The Influence Of Atmospherics In Consumer Research Data Collection

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ABSTRACT

This study investigates the effects of ambient atmosphere on market research survey response quality, following approaches in the retail atmospherics literature. Participants completed a survey task and reported their affect states in a between subjects factorial experiment which manipulated ambient music, lighting and aroma conditions. Structural equation methods were used to test for effects of atmospheric factors on response quality and respondent affect. Findings suggest that ambient atmosphere may contribute to cognitive enrichment up to a point where it becomes distracting. At that point, ambient cues appear to interfere with cognitive processing. Survey response quality may be compromised through reduced positive affect, increased fatigue, or boredom, but the influence mechanism is different between males and females. The importance of stimulus manipulations is stressed and the effects of specific stimulus are provided to help researchers understand the impact toward response quality. Marketing researchers from both the academic and managerial community may be able to improve survey response quality by managing environmental conditions to enhance survey experience.

Keywords: Market research, response quality, atmospherics, affect shifts, data collection, structural equations

INTRODUCTION

Scholars have long expressed concern about the level of refusals to participate in survey research (Baruch, 1999; Jarvis, 2002; Remington, 1992; Wiseman and McDonald, 1979). The Council for Marketing and Opinion Research (CMOR) report a three-fold increase over a ten year period in the proportion of U.S. consumers who stated that they had "refused to participate in a survey in the past year" (from 15% to 45%). Among the reasons given for this trend are consumers' concerns about data privacy protection and aversion to telephone surveys, especially when telephone research is associated with telemarketing in general (Jarvis, 2002). In today's time-poor marketplace, consumers are also unwilling to forego their limited free time to participate in surveys for no perceived reward. A review of the marketing research literature reveals that respondents are affected in several different ways by the experience of participating in research. Specific effects that have been reported include: a) respondent satisfaction from participating in a data collection study (D'Ambra et al, 1998; Manfreda et al, 2002), b) respondent fatigue (Bijmolt and Wedel, 1995), and c) respondent boredom (Bijmolt and Wedel, 1995).

Given the increasing difficulty of gathering consumer responses and the dramatic decrease in response rates plaguing the research industry (Shaw et al, 2002), it is critical that the following questions are addressed: 1) How can research practitioners and scholars capture and retain the majority of consumers who are willing to participate in survey research, and 2) how can researchers ensure that they optimize the potential for effective participation by consumers in research studies? This study addresses these important questions by presenting the potential for improving understanding of the influence of the market research environment on respondent affect and on response quality. Specifically, findings are presented from an experiment to investigate the influence of ambient environmental conditions (lighting, music, and aroma) on respondent affect and response quality in survey research.

CONCEPTUAL FRAMEWORK

Physical Environment

Several scholars have recognized the role of environmental factors in influencing human behavior, and the marketing literature has emphasized the importance of situational variables as accounting for substantial variance in consumer choice behavior (Belk, 1975; Bush and Parasuraman, 1985; Kassarjian, 1968). The nature of the physical environment can also influence the research situation. If the weather is cold on a day when respondents are being recruited at an open shopping center, response rates might be significantly lower, or the inviting aroma of free food might beckon participants to investigate a survey recruiting table. A psychological experiment found that discussion groups spent a longer time and had more verbal interaction when exposed to soothing background music, compared to no music (or stimulating music), and that this effect was clearest in anxiety-inducing situations (Yalch and Spangenberg, 1990). These are but a few of the wide array of possible atmospheric conditions that play a part in determining the overall research participation experience.

Atmospherics

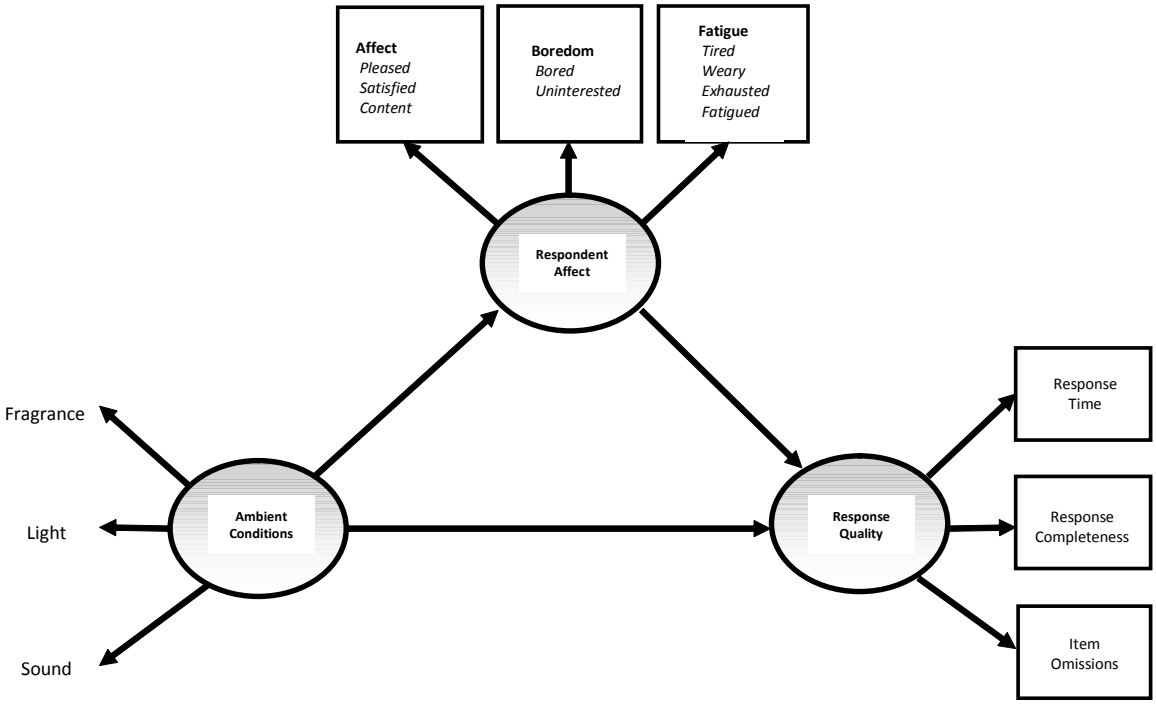
The field of environmental psychology has long examined the influence of the physical environment on human behavior (Baker et al, 1992) in settings including work, home, school and even prison environments. Since Kotler introduced the concept of atmospherics in the retail environment in 1973, studies have been reported in the retailing literature that focus on the potential of the physical, social and ambient store environment as an important factor in consumer satisfaction with the shopping experience. Atmospherics refers to the design of an environment to stimulate perceptual and emotional responses by consumers, and ultimately to influence their behavior (Yalch and Spangenberg, 1990). Much work in retail atmospherics has explored the effects of consumers' emotional states induced by in-store environments.

