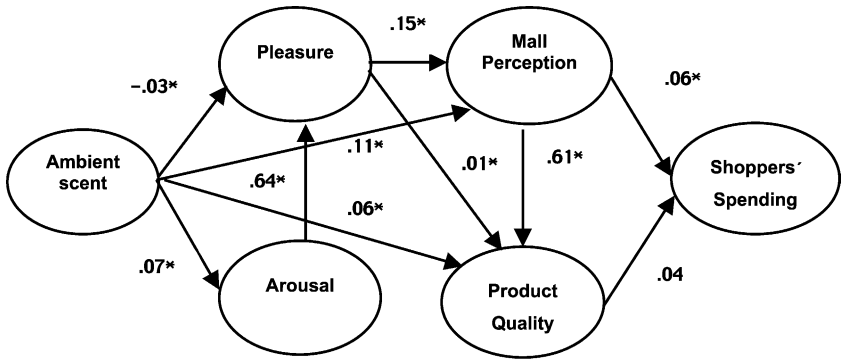

Fig. 3. Model 1 — affect–cognition model: emotion as an antecedent to cognition (standardized parameters).

described in Table 2. Shopping mall perceptions were captured with a selection of Fisher's (1974) semantic differentials (alpha coefficients=.94). Mehrabian and Russel's (1974) pleasure and arousal items were also administered (alpha coefficient=.91). Participants were asked how much they had spent, excluding groceries, during their shopping trip.

To illustrate the cognitive and affective paths of ambient scent, structural equation modeling (SEM) was used (EQS for Windows 5.7a). Variables described in Table 2 were entered in both models. All efforts were made to keep the structural model to a manageable size. Only the most relevant items from Fisher's (1974) semantic differentials, and from the Mehrabian and Russel's (1974) pleasure/arousal scale, were entered in the model.

Exploratory factor analyses helped select items with the highest factor loading on one dimension. Both models to be tested were built with three indicators per latent variable (Bollen, 1989, p. 244), with the exception of Arousal (two indicators). Bollen (1989) underlines that the two-indicator rule is a sufficient condition for measurement models with more than one ξ variable (p. 244). One of the Arousal indicators also loads high on the Pleasure dimension, showing a correlation between the two nonorthogonal constructs (Crowley, 1993; Berlyne, 1971, 1974).

Table 3
Model 1 — affect–cognition structural model estimates (*t* values)

Pleasure	= Arousal	– Ambient Scent	
	0.575 (28.32)	0.025 (– 2.49)	
Arousal	= Ambient Scent		
	0.063 (5.28)		
Environment	= Pleasure	+ Ambient Scent	
	0.158 (34.28)	0.099 (13.68)	
Quality	= Pleasure	+ Environment	+ Ambient Scent
	0.009 (2.66)	0.445 (28.35)	0.036 (4.91)
Spending	= Environment	+ Quality	
	0.089 (3.05)	0.062 (1.54)	

Confirmatory factor analysis (CFA) performed on the factor structure in Table 2 substantiates the exploratory analysis findings (Satorra–Bentler scaled $\chi^2 = 52.24$, $df = 46$; $P = .244$; CFI = 0.999). As anticipated, the perceptions of product quality and of the shopping mall environment are correlated; so are consumers' pleasure and arousal effects. However, the two pairs of constructs are orthogonal to each other.

Consumer spending has only one indicator, actual dollars disbursements during the shopping trip, excluding groceries. Its error variance has been set to zero. The presence or the absence of scent is represented by a dummy variable (1 and 0). Bagozzi (1994) and Bagozzi and Yi (1989) have used dummy variables with structural equation models in experimental designs. Because of the categorical variables, the models were estimated with Yuan–Bentler corrected AGLS chi-square statistics, an asymptotically distribution-free (ADF) statistic added to EQS 5.7a (January 1998).

6. Research findings

6.1. Model 1

In the first model, where emotions are antecedent to cognition, the effect of the ambient scent on shoppers' mood cancels itself through Arousal ($\beta = 0.063$, $t = 5.28$) and Pleasure ($\beta = -0.025$, $t = -2.49$). The odor may be somewhat arousing but fails to directly induce pleasure. The combined effect of scent on shoppers' mood is almost null (β: $0.063 \times 0.575 - 0.025 = 0.009$). Instead the Lagrange Multiplier test suggests direct paths between ambient scent and the cognition variables (mall perception: $\beta = 0.099$, $t = 13.68$; perception of product quality: $\beta = 0.036$, $t = 4.91$). These paths have been hypothesized in the competing model. Fig. 3 shows the standardized parameter paths. The structural parameter estimates, and t values are found in Table 3.

