Development of Consumer Study in Retailing with Visual Technology: A Demand-Side Research Agenda

Sandra S. Liu*, Robert Melara**, Raj Arangarasan***, and Kyung Jae Lee****

Overview

In this project, the research team developed a new research methodology to allow an objective measurement of the cognitive and psychophysical reactions of consumers to structural changes within realistic store settings. The research methodology combines a new tool of immersive virtual reality display, built recently in the Purdue Envision Center, with a set of objective and subjective measurements of the consumer experience. The virtual display is a photorealistic rendering of a virtual mall and store, which was developed through stereoscopic rendering technology. Within this virtual environment, participants navigated through a virtual mall and engage in various shopping tasks (e.g., purchasing items from a predetermined list, browsing merchandise, comparing brands and prices, etc.). During this exploration, a set of objective variables was measured, including navigational path, type and accuracy of intended purchases, time of purchase deliberation, and biases in purchase decisions. After the store exploration, participants were surveyed for details of their usual shopping habits and their recent experience in the virtual store. Together, the objective and subjective measures provided a full picture of buying habits within a tailored shopping environment. This approach differs from previous use of static measures in existing research by enabling dynamic manipulation of specific aspects of the physical environment (e.g., store layout and merchandizing) and real-time monitoring of its effects on the purchasing behavior of different consumer types. The project demonstrates systematic changes in shopping behavior as a function of test conditions. The results confirm the validity, flexibility, and power of this new research methodology.

Background

Recent research on store and service environments (Turley and Milliman 2000; Lam 2001; Massara 2003; Ng 2003) has underscored the powerful role that a physical setting has in affecting the shopping experience, and the probability of a consumer making a purchase. Point of Purchase Advertising Institute's (POPAI's) (2001) study of consumer buying habits suggested that 70% of decisions about what to buy happen at the point of purchase, a figure that divides into 60% unplanned purchases and only 10% planned purchases (i.e., planned on the product but not the brand). Such results suggest that numerous marketing opportunities can be derived from understanding how store space characteristics influence purchase decisions. Indeed, individual atmospheric variables (e.g., music, layout, color, lighting levels, advertising, odors,

- *** Purdue University, West Lafayette, IN 47907, or arangarasan@purdue.edu
- **** Simon Fraser University, Surrey, BC V7P2V7, or wayfindingcow@yahoo.com

^{*} Purdue University, West Lafayette, IN 47907, or liuss@purdue.edu

^{**} Purdue University, West Lafayette, IN 47907, or melara@psych.purdue.edu

product display, etc.) demonstrably affect the outcome of a shopping trip, including the volume of purchases made (Milliman 1982; Park, Iyer, and Smith 1989), the rate of purchasing (Bellizzi and Hite 1992), the proportion of unplanned purchases (Iyer 1989; Park, Iyer, and Smith 1989; Donovan et al., 1994; Heilman, Nakamoto, and Rao 2002), the time spent in the store (Areni and Kim 1993; Spangenberg, Crowley, and Henderson 1996), the judgments of brand (Akhter, Andrews, and Durvasula 1994), the perceptions of price (Smith and Burns 1996; Babin, Hardesty, and Suter 2003), and the quality of merchandise (Baker et al., 2002).

A variety of techniques have been used to investigate the influence of a physical environment on shopper activity. For instance, researchers often use written descriptions of a setting to elicit a reaction from a surveyed consumer (Gardner and Siomkos 1985; Akhter, Andrews, and Darvasula 1991). More often, though, visual stimuli are presented in various forms to manipulate a store environment, either in the form of static pictures (Hui and Bateson 1991) or 2-D videos that navigate the viewer through the store (Baker, Levy, and Grewal 1992; Baker et al. 2002). These techniques enable the researcher to obtain measures of end-state behavioral processes, including the total number of sales or the total number of unplanned purchases. In addition, these techniques provide ease of stimulus manipulation and tight stimulus control. Another technique, focused on obtaining on-line tracking measures of shopping behavior, monitors shopping activity in an actual store environment in relation to where physical parameters (e.g., layout of products or shelves) are changed to reflect particular scenarios.