Baker (1986) introduced a framework of environmental factors in three critical dimensions: design, social and ambient factors. This study focuses on the third dimension, the ambient factor, which encompasses the array of background conditions in the environment, such as music, lighting, aroma, noise or temperature. Bitner (1992) expanded the scope of the importance of atmospherics in consumer behavior to all services, describing the importance of the servicescape (i.e., environmental context of the service consumption experience) in influencing behaviors through their effect on emotion and physiological sensations in consumers. Thus, the scope of influence of atmospheric conditions was broadened to encompass services such as health care, legal services and, potentially, marketing research practice (Bailey and Areni, 2006). This study investigates the effects of ambient conditions on survey research response quality through their influence on consumer affect.

Conceptual Model

The dominant theoretical framework for the study of retail atmospherics examines the relationship between stimulus-organism-response (S-O-R) as studied widely in environmental psychology. Following this paradigm, Mehrabian and Russell (1974) developed a model (M–R Model) representing the influence of environmental cues (S) on mediating emotional states (e.g. degrees of pleasure and arousal) (O), which in turn result in either approach or avoidance behaviors (R). Approach behaviors include all positive behaviors that might be directed at the environment, such as a desire to remain in a store or to spend more time engaged in a group discussion (Bitner, 1992; Spangenberg et al, 1996). In the survey research setting, the M-R model might simply propose that respondents will avoid unpleasant environments, and approach pleasant ones (cf., Dubé and Morin, 2001; Garlin and Owen, 2006).

Figure 1: Influence of Ambient Cues on Response Quality through Affect



MEASURES AND EXPECTED STRUCTURAL PATH RELATIONSHIPS

Ambient Atmospheric Cues

Lazarus (1991) posits that emotions are the result of anticipated, experienced or imagined outcomes of adaptive transactions between organism and environment; that is, cognitive processes influence the nature of emotional response. While affect can exist before cognition occurs (Zajonc and Markus, 1984), this study relies on self report of affect and the mediating influence of emotions on response quality; thus the current study assumes the cognitive theory of emotions. Accordingly, the impact of ambient environment on response quality through respondent affect when participating in a research study is examined (refer Figure 1).

Baker's (1986) general typology of atmospherics identifies 1) design factors, incorporating functional and aesthetic design elements of the environment, such as building architecture, visual layout, and style aesthetics such as color or décor (e.g., furnishings); 2) social factors, representing people in the environment including customers and employees (their presence, attitudes), and interactions among customers and employees; 3) ambient factors: background cues such as temperature, air quality, aroma, noise, music and lighting. Music, lighting and aroma are the variables chosen to operationalize the *ambient factor* for this study. An array of studies suggests effects for ambient cues such as music (Herrington and Capella, 1996; Hui et al, 1997; Mattila and Wirtz, 2001, Milliman, 1986; Yalch and Spangenberg, 1990, 1993), lighting (Golden and Zimmerman, 1986), or pleasant scent (aroma) (Chebat and Michon, 2003; Spangenberg et al, 1996) on mood or emotions which, in turn, influence the desire to spend more time in the environment, or engage in other approach behaviors, including loyalty, future intentions, affiliation and/or interaction with employees.

The literature reports a number of studies on the effects of ambient *music* in the retail environment. Garlin and Owen's (2006) meta-analysis of the effects of music in retail settings provides an excellent discussion of the range of music dimensions including: familiarity, liking, tempo, tone, genre and volume that can moderate the

influence of ambient music in commercial settings. Despite the complexity involved in identifying appropriate music for specific consumer behavior settings, the authors find that the mere presence of atmospheric music has a positive effect on felt pleasure, behavior duration and value returns.

Mehrabian (1976) believed that *lighting* was a chief factor in the environment's impact on individuals. Supplemental lighting has been demonstrated to have a positive effect on consumer behavior (Areni and Kim, 1994; Golden and Zimmerman, 1986; Hoyer, 1984; Summers and Hebert, 2001). Research on atmospheric lighting has tended to focus on levels of brightness, but aspects of color and temperature in lighting have also been considered. Baron et al (1992) found no *direct* effect of lighting on shopping behaviors, but reports an *indirect effect* of lighting on performance through the intervening variable of affect: lighting that induced the least negative mood enhanced performance. Summers and Hebert (2001) present an in-depth discussion of the literature on lighting in commercial and consumer behavior settings.

Studies on ambient olfactory stimuli (aroma) in consumer behavior are less common. Olfactory stimuli have been termed "scent," "odor," and "smell" in different studies; the preferred term (used throughout this article) is *aroma* for its broader meaning. Ambient aroma is an olfactory stimulus that is not emanating from a particular object but is present in the environment (Miller, 1993). Aroma has affective, arousability, and intensity dimensions (Spangenberg et al, 1996). Aromas are primarily perceived in terms of their pleasantness or unpleasantness (Buck and Axel, 1991; Ehrlichman and Halpern, 1988). Mixed results have been found regarding the effects of ambient aroma on mood and cognitive processes. A number of studies found no main or interactive effects regarding scent on mood (Chebat and Michon, 2003; Morrin and Ratneshwar, 2000; Spangenberg et al, 1996). Bone and Ellen (1999) report that subjects spent more time on a task in the presence of an ambient aroma; these findings suggest that processing of olfactory cues occurs without antecedent cognitive processes (necessary for self-report of affective response). Aroma is processed in the limbic system of the brain, which is the center of emotions (Liukel, 1976; Restak, 1984). Thus, direct effects of aroma on behavior support emotion-cognition theory (Zajonc and Markus, 1984) where motor activities (duration of behavior) are the hard representations of emotions and effects on mood can only be observed through behavior and not cognitive assessments of affect.

Mitchell et al (1995) report that subjects spend more time processing data when ambient aroma is congruent with the product class than they spend when ambient aroma is incongruent. One explanation for this result is that cognitive enrichment or increased cognitive flexibility may occur when ambient aroma is congruent with the product class. When there is incongruity between the aroma and the product class, cognitive interference may occur, the task becomes cognitively more difficult for the consumer, and recall of task relevant information may be inhibited (Mitchell et al, 1995).

The M-R model posits an "inverted u" shaped relationship between the intensity and pleasantness of ambient atmospheric stimuli: as aromas become more intense (beyond an optimum intensity level), reactions tend to become more negative (Richardson and Zucco, 1989). Thus, Mehrabian and Russell (1974) propose that any atmospheric cue, such as lighting, aroma, or even music volume that is "too intense" could lead to avoidance behavior.

Two potential effects of ambient cues are possible: first, pleasant ambient conditions are expected to influence response quality through affect shifts in accordance with the M-R model and second, the presence of ambient cues in the survey environment may influence information processing directly. Direct effects can alternatively be explained by emotion-cognition theory (as discussed in relation to ambient aroma), or schema incongruity theory, which posits that when faced with stimuli that are mildly incongruent with prior expectations, individuals will engage in more elaborative information processing (Eroglu et al, 2005), thus suggesting a potential direct effect of ambient cues on behaviors. Both indirect and direct paths are considered in building the research hypotheses for the present study. In general, the proposed model tests the proposition that the perceived survey research environment (S = ambient cues) will influence respondents' organismic states (O = emotional states), which then affect their response outcomes (R = response quality) (H1). Tests for direct effects of research environment on response quality are also conducted (H2).