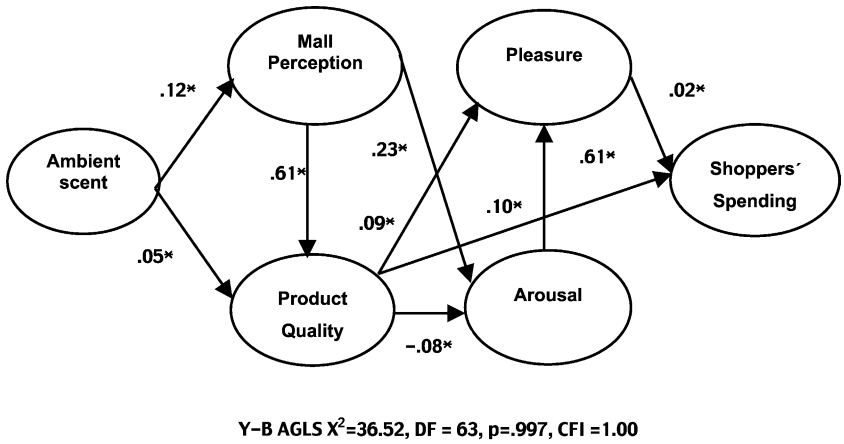

Fig. 4. Model 2 — cognition–affect model: cognition as antecedent to emotion (standardized parameters).

Arousal influences pleasure (β = 0.575, t = 28.32). Pleasure mediates shoppers' perceptions of the retail environment (β = 0.158, t = 34.28). However, this positive mood is not due to ambient scent. As expected, the retail atmospherics mediate the perception of product quality (β = 0.445, t = 28.35). The effect of pleasure on the perception of product quality is marginally significant (β = 0.009, t = 2.66). In this emotion–cognition model, the perceptions of the retail environment (β = 0.089, t = 3.05) and of product quality (β = 0.062, t = 1.54) have little effects on shoppers' spending. The path between product quality and consumer spending is not significant. Fit statistics associated with this model are perfectible (Yuan–Bentler AGLS χ^2 = 90.18, df = 63; P=.014, RMSEA = 0.034; CFI = 1.00).

6.2. Model 2

The competing model (Fig. 4) assumes that perception influences shoppers' mood. This model yields a better fit (Yuan–Bentler AGLS χ^2 = 36.52, df = 63, P=.997, RMSEA = 0.00; CFI = 1.00) (see Table 4). The effect of ambient scent on shoppers' perceptions is nonambiguous. The presence of odor primarily influences the perception of the shopping environment (β = 0.106, t = 15.81) and that of product quality (both directly: β = 0.043, t = 4.86) and indirectly: 0.106 × 0.551). The perception of mall atmospherics mediates shoppers' arousal (β = 0.396, t = 11.00). The perception of product quality influences pleasure (β = 0.104, t = 5.27), although it is somewhat moderated through its nonarousing effect (β = − 0.163, t = − 4.21). As anticipated, arousal stimulates pleasure (β = 0.358, t = 27.63). Yet, shoppers' emotions are not a strong antecedent to consumer spending. The model underscores that shoppers' spending is mediated primarily by perceptions of product quality (β = 0.126, t = 14.48), not by mood (β = 0.026, t = 4.43).

Table 4
Model 2 — cognition–affect model estimates (t values)

Environment	= Ambient Scent	
	0.106 (15.81)	
Quality	= Environment	+ Ambient Scent
	0.551 (27.75)	0.043 (4.86)
Arousal	= Environment	− Quality
	0.396 (11.00)	0.163 (− 4.21)
Pleasure	= Arousal	+ Quality
	0.358 (27.63)	0.104 (5.27)
Spending	= Pleasure	+ Quality
	0.026 (4.43)	0.126 (14.48)