The objective of this study is to combine the stimulus control of the laboratory approach with the external validity of the field study. We achieved this by performing structural manipulations of store environments within a virtual reality system, by collecting a variety of objective measures of shopping behavior within that environment, followed by measures of the consumer profile and experience in the environment. The application of virtual reality systems to the study of advertising and consumer behavior has recently attracted the attention of researchers (Holbrook and Kuwahara 1999). Cause for introspection into virtual reality systems is due to them being extolled for their ability to achieve a high degree of vividness, clarity, realism, and depth in stereoscopic three-dimensional images, both in the visual displays presented to consumers and in later depictions of results intrinsic to data analysis. It should be noted that while these systems have recently garnered attention, existing approaches have in general continued to utilize traditional static approaches.

Burke et al. (1992) discussed various methods for obtaining good stereoscopic rendering. They recommended that the closer the simulation matches actual physical environment in terms of (a) product categories in which purchases are based, (b) the visual size of products, and (c) the physical navigation through the shopping space, the higher the validity of consumer choices in virtual environments in eliciting normal shopping behavior. The visual technology utilized in this project was developed to

optimize the match in essential characteristics of human perception between real and virtual store environments, thereby allowing participants to attain an immersive shopping experience similar to that of actual stores.

Virtual systems offer several advantages when analyzing purchasing patterns, which include research efficiency, strong environmental control, design flexibility, and maximal power of parametric statistical tests. Needel (1998) detailed these advantages in his description of Visionary Shopper, a virtual reality supermarket created by Simulation Research, Inc. First, virtual systems allow the rapid testing of a large sample of research participants. In our initial feasibility study, forty-five participants were tested in overlapping one-hour sessions within two days, improving efficiency, and the costs associated with research testing were substantially reduced. A second virtue is strong environmental control. Each participant views the identical store environment, including the number and type of items on each shelf, regardless of what items were purchased by previous shoppers. Such tight control fosters a rigorous evaluation of the physical environment, including the effects of missing sale items, shelf crowding, or sub-optimal product organization. A third virtue is design flexibility. Large-scale changes to the store environment, such as the physical layout of large store fixtures, can be created, tested, and compared effortlessly. Equally, small-scale changes, such as pricing or the arrangement of items on a shelf, can be examined for their effects on sales and ease of shopping. Finally, virtual systems are useful in maximizing the power of parametric statistical tests. Evaluating a single shopper in multiple settings (i.e., the "within-subject" statistical designs) can be employed to reduce the total number of respondents needed to achieve statistical significance. The current project sought to exploit each of these virtues in assessing the effectiveness of our new approach, which combines an attractive and realistic virtual environment with precise measures of shopper interaction within that environment.

Development of the Research Methodology

The research methodology developed in this project involves three parallel phases: (1) creation of the virtual environment and simulation, (2) creation of a set of objective measurements of consumer behavior and psychophysical measurements of the shopping environment, and (3) development of a set of subjective measures of the shopping experience. Collectively, these three elements form our research to explore consumer-environment interactions.

1. Virtual Environment and Simulation

Three steps were required to generate a photo-realistic virtual mall (Figure 1) and store environment (Figures 2 and 3):

• Photography in high-resolution digital images of the products, aisles, architectural layouts of an actual mall, and a local store.

- Construction of three dimensional photorealistic models of the virtual environment and all of the selectable products.
- Development of the algorithms and tools for visualizing, navigating, and manipulating the virtual environment within a large immersive display system, while tracking the momentary spatial path taken by the consumer during navigation and purchase.

Figure 1. View of the virtual shopping mall.

Figure 2. View of inside the virtual shopping store.



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Figure 3 Close-up of view of aisle in the virtual shopping store.