Affect

Affect includes emotional states, specific feelings, and moods that vary in intensity and level of arousal within a given situation (AMA, 2008)[1]. The physical environment and experimental design of a research situation can evoke either positive or negative affect in a participant.

Positive Affect

Positive affective reactions to environmental situations include liking, positive evaluation, or the experience of pleasure. Research in the retail environment suggests that positive affect leads shoppers to stay longer and interact with employees more (e.g., Babin and Darden, 1995; Donovan and Rossiter, 1982; Milliman, 1986; Yalch and Spangenberg, 1993), perceive stronger store image (Darden and Babin, 1994) and form improved quality perceptions of the store's products and service levels (Baker et al, 1994; Yalch and Spangenberg, 1993). Respondents' levels of satisfaction (one measure of positive affect) with research participation have been identified as an important factor that may influence survey response rates (Manfreda et al, 2002). Based on evidence from the retail literature for improved positive affect in pleasant ambient environments, it is expected that improved positive affect will result from the presence of pleasant ambient atmosphere (H3).

Positive affect and negative affect represent independent domains of emotion; the absence of positive affect does not imply the presence of negative affect, although both may be present simultaneously. Babin and Attaway (2000) suggest that both positive affect and negative affect impact repeat shopping behavior. Specifically, negative emotions can increase consumers desire to leave a retail environment (Eroglu and Machleit, 1990), may encourage consumers to be less patient waiting for service (Baker and Cameron, 1996; Chebat et al, 1995) or be less likely to fulfill their intended purpose (Eroglu and Machleit, 1990). For decades, researchers have been concerned about the possibility of negative respondent affect due to survey participation. Negative affect has been measured via levels of respondent fatigue and respondent boredom (Bijmolt and Wedel, 1995).

Fatigue And Boredom

Fatigue is described as a mental condition caused by the continuation of a mental activity which may diminish the ability to perform (Bijmolt and Wedel, 1995). Hart et al (2005) found that survey mode influences respondent fatigue with survey tasks. Boredom is caused by the monotony of a mental task, in which the motivation to continue is decreased (Bijmolt and Wedel, 1995). Narayana (1977) proposed a "more economical" survey scale in order to reduce the risk of respondent boredom and fatigue. Previous studies also measure the level of satisfaction, fatigue and boredom that respondents experience when participating in different forms of consumer research data collection activities. In general, appropriate ambient cues can reduce negative affect (see Garlin and Owen's meta-analysis of the effects of music in retail settings, 2006). If music, aroma and/or lighting are pleasant and congruent with the environment, their presence can be expected to contribute to the reduction of fatigue and may alleviate boredom (Kellaris and Mantel, 1996). The fourth research hypothesis (H4) states this expectation.

Ambient cues can potentially serve as a *distraction* and thus increase anxiety in cognitive task situations. For example, Park and Young (1986) suggest that ambient music can distract customers from cognitive tasks. By drawing attention away from a primary cognitive task (e.g., the survey task), environmental stimuli potentially reduce the amount of cognitive effort devoted to the primary task (MacInnis and Park, 1991), and so also can be expected to produce lower levels of response quality. This position finds support in Areni's (2003) study among managers, who reported that customers who are trying to focus on mental activities are distracted by background music.

Music has been posited to interfere with cognitive processing, especially when it is *incongruent* with the environment. Individuals in a library would not expect to encounter music or ambient aromas in a library; that is, they are incongruous with expectations. For the most part, market research interviews represent cognitive tasks and

[1] http://www.marketingpower.com/

thus ambient music, lighting and/or aroma can potentially be construed as incongruent factors which have the potential to reduce levels of positive affect or produce negative affect in survey respondents. In particular, non-typical ambient music or aroma may lead to increased fatigue and thus to reduced response quality. Non-pleasing music can also lead to disinterest (boredom) which in turn is expected to reduce time spent in a survey research environment and result in poorer response quality.

Response Quality

There is potential for survey or experimental conditions to influence response quality (Bush and Parasuraman, 1985; Deutskens et al, 2006; Green and Krosnick, 2003; Knopp and Kirk, 2003; Tse, 1995). *Response quality* refers to the level of thought and effort that a respondent applies to survey questions (Bush and Hair, 1985; Hannah et al, 2005; Houston and Ford, 1976). This study considers the construct of response quality in respect to response time, completeness of answers, and item omission.

Response Time

Response time is the amount of time it takes for a respondent to complete one survey response (Bijmolt and Wedel, 1995; Weible and Wallace, 1998). Sullivan (2002) and others demonstrated that the presence of ambient music in a retail shopping environment will increase time spent in the store. In the consumer research context, this suggests that the presence of ambient music will lead to respondents spending more time completing the survey task, or participating in a group discussion (H5).

Completeness

Completeness of answers refers to the extent to which respondents provide in-depth, full, complete answers to survey questions (Bush and Hair, 1985; Deutskens et al, 2006; McCoy and Hargie, 2007). This has been measured by counting the number of words or characters used to form responses to one or more open-ended questions (McDaniel and Rao, 1980). Similarly, this study computes completeness of answer by counting the number of characters used to compose answers to all open-ended questions in the survey questionnaire. Following the expectation of greater response time under pleasant ambient conditions and/or in more positive and less negative affect states, increased response completeness for all three of these conditions is posited here (H5).

Item Omissions

Item omissions occur when respondents refuse or otherwise neglect to answer specific individual questions from a survey task (Bush and Hair, 1985). Extensive research has been conducted to compare item omission rates for varying data collection methods (Deutskens et al., 2006; Roster et al., 2007; Schmidt et al., 2005), but no articles were identified that consider the effects of atmospheric factors on item omissions in the marketing research context. It is reasonable to expect that survey respondents who are not experiencing negative affect (fatigue or boredom) will pay more attention to the survey task and omit fewer response items. Similarly, it would be expected that pleasant atmospheric environments would be conducive to the survey task and therefore would be likely to produce lower item omission rates (H5).

More time spent on a survey task may suggest more attention and thoughtfulness toward survey participation. In keeping with previous research, this measure is incorporated as an indicator of response quality, but caution is noted that increased response times do not necessarily indicate improved response quality. The literature is not clear on the directional influence of negative affect on response time. *Boredom* may lead to reduced time spent in the survey environment. If *fatigue* leads to extended completion time on a survey task, this may result in a number of possible outcomes: i) early closure of the task resulting in incomplete responses, ii) the survey task may be completed with greater care and response quality may not be compromised, or iii) there may be a mixed effect on response quality if fatigue diminishes cognitive processes even though extra time is taken in an attempt to ensure completion. Under the assumption of the M-R model and following Donovan and Rossiter (1982), it is expected that

higher levels of fatigue will lead to reduced response completeness, thus hypothesis six states that response completeness is reduced and level of omissions are higher under conditions of greater fatigue (H6).