7. Discussion

The two models under investigation are built from the same latent variables and indicators. They only differ on the order of mediating variables. The first model follows the environment psychology paradigm where positive (negative) affects stimulate approach (avoidance) behaviors. Fit statistics are marginal. Despite a strong CFI (1.00) and low RMSEA (0.034), the Yuan–Bentler AGLS chi-square fits poorly (χ^2 = 90.18, df = 63, P=.014). The structural equation model supports Hypothesis 1a (a light and pleasing ambient scent arouses consumers) but rejects Hypothesis 1b (a light and pleasing ambient scent increases consumers' positive affect). The direct and indirect effects of ambient scent over pleasure cancel each other. The path from ambient scent to arousal (β = 0.063, t = 5.28) is significant, indicating that the presence of odor may have an arousing effect. At the same time, the path from ambient scent to pleasure has a negative coefficient (β = − 0.025, t = − 2.49), suggesting an attenuating effect of scent over pleasure. EQS's Lagrange Multiplier (LM) test keeps suggesting more robust paths from ambient scent to perception variables (β = 0.099, t = 13.68 for the mall environment; and β = 0.036, t = 4.91 for product quality). This finding is in opposition with one of the main elements of the approach/avoidance model: pleasure and arousal do not mediate the effects of environmental cues on perceptions and behaviors.

The second set of hypotheses is partially supported: the mediating effect of ambient scent on mood improves consumers' perception of their shopping environment (Hypothesis 2a) and of product quality (Hypothesis 2b). The effect of ambient scent on shoppers' mood has already been shown as insignificant. Consumers' mood (pleasure) — not induced by ambient scent — affects the perception of the shopping atmospherics ($\beta = 0.158$, $t = 34.28$). As expected in the approach/avoidance theory, the mood enhanced perception of the retail environment influences shoppers' spending ($\beta = 0.089$, $t = 3.05$). Yet, the perception of product quality, in this model, has no significant effect ($\beta = 0.062$, $t = 1.54$) on consumer spending. Hypothesis 3a is accepted, while Hypothesis 3b is rejected.

The alternate model is more robust than the previous one: the Yuan–Bentler AGLS chi-square statistic provides strong indications of the model fit ($\chi^2 = 36.52$, $df = 63$, $P = .997$). The SEM depicting perceptions as an antecedent to emotions supports the forth set of hypotheses: a light and pleasing ambient scent directly affects consumers' perception of the shopping environment (Hypothesis 4a) and of product quality (Hypothesis 4b). The paths from ambient scent to the perception of the retail environment ($\beta = 0.106$, $t = 15.91$) and to that of product quality ($\beta = 0.043$, $t = 4.86$) are both significant. However, the cognitive effect of ambient scent primarily passes through the perception of the retail environment.

Consumers' spending is more likely to be induced by cognitive processes than by mood alone. The first part of Hypothesis 5 is strongly supported, while the second part of the proposition must be regarded with circumspection (The mediating effect of ambient scent on the retail environment modifies the shoppers' perception of quality which, in turn, induces a more favorable shopping mood resulting in more money being spent.). The path coefficients from ambient scent to the perception of the retail environment ($\beta = 0.106$, $t = 15.81$) and from the retail environment to the perception of product quality ($\beta = 0.551$, $t = 15.81$) are convincing. Shoppers' perceptions of their environment and of product quality affect their mood. The paths from the perception of the retail environment to arousal ($\beta = 0.396$, $t = 11.0$) and from the perception of product quality to pleasure ($\beta = 0.104$, $t = 5.27$) cannot be rejected. The perception of product quality does not have an arousing effect ($\beta = -0.163$, $t = -4.21$). Consumer spending is primarily influenced by the perception of product quality ($\beta = 0.126$, $t = 14.48$) rather than by mood ($\beta = 0.026$, $t = 4.43$).

8. Conclusion

Ambient scent contributes to the building of a favorable perception of the mall environment, and indirectly of product quality. Although significant, product quality may be viewed as a necessary but not sufficient condition to explain increased shopper's spending. Nonenvironmental factors mediate consumer spending. For example, Babin and Attaway (2000) have shown that shoppers' utilitarian and hedonic affect behaviors.

Retailers should seriously consider ambient scent in their marketing toolbox. It is probably among one of the least expensive techniques to enhance shoppers perceptions. Product-related or congruent scent may be effective to increase the sales of a particular product (Bone and Jantrania, 1992), but may also jeopardize the sales of other products (Spangenberg et al., 1996). Effective ambient scent should support all products in the store (e.g., office supplies and furniture; Gulas and Bloch, 1995).

In this experiment, the environmental cue (ambient scent) directly affects shoppers' perceptions. The latter have a significant influence over consumers' mood. The best fitting model supports the cognitive theory of emotions. Both cognitive and affective dimensions are central to market-oriented managers. For retailers, whether emotions precede cognition or vice versa, the question may appear trivial. Yet, one does not go without the other. It may be even more trivial to try to enhance mood, for example, through some form of entertainment, if it does not influence shoppers' perceptions of the retail environment and that of product/service quality.