Cooperation with local retailers was essential in providing unfettered access to the mall and store to enable photographs to be taken of the storefronts and each of hundreds of individual store items. The construction of photorealistic models was the most labor intensive of the three steps, requiring hundreds of hours from computerassisted design technicians. One of the many techniques, created in the third step, is a location measure that permits moment-by-moment tracking of the consumer's position during each shopping excursion. Raj Arangarasan, and his research team from the Envision Center, further developed visualization, monitoring, and tracking techniques for characterizing the route consumers take in searching for items on a shopping list. This route, called the actual path, can be compared with an optimal path, computed using a Minkowski metric (e.g.,Euclidean or city block), to determine the navigational efficiency of each participant.

Participants in the study viewed the completed store and mall in a stereoscopic rendering display using special polarized glasses. Stereoscopic rendering is a graphical technique that creates two slightly different views of a scene, fused together by the human visual system to give a three dimensional appearance (i.e., perception in depth). There are several ways to achieve the stereoscopic effect. One common way is to polarize the light in different directions (passive stereoscopic rendering). In this technique, left and right eye image pairs are shown separately on the display screen with different polarizations. For example, as shown in Figure 4, the first (left eye) image is displayed with a vertical polarization and the second (right eye) image with a horizontal polarization. The glasses have corresponding polarizations, allowing each eye to see only the image that matches its polarization. We used circular polarization to achieve the stereoscopic rendering in the immersive tiled display wall. In contrast to linear polarization, where light waves are polarized in a linear fashion (see Figure 4, top), circular polarization splits light waves in circular fashion (see Figure 4, top).



Figure 4. Linear and Circulat Polarization.

Circular Polarizer

Stereoscopic vision is thus achieved on the basis of clockwise or counter-clockwise circular polarization. Circular polarization has the advantage of allowing the participant to tilt his or her head while still being able to see the rendered images in stereoscopic display.

2. Objective and Psychophysical Measures

The virtual reality system developed with the present methodology facilitates three objective measures of shopping behavior: location (mentioned above), response time, and derived measures of accuracy, which can be evaluated in separate statistical analyses for effects of any environmental manipulation. In this report, only the results with accuracy measures and response time measures were evaluated. The response time measures include: (1) inter-purchase latency – the time lag between selections in the shopping task, and (2) dwell time – the time spent within a region or over a product. The raw accuracy measures include: (1) hit rate (i.e., rate of making planned purchases), defined as the probability of selecting a designated product, and (2) false alarm rate (i.e., rate of making unplanned purchases), defined as the probability of selecting a designated product, and the rate of missing items that one planned to buy, equals 1.0 (i.e., rate of missed purchase =

1-p[hit]). Hit and false alarm rates were subjected to signal-detection analysis (Green and Swets 1966; Macmillan and Creelman 1990) to derive two indices of consumer behavior: (1) Sensitivity in selecting items on the shopping list (measured as d'), and (2) Subjective bias in the pattern of selection behavior (measured as β). Sensitivity indicates the degree to which shoppers complete purchasing their planned items. Bias refers to the tendency of shoppers to be conservative (purchasing less) or liberal (purchasing more) in their shopping habits.

In addition, five psychophysical measures were made for the store environment. In our approach, we regress the objective signal detection measures on each of these five psychophysical measures. (1) Path efficiency is the difference between the actual path and the optimal path. One possible result is that impulse buying, as reflected in false alarm rates, will increase as the deviation between actual and optimal paths increases. (2) Perceptual competition of items. It is a measure that was taken by independent judges who assessed color contrast and salience of items relative to their nearby counterparts on the shelf. This term is an inverse surrogate of perceptual competition. We believe that the greater the perceptual competition, the lower the shopping sensitivity (i.e., more difficulty in finding the intended item). (3) Positioning of items. It refers to how the items are placed on the shelf whether in the vertical or horizontal direction. Products located at eye level, for example, are more apt to catch consumers' attention, and require less time to locate. Thus, central positioning should be related positively to sensitivity, as measured by d'. (4) Product homogeneity. It is defined as the number of SKUs included within a given space (e.g., in a single fixture). We calculate homogeneity using a variant of the Herfindall Index (a measure of concentration of market shares), that is, the number of SKUs and product faces in a fixed amount of space. We believe that sensitivity (d') will vary inversely with homogeneity. (5) Brand familiarity of the shopper. It represents how familiar the shoppers are with the products on the shopping list. Familiarity with the brand, or overall category knowledge, should influence the shopping task by reducing search time. It should, therefore, exert a positive influence on d'.