Moderating Factors

Previous research suggests that the effects of ambient atmospheric conditions in the retail environment are quite different for male and female participants. Specifically, Knez (1995) reports that men and women present different emotional reactions to changes in indoor lighting conditions and recommends that criteria for optimal lighting conditions should take into account male and female emotional and cognitive response. The fragrance industry has also traditionally profiled different fragrances against male and female consumers. This study accordingly assesses whether gender serves as a moderating factor in the influence of ambient atmospheric environment on market research survey response quality. This is achieved via a test of the empirical model for moderation of effects by gender (H7).

Summary Of Expected Empirical Relationships

The relationships tested in the empirical model are shown in the table of experimental results (Table 1). The directions of the relationships (positive, negative, or no relationship) as reported in the literature are provided. Hypotheses for this study and expected structural path relationships are based on assumption of the M-R model and the work that has followed Donovan and Rossiter (1982).

METHOD

Experimental Design

The research hypotheses were investigated with an experiment using a 2 (low light vs. high light) x 2 (no music vs. music) x 2 (no aroma vs. aroma) between subjects factorial design. Atmospheric cues were operationalized as the "stimuli," emotional reactions as the "organism" and approach/avoidance behaviors as the "response" factors in the S-O-R model adapted from Mehrabian and Russell (1974).

Procedures

Undergraduate students at a public university were recruited to participate in a study about shopping behavior. In order to minimize hypothesis guessing and possible demand effects, participants were not told that the ambient conditions in interview rooms were being manipulated as part of the study design. Recruiters offered a choice of light refreshments as a token of gratitude for participation. The refreshments were served on a table outside the interview rooms. A small amount of course credit was given in exchange for participation in the study. Participants were assigned randomly to each experimental condition. Four interview rooms were set up over several days to create the range of eight different treatment combinations. Conditions were already present (e.g., music was playing) when participants were ushered into an interview room to complete a self administered questionnaire. No time constraints were placed on individual participants for completion of the questionnaire task. Actual time was recorded before and after each questionnaire was completed, and interviewers asked questions about affect after completed questionnaires were handed back to researchers upon exiting the interview rooms.

Stimulus Manipulations

A pretest was conducted in order to determine optimal manipulations of music, lighting and aroma conditions. Results indicated that the “brighter” light condition should use more than twice the wattage than the “normal” light condition. Furthermore, brighter lighting was favored over normal lighting. A popular retail plug-in aromatic air freshening fragrance was chosen to provide the aroma condition, and two product containers were activated in the “aroma” condition in accordance with the pretest finding that this was the level at which the aroma condition was perceptible but not overwhelming to pretest participants. In the pretest situation, the rooms with aroma present were preferred to those with no aroma. The chosen music for the no music/music manipulation was

background classical music played at low volume. While participants noticed the presence of music in the pretest situation, preference for the "background music" condition was not as clearly preferred as was the case with the brighter light and aroma conditions.

Empirical Measures

The experimental task consisted of a self completion survey questionnaire covering fourteen questions: a) seven demographic questions, b) three questions that required scale responses to five-point Likert scales (35 items overall) anchored at the extremes with opposite positions (strongly agree to strongly disagree, or extremely likely to extremely unlikely), and c) two open ended questions and one "other reason" category for free response. Question content was not related to the current study, but enabled researchers to observe actual time spent on the task, number of items omitted and completeness of written answers to open-ended questions in varying ambient conditions. After completing the questionnaire, participants completed a question about their affective state. A total of nine items were rated using a five point Likert scale, with options from "strongly agree" to "strongly disagree." Three of the items measured positive affect levels, two measured interest/boredom, and four measured level of fatigue.

Positive Affect

Positive affect was measured using three items: "I feel satisfied," "I feel pleased'" and "I feel content." Items were selected from the array of scale items used by Eroglu et al (2003), Manfreda et al (2002), Mehrabian-Russell (1974), and McGoldrick and Pieros (1998). While the term "happy" has been used more often in retail studies than the third item "content" used here, the latter was chosen here because it was considered more relevant for the market research context and has been used successfully in previous studies (cf. Bailey and Areni, 2006; Eroglu et al, 2003).

Fatigue And Boredom

Level of boredom was measured using two items: "I feel uninterested" and "I feel bored." Level of fatigue was measured using four items: "I feel fatigued," "I feel tired," "I feel exhausted" and "I feel weary." The fatigue and boredom constructs were drawn from the research study of Bijmolt and Wedel (1995) where subjects were asked to indicate their levels of fatigue and boredom, although that study employed single-item scales with scores ranging from 0 to 100. The item "uninterested" was included as an additional indicator for the boredom construct and the three items "tired," "weary," and "exhausted" were added to extend the item list for the fatigue construct in the present study following a scan of similar scales in the retail atmospherics literature.

When developing the affect measures, both the marketing research and the retail literature were consulted. The retail atmospherics literature points to the relevance of positive versus negative affect as two distinct factors. In the marketing research literature negative affect is referred to via the constructs of fatigue and boredom. Hence, affect items measured here could alternatively be classified as positive or negative affect, following the retail atmospherics literature, or as positive affect, fatigue and boredom (i.e., negative affect split into two factors) in accordance with the marketing research literature. Examination of fit using CFA with varimax rotation revealed that the three factor solution is superior to the two factor solution and demonstrates discriminant validity for three affect measures. Therefore, hypothesis testing relies on the three-factor solution to represent affect. Factor loadings are between 0.76 and 0.93 for the three items representing positive affect, between 0.83 and 0.91 for the four items representing fatigue and between 0.82 and 0.87 for the two items representing boredom. Inter-item correlations within the three measures were higher than the intra-item correlations across measures. Finally, Cronbach's alpha reliability estimates were acceptable (positive affect $\alpha = 863$; fatigue $\alpha = 0.927$; boredom $\alpha = .754$).

Response Time

Yalch and Spangenberg (1993) report that perceived shopping times present conflicting results to actual shopping times - individuals report shopping longer when listening to familiar music but they *actually* shop longer when listening to unfamiliar music. In this study, *response time* is an indicator of survey response quality, so actual

rather than perceived response time is the preferred dependent variable. Participants were asked to record on the questionnaire the exact time at the beginning of their interview and again after the questionnaire completion. *Self*-report of actual response time is chosen over *second-party* report for three reasons: 1) there were multiple interviews in progress at any time, and researchers might introduce measurement error if they were unable to attend to a participant immediately after they left the interview room, 2) participants were placed in closed rooms (to ensure the integrity of the ambient conditions) and time taken to gather their materials and personal effects after completion of the questionnaire task might differ from one individual to another without the knowledge of the researcher, and 3) the time on individual participants' watches was expected to be more consistent than time taken from the (potentially different) multiple researchers on duty before and after task completion.

