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Original Article

EVOLVED FORAGING PSYCHOLOGY UNDERLIES SEX DIFFERENCES IN SHOPING EXPERIENCES AND BEHAVIORS

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Abstract
This study documents that men and women experience and perform consumer shopping differently, and in ways consistent with adaptations to the sexually dimorphic foraging strategies utilized during recent human evolution. There is an abundant literature on sex differences in spatial abilities and object location that follow from the specific navigational strategies associated with hunting and gathering in the ancestral environment. In addition to sex differences in navigational strategies, the unique features of hunting and gathering may have influenced other aspects of foraging psychology that underlie sex differences in modern male and female shopping experiences and behaviors. Scales were developed to assess several aspects of shopping psychology that may be based on sexually differentiated ancestral adaptations. Results generally confirmed the predicted directions of sex differences. Compared to men, women relied more on object oriented navigation strategies and scored higher on skills and behaviors associated with gathering, the degree to which shopping is seen as recreational, the degree to which shopping is a social activity, and the tendency to see new locations as opportunities for shopping. Men scored higher on skills and behaviors thought to be associated with hunting. Most effect sizes were moderate or strong. These results suggest that shopping experiences and behaviors are influenced by sexually divergent adaptations for gathering and hunting.

Keywords: Evolution, sex differences, hunting, gathering, consumer behavior, shopping

Introduction

Evolution by natural and sexual selection is the unifying theory of the life sciences. Evolutionary theory provides the ultimate explanation for the structure and purpose of biological phenomena. In recent decades, research based in evolutionary

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theory has generated a considerable contribution to the behavioral sciences. The academic market share of the evolutionary approach is increasing (see Fisher et al., 2009). As behavioral scientists, market researchers may benefit from understanding and integrating knowledge of the ancestral selection pressures and evolved psychological adaptations which guide human behavior.

Evolutionary Psychology and Consumer Behavior

Until the 21st Century, the evolutionary framework was virtually non-existent in the study of consumer behavior (Saad, 2006). This omission is noteworthy and paradoxical because consumer products and marketing practices reflect an implicit view of human psychology that is remarkably similar to that espoused by the evolutionary approach (Colarelli & Dettman, 2003). Although unspecified as such, the accordance with evolutionary theory may have emerged from the selection of market forces, where marketing strategies consistent with evolved preferences and attributes were adopted simply because they were relatively more effective than other approaches (Colarelli & Dettman, 2003). Two recent books address evolutionary psychology and consumer behavior. Saad (2006) provides a synthesis of previous research detailing the relationship between our evolved psychology and consumer behavior and Miller (2009) proposes that costly signaling for mate attraction underlies consumerism.

Shopping as Foraging

In current foraging and horticultural cultures, a large portion of daily activity revolves around finding and preparing food (e.g., Hill & Hurtado, 1996). In modern societies, much less time is spent on food acquisition and preparation. Modern humans still devote considerable time and effort to foraging, although the foraging context is now in the settings of shopping malls, grocery stores, and Internet sites (Hantula, 2003).The psychological adaptations which developed in our ancestral foraging environments may now influence the experiences and behaviors of current foraging in the modern consumer environment (Colarelli & Dettman, 2003).

Within ancestral environments, it is likely that men were predominantly the hunters and women were predominantly the gatherers (Lee & DeVore, 1968). Caring for vulnerable infants likely interfered with women's potential for hunting activities (Hurtado, Hill, Kaplan, & Hurtado, 1992). These are aggregate tendencies, as men sometimes gather (Halpern, 1980) and women sometimes hunt (Noss, 2001). The sex reversal in activities usually take place under special conditions, such as male gathering when meat is scarce during the dry season, and these men often specialized in carrying heavy loads rather than searching for food (Halpern, 1980). In environments where food is more abundant and less seasonal, males gatherer proportionally more so than in more scarce and seasonal environments (Marlowe, 2007). Women do not hunt as often as men, and usually hunt more reliable small game when caloric return is relatively high compared to gathering alternatives (Noss, 2001). For example, Agta women in central Africa hunt in groups with nets for small game, and do not hunt when they have infants, a limitation that men do not face (Noss, 2001). It is important to recognize that evolution by selection does not require or imply absolutes; there will often be a few examples that contrast with the general pattern. Therefore, in general men tend to hunt and women tend

to gather, but there are exceptions. These exceptions, as seen in the above example, can often be understood when taking in the socio-ecological context of the group.