3. Subjective Measures

To determine consumer profiles, and to provide a record of the participants' reactions to their shopping experience in the virtual store, we developed a set of questionnaire items that were administered to the shopper after they had been tested in the store. Other existing scales were also used for measuring a consumer's experience (Zeithaml 1985), spatial anxiety (Lawton 1994), and perceptual curiosity. The appendix contains the entire exit questionnaire from our initial feasibility study. Below, we summarize the results obtained with specific items from this survey. The questionnaire contains items about the participants' opinions on virtual shopping (e.g., "In the future, I could see using virtual shopping as a substitute for visiting a real store"), items about their experience in the virtual store (e.g., "I shopped in the virtual store using the same approach I use when shopping in a real store"), items about their general approach to shopping (e.g., "I usually find great pleasure in shopping"; "I love to browse when

shopping"), and items about their views on navigating through space or perceptual curiosity (e.g., "I like to discover new places to go"). We also asked questions about the shopper's knowledge of specific products. Our strategy of coupling an in-depth exit interview, with objective measures of actual shopping behavior, allows us to go beyond descriptive or inferential investigations to identify individual basis for purchase decisions.

Research Method

A group of college students was recruited to navigate through the virtual store and to provide feedback on their virtual shopping experience. They were asked to select and purchase a predetermined set of items. The students took two separate trips, once with the shopping list before them (Perceptual Condition) and once with the shopping list in memory (Memory Condition). The small sample size of forty-five participants, and the selection bias of mostly male college students, precludes us from drawing substantial conclusions about shopping preferences or purchasing behavior. Nevertheless, the results of our study demonstrate the utility of our approach as a powerful technique for investigating buying activity.

Participants

Forty-five volunteers (nine women, thirty-six men) from the Purdue University participated in the study for course credit. All observers had normal or corrected-to-normal acuity as assessed by self-report. The nature of the procedures was explained fully, with consent from each participant. The Institutional Review Board of Purdue University approved the protocol.

Stimuli, Apparatus, and Procedure

Participants interacted with a virtual environment modeled from a regional shopping mall (see Figure 1). The virtual mall was projected on a tiled display wall in the Purdue University's Envision Center. The task of participants was to navigate through the virtual mall to a discount store (see Figures 2 and 3) where they were asked to find and select items from a shopping list under a time limit. The store layout was in a grid format. Two conditions were tested. In one condition, participants were given eight minutes to find and select six items printed on a list that was available to them throughout the shopping trip (Perceptual Condition). In the second condition, participants were given two minutes to memorize a list of six purchases and had to find and select the items from memory in eight minutes (Memory Condition). The Perceptual condition always preceded the Memory condition. Shopping items were drawn randomly on each excursion from a list of 138 selectable products in the store.

To view the mall and store in 3-D, participants wore a pair of stereo glasses (polarized glasses for passive stereoscopic display), attached with a tracking device to sense head movement. They also held a wand, a specially designed spatial six degree-of-freedom

navigational tool, to select items and to navigate through the virtual environment. The head tracker and wand conveniently enabled participants to adjust the speed and direction of movement, to turn their head independently of body movements, and to adjust elevation to shelf height, all of which are critical elements to smoothly navigate the shopping environment. The wand also enabled participants to select or deselect items for purchase, which appears in a "shopping basket" at the top of the viewing field. Participants were able to achieve proficiency in navigation and selection within a brief period of training in the use of the head tracker and wand.