Our findings strongly support the model derived from Lazarus (1991), which contradicts one of the basic tenets of the approach/avoidance model, that is the mediating effects of consumers' mood in the atmosphere–perception relationship. In this specific case, odors do impact significantly on perceptions of both product quality and shopping environment. Mood (i.e., pleasure and arousal) contributes very little (although the contribution is significant) on spending. Odors affect the perception of product both directly and through the perceptions of the mall environment. In addition, the effect of mall perception on product quality is very strong. This result is central to store atmospherics: the shopping mall plays the role of a global packaging for the products sold. Since odors may affect the mall perception, retailers should consider this specific odor study here, i.e., citrus as a powerful way of influencing product perception. This is even more important since product perceptions affect significantly sales ($\beta = 0.126$; $t = 14.48$). Perception of the mall environment affects shoppers' arousal ($\beta = 0.396$; $t = 11.00$) very strongly, whereas perception of product quality has very little impact (although it is significant) on emotions. Perception of mall environment cannot be downplayed: it impacts on the perception of product, which, in turn, affects spending. It also impacts on emotions but they do not contribute much to spending.

We conclude from this that the importance granted to emotions in the store atmospheric literature may have been overstated. In other words, the approach/avoidance model that strongly stressed the emotional effects of the environment to the detriment of the study of the *meaning* of the environment. Odors, as well as music, may mean something to the consumers more powerfully than they affect their

emotions. For instance, Chebat et al. (2001) showed that store music background has strong cognitive effects in terms of both cognitive response and information processing. They explain that music background may stimulate (or cancel) strong cognitive processes. We reason that odors may have similar effects. Odors may affect the cognitive processes (as shown by Laird, 1932; Mitchell et al., 1995, for instance). We then strongly suggest to reorient, at least partially, the store atmospherics toward the understanding of ambient meaning to shoppers.