Sex Differences in Navigation Strategies

There is an abundant literature on sex differences in spatial abilities and object location which is consistent with the specific navigational strategies associated with hunting and gathering in the ancestral environment (see Silverman & Choi, 2005). Sex differences in spatial ability are among the most reliable and robust of psychological differences (McBurney, Gaulin, Devineni, & Adams, 1997). Sex differences in spatial abilities have been proposed to stem from these pervasive and longstanding sex differences in the propensity of hunting versus gathering behavior.

Silverman and Eals (1992) posited the hunter-gatherer theory of spatial sex differences, which states that this division of labor has led to sexually differentiated spatial abilities, such that men are better able to use abilities advantageous to hunting and women are better able to use abilities advantageous to gathering. Tracking animals involves very distinct abilities from foraging for plant material, and given that these tasks are sex-specific, women and men have, over time, differently developed in terms of their spatial ability. Research on spatial abilities is consistent with this premise; men are, on average, better at measures of map reading and wayfinding (e.g., Silverman et al. 2000), whereas women are, on average, better at measures of object memory and location memory (Silverman & Eals, 1992). Cross-culturally, men consistently perform better on measures involving the orientation of oneself in relation to objects or places, such as with mental rotation (Silverman, Choi & Peters, 2007). They also generally perform better than women on tasks related to mental transformations of oneself in relation to movement across a geographic plane, such as accurately pointing to a place of origin (Dugo & Erkip, 2000), regardless of whether these tasks occur in the real-world of in virtual worlds (e.g., Tlauka, Brolese, Pomeroy, & Hobbs, 2005). These skills would be highly useful in recalling the location of oneself in relation to the animal being tracked and to other important geographic features. Hunting often means traversing over unfamiliar territory while following one's prey, and then needing to take an efficient and direct route back to home with the meat. Similarly, the ability to recall the identity of objects, as well as their location, would be highly useful for gathering vegetative matter. Vegetative matter might be only seasonally available, and remembering what item was available in a specific location might be useful in the following seasons.

A recent study examining sex differences in foraging navigation abilities is particularly relevant to our evolutionary model. New, Krasnow, Truxaw, and Gaulin (2007) proposed that fruits, vegetables, and other traditional gatherable foods trigger gathering-specific spatial adaptations which are especially well developed in women. Using a farmer's market for the experimental setting, they provided evidence that women have better memory for the locations of gatherable foods and that accuracy is enhanced for foods that are higher in nutritional value. Women were more accurate than men in pointing the straight line direction to various food locations. The results suggest that foraging context may moderate sex differences in Euclidean navigation abilities.

Euclidean Versus Object-Oriented Navigation Strategies

Research on Euclidean navigation shows that a sex difference emerges in strategies women and men use to find a destination. Women often report that they rely upon object oriented navigation with landmarks and relative directions for routes, whereas men tend to rely on Euclidean navigation with cardinal directions and distance (Lawton, 1994; Lawton, & Kallai, 2002). This sex difference in the use of object oriented versus Euclidean navigation also appears when participants are asked to give directions to a specific destination (Choi & Silverman, 1996). In general, males report using, or when giving directions they rely upon, an orientation strategy where they determine their position in the environment and use the most direct route to get to the destination. In comparison, women use a route strategy comprised of the relative location of landmarks.

The demands on one's spatial ability required by hunting likely encourage the development of Euclidean navigation strategies. Travel across a wide-ranging area would benefit from attention to global referencing points, such as the direction North, rather than specific landmarks, because the former remain in a fixed location (Lawton & Kallai, 2002). In contrast, gathering vegetation would rely upon an awareness of the local environment, and the ability to recall the placement of objects within that local context.

It is important to note that the context under which one selects an object-oriented or Euclidean strategy matters. Choi et al. (2006) found that men used shorter routes than women to return to a point of origin when asked to do so. However, there were no sex differences in the ability to retrace the original route taken to reach a destination, nor differences in the distance one travels if freely allowed to choose a route, nor any difference in the extent to which the original route was relied upon. Therefore, the issue is not that there is a sex difference in ability to get to a destination, but rather in how one actually gets there. In general, even though there was no sex difference in retracing a route or getting to a destination, women relied more upon landmarks and relative directions to navigate a route, but for men there is seldom a reliance on such markers.