Throughout each excursion, two 3-D spatial trackers monitored the position of participants' head and hands, respectively. Measurements were made from participants' navigational path, length of time to reach and search for specified items, and accuracy (errors of omission and errors of commission) of the selections. The experiment involved a single one-hour session. During the first half of the session, participants first learn to navigate the system and then to complete the two shopping excursions (conditions). In the second half, participants were asked to complete a series of surveys on their experience and shopping habits (see appendix). Participants then were debriefed on the purposes of the study.

Results

Objective Measures

The z-transformed accuracy measures, hit rate, false alarm rate, and the signal detection statistics, d' and β , were separately subjected to a one-way repeated-measures analysis of variance (ANOVA), with the two levels of condition, perceptual and memory, as factors. Sensitivity was larger in the perceptual condition, with equal contributions from hits (which were larger in the perceptual condition) and false alarms (which were smaller in the perceptual condition). The miss rate (1-p[hit]) was significantly greater in the memory condition, however, this effect was offset by an equal change in the false alarm rate. In other words, shoppers who missed selecting the target item in the memory condition falsely selected another item. This tradeoff between misses and false alarms kept the response bias equivalent across the two conditions.

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Figure 6. Scatter plot of inter-purchase latency (abscissa) and shopping criterion (ordinate) in the memory condition, with least-squares regression line.



InterPurch II

To further examine the role of shopping bias in purchase behavior, we performed a regression analysis on the time between purchases on the bias measure, separately in the perceptual and the memory condition. We examined the lag time between product selections, separately, for when participants had the shopping list on hand, and when they were asked to purchase items from the list by memory. The results are shown in Table 2. We found that the more conservative the shopping tendencies (i.e., the greater the reluctance to purchase), the greater the lag between purchases. Figures 5 and 6 depict the relationship between inter-purchase latency and shopping bias in the perceptual and memory conditions, respectively.

Subjective Measures

We performed a factor analysis on questionnaire items concerned with participants' usual shopping behavior. One factor surfaced in this analysis: the degree to which consumers usually shopped for enjoyment versus need. This factor allowed us to divide our participants into recreational or utilitarian shopper types. Interestingly, the recreational consumers in this study demonstrated a more efficient use of their shopping time than their utilitarian counterparts. Our ability to identify consumer profiles will be valuable in studying (in a larger sample) the variability in shopping behavior according to intrinsic classes of consumers.



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Table 3.	Question	naire item	s analyzed	in Figure	7.
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- Item #1 I shopped in the virtual store using the same approach I use when shopping in a real store.
- Item #2 It was difficult for me to remember all of the items on the shopping list.
- Item #4 It was easy to learn how to navigate through the virtual store.
- Item #6 I felt under pressure in this experiment to complete the shopping trip on time.
- Item #7 The task used in this experiment was unrealistic of normal shopping behavior.
- Item #9 I had trouble selecting an item once I had found it in the virtual store.
- Item #10 In the future, I could see using virtual shopping as a substitute for visiting a real store.
- Item #11 I had no problem turning myself around inside the virtual store.
- Item #13 Moving in the virtual environment made me feel dizzy.
- Item #14 I found the items according to their order on the shopping list, rather than according to their loacation in the virtual store.
- Item #15 The layout of the virtual store aided me in finding the items on the list.
- Item #17 The task of navigating in the virtual store distracted me from the task of shopping.
- Item #18 The items on the shopping list were easy for me to find in the virtual store.
- Item #19 I used the signs in the virtual store to identify which aisles to travel down.
- Item #21 I had trouble reading the labels on the items in the virtual store.
- Item #22 I often was disoriented in navigating through the virtual store.
- Item #23 I felt that this experiment was an enjoyable shopping experience.

Participants' responses to the questionnaire provided a glimpse into their attitudes toward shopping within a virtual reality environment. Figure 7 shows a summary of the results from a subset of the questionnaire items (see Table 3 for the exact items).