Response Completeness

Response completeness has been measured in previous experiments by counting the number of words or characters used to form responses to one or more open-ended questions (McDaniel and Rao, 1980). This study accordingly computes completeness of answers by counting the number of characters used to compose answers to all open-ended questions in the survey questionnaire.

Item Omissions

Item omissions are observed as the number of unanswered questions in the self-completion survey questionnaire. Questions where a "not applicable" response was possible, such as "age of children in the household" for a respondent with no children, were excluded from the computation of item omissions.

To summarize, the *empirical model* measures the ambient atmosphere manipulations of "no music/music," representing the stimulus part of the S-O-R model. The organism variables are represented by positive affect, fatigue and boredom responses. Finally, response time and completeness outcomes represent the approach/avoidance behaviors.

Analysis

A total of 224 students completed the survey task in experimental conditions using a 2 x 2 x 2 experimental design. After the main survey task was completed, questions to confirm perceptions of the experimental manipulations were asked to ensure respondents sensed lighting, music and aroma in the manner intended. Twenty-two cases were identified where two or three ambient stimuli did not reach the perceptual threshold when present. Another nine extreme outliers for either response time or response completeness were identified and excluded from the analysis and hypothesis testing phase, leaving a final of 193 case observations for full analysis.

In the case of omissions data, the distribution of observations was almost completely flat; hence, no tests for effects on omissions were conducted. The authors suspect that a more sensitive test for observing omissions effects is needed for experimental design in a student population; this population has been specifically trained to avoid omissions, and the measurement instrument was not complex enough to allow for a distribution of omissions in a survey task which, in many ways simulated a test environment. Relatively small variance on some other effects provides for a strong test of the research hypotheses (refer Table I).

The proposed model and hypotheses were tested using structural equations modeling (SEM) since this method of analysis can support simultaneously latent variables with multiple indicators, interrelated dependent variables and mediating effects (see H1), and causality hypotheses. Structural equations can measure independent variable errors while regression analysis and ANOVA cannot (Bollen, 1989, pp. 72–73). A two-step model validation procedure was conducted that first purified the data used for the measurement model and then tested the proposed theoretical model structure (Gerbing and Anderson, 1988).

RESULTS

Overall Model Fit

Amos 16.0 statistical software was used to test the main model and two sub-models (for male and female subsamples) using the multi-group structural equation modeling technique. The main-effects model provides good fit for the data (χ^2 = 395.6, *df* = 183, p < .001). The comparative fit index (CFI = .91) is close to unity, also indicating good fit (Bentler 1990). The root mean square error of approximation (RMSEA) was examined due to the complexity of the model (numerous path relationships). The observed model RMSEA value of .05 meets the criteria for a good model fit as stated by Browne and Cudeck (1993).

Structural Path Results

In accordance with Labovitz (1968), the chosen standard for statistical significance (α = 0 .10) is adopted for assessing all structural coefficients and for testing differences between male and female consumers in the strength and direction of a given coefficient. This criterion is reasonable given the relatively small range of scores on the affect measures, and the relatively small sample size per group.

The multi-group model reported here demonstrates acceptable overall fit, but only five of the twenty seven structural path relationships tested in the overall empirical model are significant. The empirical model demonstrates remarkably different processing paths for male and female participants: relationships that reveal significant effects for males produce insignificant effects for females and vice versa. Thus, the model test confirms the hypothesis (H7) that gender moderates the relationship between atmospheric conditions, respondent affect and response quality in survey research. Consequently, model results are discussed separately for male and female outcomes. Figures 2a and 2b depict the model paths that are supported by test results for male and female participants respectively, with significant path relationships shown in bold form, and remaining posited model relationships (that were not supported) in feint form. Specific findings for path relationships are discussed in turn.

Mediation Effects: Ambient Atmosphere – Affect – Response Quality

No mediation effects are found in testing the overall model. Among males, the presence of background music resulted in reduced levels of positive affect (γ = -.284; p < .10), which in turn led to shorter response time (γ = -.742; p < .10). No significant mediating relationships were found for the effects of ambient lighting or aroma among males. Neither fatigue nor boredom served as a mediator of the ambient atmosphere – response quality relationship among males.

Females indicate mediated relationships for both ambient music (γ = .269; p < .10) and lighting (γ = -.415; p < .01) through fatigue, which then lead to longer survey response times (γ = .624; p < .10). No significant mediated relationships were found for the effects of ambient aroma among females. As with males, female survey responses to ambient atmosphere were not influenced through boredom. Females also showed no mediation effects for positive affect on the ambient atmosphere – survey response quality relationship.

These results support the first study hypothesis: atmospheric conditions in the survey research environment influence response quality among survey respondents through affect shifts (H1). However, the study only provides partial support for this hypothesis, and only when the moderating influence of gender on model tests are taken into account.

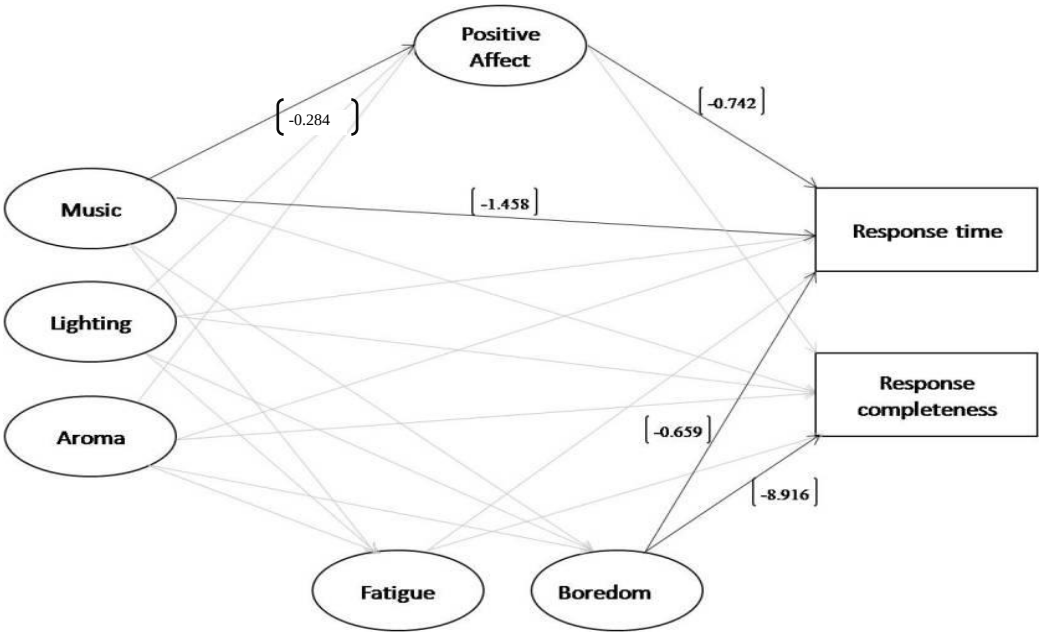
Ambient Atmosphere – Affect Relationships