Gathering Skills and Behaviors

Although the general public may associate Pleistocene era food production with spear wielding hunting parties pursuing megafauna, the majority of calories were likely derived from gathering, just as they are in current foraging societies (Burenhult, 1995; Hill & Hurtado, 1996). Females may seek the foods that are most reliably available as this may be the best strategy for feeding their offspring (Marlowe, 2007). Frequent daily trips are made in search of fruits, vegetables, nuts, and tubers. Gatherers might search across generally familiar locations, or may need to venture further when available resources are scarce. Vegetation gatherers would search for patches of food sources, especially rich ones that have higher proportions of ripe, nutrient dense specimens.

Many vegetable species consumed by humans show distinctive characteristics such as size, shape, smell, color, and of course, taste, when ripe for consumption. Gatherers select, via personal examination, those in the best available condition for consumption. The genes that enable trichromatic (color) vision are located on the X-chromosome, which is why women are less likely to be color blind than men as they have an extra copy to compensate for deleterious mutations (Jordan & Mollon 1993). Women are more sensitive to pinks, reds, and yellows than men (Hoyenga & Wallace, 1979; McGuinness & Lewis, 1976), colors which correspond to ripening fruits and vegetables.

One may encounter a patch where the food is not quite ripe, and one may pick the ripe specimens and leave the others to be harvested later. Given that this source will remain in the same spot over time, in situations such as these, one would benefit from remembering the location of the patch and the temporal trajectory for maturation (McBurney, Gaulin, Devineni, & Adams, 1997). Certain species mature at reliable times during the year, others are usually present, and still others may be cyclical, regenerating in a reliable period of time after being harvested. These patterns would encourage greater attention to temporal trends and seasonality specific to particular species. Among the Hadza, gatherers alter their diet to focus on specific resources, depending on what is in season (Hawkes, 1996).

Foraged edible plants are usually consumed within the family; they are less likely to be shared outside the family than hunted meat (Halpern, 1980; Hawkes, 1996). Therefore, given that meat is shared, men's reproductive success (i.e., the number of descendents who survive and reproduce in turn) would benefit from their reputation as being very successful hunters (Bird, 1999; Hawkes, 1996), much more so than female reputations would benefit from being known as better than average foragers. Furthermore, given that women are feeding their families and a food patch might not have enough to share with those not closely related; women may keep knowledge of productive patches to themselves.

Gathering skills and behaviors that are useful in vegetation foraging may influence modern consumer shopping techniques. We propose that individuals who have highly developed gathering related preferences and abilities would make frequent shopping trips, and prefer in-person examination of items they are purchasing. Given that ripe food would be considered more valuable than non-ripe items, and that such a preference has evolved over time, we further contend that the qualities of items, such as color and texture would be considered especially important when selecting an item for purchase. These individuals would pay particular attention to seasonal trends in styles, and would be more likely to know when certain types of items usually go on sale, as this would be the optimum time for consumption. While shopping for an item, they may notice other desirable products which are currently relatively costly (i.e., not at the optimum time for harvesting), and return to buy it when it is likely to be on sale. Lesser known stores that provide particularly good foraging (i.e., rich patches of resources) may be kept secret, and individuals may decline to reveal where they procured unique and attractive items. The authors contend that these abilities are sex-based, such that women will exhibit more proficiency at shopping behaviors resembling gathering. There is evidence that women seek more information than men when searching for products, comparing prices and features and reading the signs in the product display area. In contrast, men try to get shopping over with quickly by requesting assistance from store clerks (Laroche, Saad, Browne, Cleveland, & Kim, 2000).

Hunting Skills and Behaviors

Whereas gathering is a daily activity, hunting tends to have a periodic rhythm, where men might hunt for three days straight but then not hunt again for another two weeks (Halpern, 1980). Whereas gatherers are likely to visit multiple patches, hunters could encounter a pack of prey species, or a smaller number of individuals from larger species that would provide adequate meat for the group. Large kills would be preferable to capturing more of smaller prey individually, as this would reduce foraging time. A

large kill could also provide meat for several days, forestalling the need for hunting until further in the future. Focusing on large game may reduce the overall success rate, as compared to catching numerous smaller preys, but it can provide higher daily averages in caloric return (Hawkes, 1996). Returning with large kills could also confer higher social status (Bird, 1999); men who are successful hunters have more mating opportunities (Hawkes, 1996).