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References

Amodio JV. Mood makers: an in-depth look at how scents claim to boost your spirit and de-stress your nerves. Good Housekeeping 1998; 227(5):53–5 (November).
Anonymous. Home sweet home. Eur Cosmet Mark 1998:519 (December).
Babin BJ, Darden WR. Consumer self-regulation in a retail environment. J Retailing 1995;71:47–70 (Spring).
Babin BJ, Attaway JS. Atmospheric affect as a tool for creating value and gaining share of customer. J Bus Res 2000;49:91–9 (August).
Babin BJ, Darden WR, Griffin M. Work and/or fun: measuring hedonic and utilitarian shopping value. J Consum Res 1992;20:644–56 (March).
Bagozzi RP. Advanced methods in marketing research. Cambridge (MA): Basil Blackwell, 1994.
Bagozzi RP, Yi Y. On the use of structural equation models in experimental designs. J Mark Res 1989;27:271–84 (August).
Bagozzi RP, Moore DP. Public service advertisement: emotion and empathy guide prosocial behavior. J Mark 1994;58:56–70.
Bagozzi RP, Gopinath M, Nyer PU. The role of emotions in marketing. J Acad Mark Sci 1999;27(2):184–206.
Baker J. The role of the environment in marketing services: the consumer perspective. In: Czepiel JA, Congram CA, Shanaham J, editors. The services challenge: integrating for competitive advantage. Chicago (IL): American Marketing Association, 1986. p. 79–84.
Baker J, Levy M, Grewal D. An experimental approach to making retail store environmental decisions. J Retailing 1992;68(4):445–60 (Winter).
Baker J, Grewal D, Parasuraman A. The influence of store environment on quality inferences and store image. J Acad Mark Sci 1994;22(4):328–39.
Bellizzi JA, Crowley AE, Hasty RW. The effects of color in store design. J Retailing 1983;59:21–45.
Berlyne DE. Aesthetics and psychobiology. New York: Wiley, 1971.
Berlyne DE. Studies in the new experimental aesthetics New York: Wiley, 1974.
Berry L, Clark T. Four ways to make services more tangible. Business 1986;36(4):53–5 (October–December).
Bitner MJ. Consumer responses to the physical environment in service setting, creativity in services marketing. In: Venkatesan M, Schmalensee DM, Marshall C, editors. Chicago: American Marketing Association, 1986. p. 89–93.
Bitner MJ. Evaluating service encounter: the effects of physical surrounding and employee responses. J Mark 1990;54(2):69–82.
Bitner MJ. Servicescapes: the impact of physical surroundings on customers and employees. J Mark 1992;56(2):57 (April).
Bollen KA. Structural equations with latent variables. New York: Wiley, 1989.
Bone PF, Jantrania S. Olfaction as a cue for product quality. Mark Lett 1992;3:289–96 (July).
Bone PF, Scholder, EP. Olfaction and marketing: does it make sense to use scents? Working Paper, Department of Marketing, West Virginia University, 1994.
Bone PF, Scholder EP. Does it matter if it smells? Olfactory stimuli as advertising executional cues. J Advertising 1998;27(4):29–40 (Winter).
Booms BH, Bitner MJ. Marketing services by managing the environment. Cornell Hotel Restaurant Adm Q 1982;23:35–9 (May).
Buck L, Axel R. A novel multigene family may encode odorant receptors: a molecular basis for odor recognition. Cell 1991;65:175–87 (April).
Butcher D. Aromatherapy — its past and future. Drug Cosmet Ind 1998a; 162(3):22–4 (March).
Butcher D. Conditioning indoor environments using aroma technology. Drug Cosmet Ind 1998b (March1).
Cann A, Ross DA. Olfactory stimuli as context cue in human memory. Am J Psychol 1989;102:91–102 (Spring).
Chebat JC, Vaillant D, Gelinas-Chebat C. Store music background in a selling context. J Bus Res 2001;54(1).
Crowley AE. The two-dimensional impact of color on shopping. Mark Lett 1993;4:59–69 (January).
Darden WR, Babin BJ. Exploring the concept of affective quality: expanding the concept of retail personality. J Of Bus Res 1994;29(2): 101–10 (February).
Darden WR, Erdem O, Darden KK. A comparison and test of three causal models of patronage intentions. In: Darden WR, Lusch RF, editors. Patronage behavior and retail management. New York: North-Holland, 1983 (491 p.).
Davis RG. The role of nonolfactory context cues in odor identification. Percept Psychophys 1981;30(1):83–9.
Dawson S, Bloch P, Ridgway NM. Shopping motives, emotional states and retail outcomes. J Retailing 1990;22:408–27 (Winter).
Donovan R, Rossiter J. Store atmosphere: an environmental psychology approach. J Retailing 1982;58:34–57 (Spring).
Dubé L, Chebat JC, Morin S. The effects of background music on consumers' desire to affiliate in buyer–seller interactions. Psychol Mark 1995; 12(4):305–19 (July).
Dunn C. The fragrance foundation looks ahead to spring. Household Pers Prod Ind 1997, vol. 40 (January 1).
Ehrlichman H, Halpern JN. Affect and memory: effects of pleasant and unpleasant odors on retrieval of happy and unhappy memories. J Pers Soc Psychol 1988;55(5):769–79.
Ellen PS, Bone PF. Does it matter if it smells? Olfactory stimuly as advertising executional cues. J Advertising 1998;27(12–22):29.
Engen T. The perception of odors. New York: Academic Press, 1982.
Eroglu S, Harrel GD. Retail crowding: theoretical and strategic implications. J Retailing 1986;2(4):346–63 (Winter).
Eroglu S, Machleit KA. An empirical study of retail crowding: antecedents and consequences. J Retailing 1990;66(2):201–21.
Eroglu S, Machleit KA, Kellaris JJ. The impact of retail density and atmospheric music on retail shoppers' crowding perceptions and store satisfaction. Presentation to Academy of Marketing Science, May 28, 1998, Norfolk, VA.
Fisher JD. Situation-specific variables as determinants of perceived environmental aesthetic quality and perceived crowdedness. J Res Pers 1974;8:177–88 (August).
Garder MP, Siomkos GJ. Toward a methodology of assessing effects of in-store atmosphere. In: Lutz R, editor. Advances in consumer research, vol. 13. Provo (UT): Association for Consumer Research, 1985. p. 27–31.
Golden LG, Zimmerman DA. Effective retailing. Boston: Houghton Mifflin, 1986.
Gulas CS, Bloch PH. Right under our noses: ambient scent and consumer responses. J Bus Psychol 1995;10(1):87–98 (Fall).
Harrell GD, Hutt MD, Anderson JC. Path analysis of buyer behavior under conditions of crowding. J Mark Res 1980;17:45–51 (February).
Hui MK, Bateson JEG. Perceived control and the effects of crowding and