Hypotheses three and four state that pleasant ambient atmosphere will lead to improved positive affect (H3) and reduced negative affect (H4) respectively. Study results do not support H3 – on the contrary, evidence is found for *reduced* positive affect in the presence of background music among men (with no mood effects for lighting and aroma), and no significant effects of ambient atmosphere on positive affect among women. Thus, the data suggest

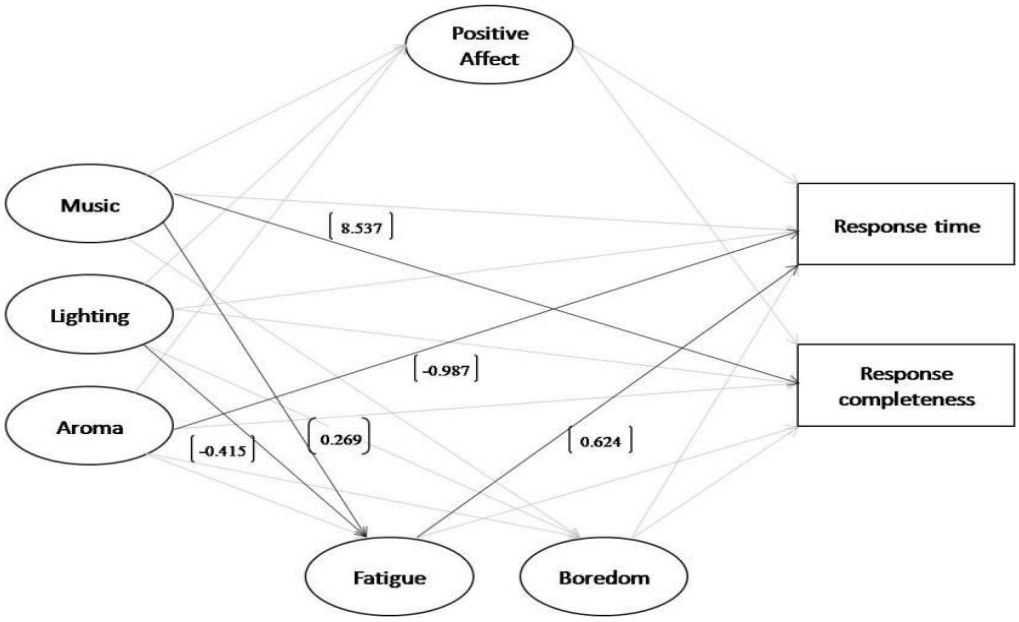
that ambient atmosphere has no effect, or a dissipating effect (background music in the case of males) on positive affect levels. While study results provide partial support for H4: supplemental ambient lighting leads to reduced fatigue among women, background music is associated with *increased* fatigue among women. No significant effects are found to suggest that ambient atmosphere has a mitigating effect on fatigue or boredom among males.

Figure 2: Observed Effects of Ambient Cues on Response Quality through Affect

a) Males



a) Females



Affect – Response Quality Effects

No support is found for the hypothesis that higher levels of positive affect will lead to improvements in response quality (H5). However, H5 cannot be fully rejected since the data demonstrates that *reduced* positive affect (among males) leads to *shorter* response times. The data provides no evidence of a relationship between positive affect levels and survey response time or completeness among females.

Fatigue was shown to produce a small increase in response time among women ($\gamma = 0.624$; $p < .10$); however, fatigue had no significant effect on response completeness. Male respondents show no evidence of a fatigue – response quality relationship (i.e., response quality or response completeness). However, a strong relationship was found for the effect of *boredom* on response quality among males, where increased boredom levels led to shorter survey response times ($\gamma = 8.916$; $p < .01$) and reduced response completeness ($\gamma = -0.659$; $p < .10$). Boredom did not influence response quality among females in this study.

Hypothesis 6 posits that response quality is improved when boredom and fatigue are reduced; however, findings reveal conflicting results between male and female respondents. As anticipated, decreased levels of response quality are observed under increased boredom and/or fatigue among *male* participants (both response time and completeness are diminished). Therefore, H6 is not rejected for males. However, *female* participants display no effects of fatigue or boredom on response completeness, and a positive effect of fatigue on response time. While findings among male respondents are consistent with our expectations, results from female respondents represent the inverse of the expected relationship for H6. Thus, H6 cannot be rejected.

Direct Effects: Ambient Atmosphere – Response Quality

A negative direct effect of ambient music on survey response time was found among males ($\gamma = -1.458$; $p < .01$) but not among females. No direct effects were found for the influence of ambient lighting among either gender group, or of aroma among males. A negative direct effect of ambient aroma on survey response time was found among females ($\gamma = -.987$; $p < .10$). Mehrabian and Russell (1974) posit that the influence of ambient environment on behaviors is mediated, and thus the model proposed here assumes no direct effects (H2). The null hypothesis is rejected because effects do occur in specific circumstances, but the data do not fully support the alternate of significant direct effects; in short, direct effects are found only for aroma on response time among women and only for music on response time among men.

Model parameter estimates are reported in Table I, which presents expected relationships, parameter estimates (along with standard errors and probabilities for confidence intervals on two-sided tests), and test outcomes versus expectations.

Discussion

Findings from the current study demonstrate that ambient atmospheric conditions can indeed influence market research response quality. Specifically, both music and lighting conditions influenced participants' mood states, which in turn affected response time and completeness of answers in a research survey. However, important differences between the paths of atmospheric effects are evident among men and women. Male study participants experience dissipation of positive mood state in the presence of background music during survey tasks, and then take longer to complete the survey. This finding suggests that background music serves as a distraction, causing cognitive interference in a survey research environment as mentioned in the literature review. Had the results shown that men spent less time completing the survey task when positive mood is eroded by interference from background music, one might conclude that men are more likely to withdraw from the research environment if positive affect erosion occurs, as suggested by the M-R model. However, male respondents spent more time completing the survey task when experiencing reduced positive affect. This suggests that extra effort is needed in order to complete the survey task when background music introduces cognitive interference in the survey environment.