Conclusions and Future Research

In this project, the research team was able to develop a fully functional virtual shopping environment to evaluate ongoing shopping behavior within a variety of settings. We were able to develop, test, and analyze two objective measures (d' and β) and a series of psychophysical measures for the purpose of specifying shopping outcomes. Research from this initial development phase demonstrates the practicality and scientific usefulness of this approach.

We demonstrated systematic changes in shopping behavior as a function of test conditions. For instance, in one manipulation, we found that the success in meeting shopping goals was directly related to the number of shopping items remembered. The study highlighted unique advantages of testing shopping behavior within a virtual reality system, for we were able to capture the precise participants' travel path while concurrently monitoring their real-time decision making processes. This virtual reality approach to studying consumer behavior will allow us to explore, with regard to each of the objective measures, interactions among various physical factors, such as store signage, store layout designs (i.e., grid, free-form, and racetrack), and product arrangement.

The preliminary results were limited by the size and selectivity of our sample. Nevertheless, we demonstrated that, at least for these participants, shopping in a virtual environment could be an easy-to-learn and enjoyable experience. The study also enabled us to examine participants' reactions when they failed to complete purchases on the shopping list. There have been few academic or industry studies that focused on deviations from purchasing plans (Block and Morowitz 1999; Kollat and Willet 1967; POPAI 1995; Underhill 1999). Moreover, such studies (Iyer and Ahlawat 1987) rarely evaluate the rate of missed purchases from a shopping list.

In our study, we introduced several new objective measures in retail analysis, and collaborated with fields such as communications, engineering, and perceptual psychology. One of these measures is shopping bias or criterion, which is the tendency of consumers to make or refrain from making purchases. This measure, labeled β , depends positively on the number of unplanned purchases (the false alarm rate) and negatively on the number of missed purchases (the miss rate). In our preliminary study, we found that whenever shoppers forgot to purchase items from their memory, they substituted unplanned purchases at an equivalent rate. We look forward to repeating this study to see if the results apply to actual purchases and a wider sample of participants.

As super centers and lifestyle centers are currently revolutionizing the nature of retail service, improving store design becomes an important issue for center owners and real estate developers. Previous studies have reported significant relationships between physical elements of a store and consumer behavior, preferred store attributes, and shopping orientations (Bellenger and Korgaonkar 1980; Darden and Ashton 1975), in-store experiences and shopping motives (Arnold and Reynolds 2003; Dawson, Bloch, and Ridgway 1990), and accuracy of way finding and knowledge of products or shopping environment knowledge (Everett 1996). In addition, the physical design and layout of a store is one of the most important determinants of store loyalty (Merrilees and Miller 2001) and customer satisfaction (Simonson 1999). Grewal and Baker (1994) note, for example, that the store layout affects consumers' acceptability of price, which positively relates to purchase intentions (Baker, Grewal, and Levy 1993). The virtual reality versions of a retail environment, developed in this project, may facilitate the investigation of the relationship between the structural environment and momentary purchasing behavior.

An essential objective of a future study is to identify the physical parameters and store atmospherics that lead to increased time spent within the store, accompanied by increased buying, and trade-ups in product selections. Our paradigm contains measures to identify reasons for consumers' willingness to buy, or conversely, reasons for consumers' decision not to buy. Causal factors and decision patterns will naturally vary by shopper profile. Identifying these profiles in our follow-up interviews, and linking them with actual on-line shopping behavior measured objectively, our paradigm can be used to develop more accurate predictive models of environmental variables that best encourage specific types of consumers to be attracted to a shopping space, maximize enjoyment of the shopping experience, and instigate purchases and thus maximize sales.

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Appendix

Exit Interview Questionnaire

Subject #:		
Date:		
Time:		
Your Gender	М	

- 1. _____ is the average number of minutes that I spend in a supermarket or department store on any given shopping trip.
- 2. _____ is the average number of trips I make to the supermarket each week.

F

3. _____ is the average number of supermarkets and department stores I visit each week.

The Shopping Experience

Please respond to the following statements by circling one of the numbers, 1-7, where 1 means "definitely untrue", 7 means "definitely true", and 4 means "neutral".