consumer choice on the service experience. J Consum Res 1991;18: 174–84 (September).
Hunter BT. The sales appeal of scents (using synthetic food scents to increase sales). Consum Res Mag 1995;78(10):8–10 (Oct).
Izard CE, Kagan J, Zajonc RB, et al. Emotions, cognition, and behavior. Cambridge: Cambridge Univ. Press, 1984.
Kirk-Smith MD. Culture and olfactory communication. In: Gardner RA, et al, editor. Ethological roots of culture. Boston: Kluwer, 1994. p. 385–406.
Knasko S. Ambient odor's effect on creativity, mood and perceived health. Chem Senses 1992;17(1):27–35.
Knasko S, Gilbert AN, Sabini J. Emotional state, physical well-being and performance in the presence of feigned ambient odor. J Appl Psychol 1990;20(16):1345–57.
Kotler P. Atmospherics as a marketing tool. J Retailing 1973;49:48–64 (winter).
Laird DE. How the consumers estimate quality by subconscious sensory impressions: with special reference to the role of smell. J Appl Psychol 1932;16:241–6 (June).
Lazarus RS. Emotion and adaptation. New York: Oxford Univ. Press, 1991.
Lorig TS, Schwartz GE. Brain and odor: alteration of human EEG by odor administration. Psychobiology 1988;16(3):281–4.
Mehrabian A, Russel JA. An approach to environmental psychology. Cambridge (MA): The MIT Press, 1974.
Milliman RE. Using background music to affect the behavior of supermarket shoppers. J Mark 1982;46(2):86–91.
Milliman RE. The influence of background music on the behavior of restaurant patrons. J Consum Res 1986;13:286–9 (September).
Mitchell DJ, Kahn BE, Knasko SC. There's something in the air: effects of ambient odor on consumer decision making. J Consum Res 1995; 22:229–38 (September).
Morrin M, Ratneshwar S. The impact of ambient scent on evaluation, attention and memory for familiar and unfamiliar brands. J Bus Res 2000;49:157–65 (August).
Moskowitz HR. Mind, body, and pleasure: an analysis of factors which influence sensory hedonics. In: Kroeze JHA, editor. Preference behaviour and chemoreception. London: Information Retrieval, 1979. p. 131–47.
Obermiller C, Bitner MJ. Store atmosphere: a peripheral cue for product evaluation. In: Stewart DC, editor. American psychological association annual conference proceedings, consumer, psychology division. Washington, DC: American Psychological Association, 1984. p. 52–3.
Rappoport A. The meaning of the built environment. Beverly Hills (CA): Sage Publication, 1982.
Richardson JTE, Zucco GM. Cognition and olfaction: a review. Psychol Bull 1989;105(3):352–60.
Russell JA, Pratt G. A description of the affective quality attributed to environments. J Pers Soc Psychol 1980;38(2):311–22.
Schab FR. Odor memory: taking stock. Psychol Bull 1991;109(2):242–51.
Schiffman SS. Preference: a multidimensional concept. In: Kroeze JHA, editor. Preference behaviour and chemoreception. London: Information Retrieval, 1979. p. 63–81.
Shostack GL. Breaking free from product marketing. J Mark 1977;41:73–80 (April).
Smith P, Curnow R. Arousal hypothesis and the effects of music on purchasing behavior. J Appl Psychol 1966;50:255–6 (July).
Spangenberg ER, Crowley AE, Henderson PW. Improving the store environment: do olfactory cues affect evaluations and behaviors? J Mark 1996;60:67–80 (April).
Stanley TJ, Sewall MA. Image inputs to a probabilistic model: predicting retail potential. J Mark 1976;40:48–53 (July).
Turley LW, Milliman RE. Atmospheric effects on shopping behavior: a review of the experimental evidence. J Bus Res 2000;49:193–211 (August).
Wakefield KL, Baker J. Excitement at the mall: determinants and effects of shopping response. J Retailing 1998;74(4):515–39.
Wheatly J, Chiu JSY. The effects of price, store image, and product and respondent characteristics on perceptions of quality. J Mark Res 1977; 14:81–186 (May).
Yalch R, Spangenberg E. Effects of store music on shopping behavior. J Consum Mark 1990;7(2):55–63 (Spring).
Zajonc RB, Markus H. Affect and cognition: the hard interface. In: Izard CE, Kagan J, Zajonc RB, editors. Emotions, cognition, and behavior. Cambridge: Cambridge Univ. Press, 1984. p. 63–103.