Table I
Model Path Relationships and Results

		Path Relationship				Original Model				Male				Female			
		Literature			Expected Direction	Parameter Estimate	S.E.	P<		Parameter Estimate	S.E.	P<		Parameter Estimate	S.E.	P<	
H1	***Atmospheric conditions in the survey research environment influence response quality among survey respondents through shifts in affect state.***																
	General studies	+	0	-	+												
1	a. Music --> Affect --> Response Quality	+	0	-	+	The main-effects model provides a good fit for the data: CMIN/df = 2.16; CFI = .91; RMSEA=0.05											
	b. Lighting --> Affect --> Response Quality	+			+												
	c. Aroma --> Affect --> Response Quality	+	0		+												
H2	***Atmospheric conditions in the survey research environment directly influence response quality.***																
	General studies	+	0	-	0												
2.1	a. Music --> Response Time	+	0		0	-0.861	0.407	*0.03*	*	-1.458	0.545	*0.01*	*	-0.246	0.587	*0.68*	
	b. Lighting --> Response Time	+	0		0	-0.29	0.405	*0.47*		-0.87	0.544	*0.11*		0.419	0.582	*0.47*	
	c. Aroma --> Response Time	+	0	-	0	-0.434	0.399	*0.28*		0.168	0.536	*0.76*		-0.987	0.571	*0.08*	*
2.2	a. Music --> Completeness of Answers	+	0	-	0	3.251	3.316	*0.33*		-1.409	4.374	*0.75*		8.537	5.131	*0.1*	*
	b. Lighting --> Completeness of Answers	+	0		0	1.954	3.296	*0.55*		0.167	4.364	*0.97*		1.515	5.09	*0.77*	
	c. Aroma --> Completeness of Answers	0	-		0	2.726	3.254	*0.4*		3.855	4.304	*0.37*		0.251	4.991	*0.96*	
2.3	a. Music --> Item Omissions	+	0		0	The distribution of observations was almost completely flat in the case of omissions data, so no tests for effects on omissions were conducted.											
	b. Lighting --> Item Omissions	+	0	-	0												
	c. Aroma --> Item Omissions	+	0		0												
H3	***Pleasant atmospheric conditions in the survey research environment result in improvements in positive affect state.***																
	General studies				+												
3	a. Music --> Positive Affect				+	-0.243	0.113	*0.03*	*	-0.284	0.153	*0.06*	*	-0.224	0.164	*0.17*	
	b. Lighting --> Positive Affect				+	-0.163	0.113	*0.15*		-0.211	0.152	*0.17*		-0.077	0.163	*0.63*	
	c. Aroma --> Positive Affect				+	-0.035	0.113	*0.76*		-0.037	0.153	*0.81*		-0.083	0.163	*0.61*	
H4	***Pleasant atmospheric conditions in the survey research environment result in reductions in negative affect state.***																
	General studies																
4.1	a. Music --> Fatigue	-			-	0.158	0.129	*0.22*		0.096	0.193	*0.62*		0.269	0.164	*0.1*	*
	b. Lighting --> Fatigue	-			-	-0.24	0.129	*0.06*	*	-0.109	0.193	*0.57*		-0.415	0.164	*0.01*	*
	c. Aroma --> Fatigue	-			-	-0.055	0.129	*0.67*		-0.014	0.194	*0.94*		-0.085	0.164	*0.6*	
4.2	a. Music --> Boredom	-			-	0.132	0.109	*0.23*		0.028	0.185	*0.88*		0.192	0.153	*0.21*	
	b. Lighting --> Boredom	-			-	-0.104	0.106	*0.33*		-0.185	0.188	*0.33*		-0.069	0.115	*0.55*	
	c. Aroma --> Boredom	-			-	0.125	0.109	*0.25*		0.12	0.187	*0.52*		0.181	0.149	*0.22*	
H5	***Higher levels of positive affect in survey respondents lead to improvements in response quality.***																
	General studies																
5	a. Positive Affect --> Response Time	+			+	-0.294	0.292	*0.31*		-0.742	0.396	*0.06*	*	0.245	0.42	*0.56*	
	b. Positive Affect --> Completeness of Answers				+	2.853	2.376	*0.23*		0.959	3.157	*0.76*		3.973	3.684	*0.28*	
	c. Positive Affect --> Item Omissions				-	No tests for effects on omissions were conducted (see above).											
H6	***Reductions in levels of negative affect in survey respondents lead to improvements in response quality.***																
	General studies																
6.1	a. Fatigue --> Response Time	-			-	0.209	0.237	*0.38*		0.005	0.296	*0.99*		0.624	0.376	*0.1*	*
	b. Fatigue --> Completeness of Answers	-			-	-0.876	1.929	*0.65*		1.615	2.37	*0.5*		-5.083	3.286	*0.12*	
	c. Fatigue --> Item Omissions	+			+	No tests for effects on omissions were conducted (see above).											
6.2	a. Boredom --> Response Time	-			-	-0.58	0.313	*0.06*	*	-0.659	0.391	*0.09*	*	-0.665	0.495	*0.18*	
	b. Boredom --> Completeness of Answers	-			-	-6.895	2.59	*0.01*	*	-8.916	3.294	*0.01*	*	-5.245	4.31	*0.22*	
	c. Boredom --> Item Omissions	+			+	No tests for effects on omissions were conducted (see above).											
H7	***Gender effects moderate the relationship between atmospheric conditions, respondent affect, and response quality in survey research.***																
	Overall multi-group model fit statistics (see H1) support this hypothesis, and gender differences in tests of path coefficients provide further confirmation.																

Female participants presented a different affective response to background music in the survey environment than their male counterparts. The presence of background music led to increased levels of fatigue among women which in turn led to longer survey response time. This finding is congruent with the finding reported among males; both support the proposition that background music serves as a distraction to survey respondents thus interfering with cognitive processing. Thus, it would appear that background music does not contribute to the survey process or environment. While this may indeed be the case, a different picture emerges when considering the strong observed direct effect of background music in producing more complete survey responses among women. One explanation for this is that ambient music contributes to cognitive enrichment (Mitchell et al, 1995), thus enhancing cognitive processing and enabling more complete survey responses. This view suggests that background ambient music facilitates cognitive processing in the survey environment, in direct contrast to the earlier position that ambient music is distracting to survey respondents.

An interesting implication of these two contrary findings is that background music may indeed contribute to cognitive enrichment up to the point where it becomes distracting, whereafter it interferes with cognitive processing. Individuals' tolerance for distraction may vary and males may experience distraction at lower thresholds than females, which would explain the contradictory findings for male and female consumers. Thus, the influence of music on cognition among women in the current experiment appears to operate at pre-cognition levels in accordance with emotion-cognition models (Zajonc and Markus, 1984), producing benefits to response quality, while male respondents may make cognitive assessments of affective response to the same background music, possibly due to its distracting effect on cognitive processes, in accordance with the cognition–emotion school of thought (Lazarus, 1991). The distraction effect is not peculiar to male respondents. While women demonstrate a strong positive direct effect for background music on survey response completeness (suggesting cognitive enrichment), a simultaneous weaker mediated effect of music in lengthening response time through increased fatigue (possibly due to distraction effects) could indicate individual differences that are related to distraction thresholds. The affective response to distraction among men and women in this study is quite different. Men show diminished positive affect levels when distracted, while women show increased fatigue as a result of distraction. In both cases, distraction leads to extended response time through respondent affect shifts in the presence of music. In general, this study is one of the early attempts to observe the influence of survey environment on response quality, and the literature on ambient music is complex – extensive research is needed to investigate the nature of ambient music and the various ways it could be applied to improve the overall research experience rather than simply survey response time.