1------7 definitely definitely true untrue

- 1. I shopped in the virtual store using the same approach I use when shopping in a real store.
- 2. It was difficult for me to remember all of the items on the shopping list.
- 3. I usually find great pleasure in shopping.
- 4. It was easy to learn how to navigate through the virtual store.
- 5. Normally, I love to shop with no particular list in mind.
- 6. I felt under pressure in this experiment to complete the shopping trip on time.
- 7. The task used in this experiment was unrealistic of normal shopping behavior.
- 8. When I shop, I like to find items quickly and check out as soon as possible.
- 9. I had trouble selecting an item once I had found it in the virtual store.
- 10. In the future, I could see using virtual shopping as a substitute for visiting a real store.
- 11. I had no problem turning myself around inside the virtual store.
- 12. I usually take a list with me when I go shopping.
- 13. Moving in the virtual environment made me feel dizzy.
- 14. I found the items according to their order on the shopping list, rather than according to their location in the virtual store.
- 15. The layout of the virtual store aided me in finding the items on the list.
- 16. I love to browse when shopping.

- 17. The task of navigating in the virtual store distracted me from the task of shopping.
- 18. The items on the shopping list were easy for me to find in the virtual store.
- 19. I used the signs in the virtual store to identify which aisles to travel down.
- 20. When I shop, I tend to impulse buy.
- 21. I had trouble reading the labels on the items in the virtual store.
- 22. I often was disoriented in navigating through the virtual store.
- 23. I felt that this experiment was an enjoyable shopping experience.
- 24. Shopping is fun.
- 25. Grocery shopping takes up too much time.

Grocery shopping is important.

Measuring your familiarity with brand names

Below are listed the six items that you were asked to shop for. For each item, please indicate how familiar you are with brand name. Please rate the brand, not the item itself (e.g., rate how familiar you are with the Heinz brand, not how familiar you are with ketchup).



Have you seen the product before?

Here again is the list of items you shopped for in the virtual store. For each item, rate how often you remember having seen this specific product on the shelf of a supermarket, pharmacy, or department store.

	17			
	never	sometimes	always	
	see it	see it	see it	
•				
•				
•				
•				

Your Spatial Anxiety

Please judge how anxious you get under each of the following situations.

12		7
not at all	moderately	extremely
anxious	anxious	anxious

- 1. Leaving a store that you have been to for the first time and deciding which way to turn to get to a destination.
- 2. Finding your way out of a complex arrangement of offices that you have visited for the first time.
- 3. Pointing in the direction of a place outside that someone wants to get to and has asked you for directions, when you are in a windowless room.
- 4. Locating your car in a very large parking lot or parking garage.
- 5. Trying a new route that you think will be a shortcut without the benefit of a map.
- 6. Finding your way back to a familiar area after realizing you have made a wrong turn and become lost while driving.
- 7. Finding your way around in an unfamiliar mall.
- 8. Finding your way to an appointment in an area of a city or town with which you are not familiar.

Your Perceptual Curiosity

Please read each statement below and check the box that best applies.



- 1. I like to discover new places to go.
- 2. I like to travel to places I have never been to before.
- 3. I like visiting art galleries and art museums.
- 4. I like to visit a park I have never been rather than one I know well.
- 5. When I see a cave I want to explore the inside of it.
- 6. I enjoy viewing an art display and many interpretations of a single theme.
- 7. I like to listen to new and unusual kinds of music.
- 8. When I hear something rustling in the grass I want to see what it is.
- 9. I like exploring my surroundings.
- 10. When I smell something new I wish to find out what the odor is coming from.
- 11. When I look at a work of art I wonder what inspired the artist.
- 12. When I hear a strange sound I try to find out what caused it.
- 13. I would like to learn more about other cultures.
- 14. I enjoy trying different kinds of ethnic foods.
- 15. I enjoy walking through interesting buildings.
- 16. When I hear a musical instrument I like to see it.
- 17. When I see a new fabric I like to touch and feel it.

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