All three stimulus conditions, i.e., ambient music, lighting and aroma, influence female participants in this experiment. In contrast, only music influences the mood state of male participants. Among female survey respondents, supplemental ambient lighting is associated with reductions in levels of fatigue but ambient music appears to heighten fatigue. Thus, music and lighting together serve to influence levels of fatigue (albeit in opposite directions) and their net atmospheric effect leads to longer survey response times. The impact of separate atmospheric effects on response time cannot be isolated here – they operate in concert to influence respondent behavior (Babin et al., 2003; Ward et al., 1920). It is probably more realistic to test multiple atmospheric cues together in the research environment, but studies that consider gradations of the qualities of a specific ambient influence (such as music) might call for separate experimental studies to tease apart specific effects. Women in this study also show evidence of a direct effect of aroma on response quality but no mediated effect through mood shifts. Contrary to expectations, female participants spent less time in the survey environment in the presence of ambient aroma than when no aroma was present. Previous research has shown mixed results for tests of aroma on duration of outcome behaviors (e.g., shopping). Several explanations are possible for the findings of this study. First, the aroma could have been "too intense" or "unpleasant," leading to avoidance behavior (shorter response times) in accordance with the "inverted u" shaped relationship between intensity of ambient cue (aroma in this case) and perceived pleasantness. Pretest findings do not support this scenario – pretest respondents preferred the "aroma condition" to the "no aroma condition" and did not find the aroma intensity to be overwhelming. Thus, avoidance behavior is not indicated. Alternatively, the ambient aroma could contribute to the creation of a more complex environment, where arousal is heightened, and cognitive processing is more effective, thus requiring shorter response time. These authors caution that the complexities of identifying and modulating appropriate aromas are great – unequivocal guidelines cannot be articulated on the basis of a simple bi-level manipulation such as was applied here.

Nevertheless, this study does demonstrate the potential for ambient aroma to influence survey response quality, and further research is indicated.

The authors point to two very interesting additional findings: 1) the strong observed relationship between boredom and response quality among men, and 2) the different affect paths that influence men and women. First, the data do not support the expectation that ambient environmental cues will reduce boredom and therefore enhance survey response quality. No ambient condition tested (music, lighting or aroma) influenced boredom levels in a significant manner among male or female participant groups. However, a significant effect of boredom on response quality is observed among men. When boredom levels increase, both response time and (especially) completeness decline. This finding supports the marketing research literature where effects have been reported for respondent fatigue and boredom when participating in research studies. Second, the locus of emotion reported here is different for men and women. Men show significant effects related to dissipation of positive affect and increased boredom levels, while women present effects through fatigue. These findings are beyond the scope of this study, but raise interesting questions for future research. Is this suggestive of a "Men are from Mars" (Gray 1993) paradigm, or an artifact of gender differences in expression of emotion? Both questions provide fertile opportunity for future research into mental models of research response, or consumer affect orientation in general.

Despite the fact that many model parameter estimates do not confirm expected relationships in accordance with the dominant theoretical framework from the literature on retail atmospherics as examined by Mehrabian Russell (1974) and other scholars, the empirical model tested here does provide a good fit for the study data. Important evidence is provided for an ambient environment → affect shift → response quality relationship in the marketing research survey environment. This study serves as a springboard for the development of a stream of research that investigates the potential for marketing research scholars and practitioners to enhance survey response quality by managing the quality of the survey environment.

Limitations And Future Research

The study reported here is limited in scope. Response to the simple presence or absence of three ambient atmospheric conditions is measured in the market research survey environment. However, the nature of ambient atmosphere is highly complex and the appropriate mix of ambient conditions and qualities of each condition (e.g., light intensity or color) will require study over an extended time in order to understand the optimal range of ambient cues to employ in enhancing the survey environment, the fine tuning of attributes of various components of ambient atmosphere (e.g., tone of music), or the placement of ambient conditions within the interview process (e.g., should pre-interview or waiting conditions be considered as well as conditions during the interview task?), to name but a few potential areas of inquiry.

Model test results are dependent on the chosen experimental stimuli and manipulations of those stimuli. In this study, classical background music was played, normal room lighting levels were varied by presenting twice the normal wattage level for the "high" ambient condition, and a popular home fragrance was purchased at retail to introduce ambient fragrance to the experimental environment. Although stimuli were screened to ensure that they reached the perceptual thresholds of consumers from the demographic to be studied, and was not seen as "unpleasant" to them, the test outcome might have differed if participants had completed the experimental task under different music, lighting or aroma conditions. The potential for observing effects of ambient atmosphere is only as strong as the experimental manipulations and measures, and much work is still needed on both manipulations and affect measures. Replication studies that consider a wide range of ambient atmospheric conditions and their effects on cognitive task performance, such as in the survey research environment in particular, should be undertaken especially since the nature of the market research survey task is very different from the shopping or entertainment experiences, where previous work on atmospherics has been reported in the marketing literature.

Further research into the ideal set of response quality measures is also important. Here, the actual time taken to complete the survey task was observed. While this was the appropriate measure for observing changes in cognitive function, perceived time may also be an important measure of the survey participation experience. The

measurement instrument was designed to provide for the counting of words in responses to a single open ended question. It may be preferable to allow for greater variation in response opportunities (a few open ended questions, or a storytelling task, or list construction task) in order to derive a more sensitive measure of response completeness.

Participants in this study were full time college students who are primed to avoid omissions when completing forms (e.g., exam or application forms). Consequently, all participants completed the task, and no variance was observed in the number of omissions on survey questionnaires, rendering the data on response omissions insensitive to manipulations of ambient atmospheric conditions in this study. Test instruments for future studies should include a range of opportunities for omissions errors to enhance measurement sensitivity.

The findings reported here highlight a number of important questions concerning market research survey experiences in general. First, test results confirm that fatigue and boredom are important considerations in survey design: they can lead to reduced response quality, and they can contribute to consumer unwillingness to participate in survey research in the longer term. Ongoing research is needed to minimize fatigue and boredom in survey research, and to identify approaches that will optimize respondent experience with survey participation.

The literature on atmospherics in the retail environment has been developed over a long period, but this is the first known study of atmospheric effects in the survey environment. The experimental design reported here drew heavily from the findings in retail studies to formulate hypotheses, models and measures for the current study, yet the nature of the consumer experience in survey participation is very different from consumer shopping experiences. Different measures and models are called for to fully explain the influence of atmospheric conditions in a research environment, and this study serves to provide an array of potential questions and challenges to be addressed by future research.

CONCLUSION

This study provides an empirical verification of the potential for ambient atmosphere to influence response quality in the market research survey environment. While men only responded to background music, women responded to all three atmospheric conditions tested here – i.e., supplementary lighting, background music and aroma. Among men, background music has the potential to reduce positive affect and then to result in less time being spent on survey completion. Among women, fatigue levels are influenced by background music (increased fatigue) and supplementary lighting (reduced fatigue) and these ambient cues together lead to extended time spent on survey questionnaires. Direct effects are found for aroma on survey response time and for music on response completeness among women. Further research is warranted to explore the potential for introducing ambient atmospheric cues to improve the survey experience for consumers, and to optimize response quality in a time of declining survey response rates and negative consumer opinions regarding market research survey participation.

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