Meat recovered from hunting trips is shared amongst the group, providing an advertisement of hunting prowess (Hawkes, 1996). Presumably this increase in status is why Ache hunters often attempt to bring home larger prey, even when there is a less efficient return on effort (Hill & Hurtado, 1996). Hunting large species is often a cooperative endeavor, as large game animals could attack and overpower individuals and/or escape before being killed. Note that male specialization in hunting is not solely related to mating effort, as flexibility in male foraging strategies suggests that foraging is a cooperative effort where men complement the foods produced by their partners (Marlowe, 2007).

Shopping as Recreation

Gathering vegetable foods was a necessary frequent activity. Those who enjoyed it may have been more productive and more reproductive. Women report enjoying shopping more so than men and are more involved in shopping activities (Fischer & Arnold, 1990). For example, 78% of respondents to a survey about Christmas shopping (Laroche, Saad, Browne, Cleveland, & Kim, 2000) and 73% of respondents to a survey about food shopping were female (International Mass Retail Association, 1993). Men would be more likely to want to obtain the resource and return as quickly as possible, as there are drawbacks and few advantages to expending more time than necessary to bring back adequate amounts of meat.

From an evolutionary perspective, women might be more likely to see shopping as a recreational activity because it represents an opportunity to meet potential mates who presumably have money to spend. Due to historical constraints on women's ability to accrue wealth and resources, they prefer mates with resources or who display personality traits related to the accruement of wealth, such as ambition and industriousness (Buss, 1989). Presumably, individuals who are in a shopping venue have money to spend on items, and thus, women could be inadvertently investigating potential mates. Shopping might also be seen as a chance to increase one's mate value, in that clothing can visibly improve one's appearance and attractiveness. Given that physical attractiveness is more of a priority for women than men, in that men place much more importance on how women look than vice versa (e.g., Buss, 1989), shopping might directly link to efforts women make to better themselves. Furthermore, shopping locations, such as malls, represent safe places for women because they are public locations and often have some form of security to monitor problems. As Dogu and Erkip (2000) review, shopping is a chance for women to take a break from their daily routines, and malls in particular are safe and controlled environments in which they can relax alone, with friends, or with children.

Shopping as a Social Activity

Gathering is much more conducive to socialization than is stalking game. Hadza hunters are usually solitary, but will form tracking parties if one hunter discovers particularly abundant game (Hawkes, 1996). Although men may use the necessity of hunting trips as an opportunity to socialize, once the actual hunting is underway it becomes much more of a silent, pragmatic activity. Keeping quiet is much less important when stalking vegetables. Thus gathering is more conducive to socialization, and gatherers could converse to pass the time during this routine activity. Moreover, women might still socialize when not foraging because in foraging cultures women tend to spend their days in the company of other women and children (Hawkes, 1996). In addition, gathering was a more frequent activity than hunting and consequently, the larger allocation of time to gathering provides more opportunity for socialization.

One may counter that women's propensity for socialization is due to the larger role they played in child care, but these are not mutually exclusive explanations. Gathering is much more conducive to child care, as the trips are over smaller distances for shorter periods of time (Hill & Hurtado, 1996; Lee & DeVore, 1968). Gathering activities have less need for social control and coordination than hunting, and do not require rapid chases where dependents would be impediments. Women are expected to be more likely than men to view shopping as a social activity.

New Areas as Shopping Opportunities

In ancestral societies gathered food was probably needed and eaten on a more regular basis than hunted meat. When groups venture into novel areas, food sources may be relatively less exploited. Anthropological sources note that shortly after a foraging group arrived in a new area, women would go out to gather (Hawkes, 1996). Therefore, we propose that there will be sex differences in how readily individuals explore new shopping venues. Eating meat is not critical for short-term sustenance, and when entering new areas men may be more concerned with assessing potential threats and establishing a security perimeter, as conflict with other hominid groups was the predominant ecological threat throughout much of our recent history (Alexander, 1979).

Hypotheses

We have summarized the differential attributes of gathering and hunting foraging strategies in Table 1, our categorization should be interpreted as differences of degree, rather than polar opposition for many attributes. The current study elaborates on how psychological adaptations to sexually dimorphic foraging strategies arising over the course of human evolution may result in different shopping experiences and behaviors in modern male and female shoppers. In addition to sex differences in navigational strategies, the unique features of hunting and gathering may have influenced other aspects of foraging psychology that result in sexually dimorphic shopping patterns.

The sexually divergent adaptations for gathering and hunting may be evident in reports of shopping experiences, as shopping could be considered a form of foraging in the modern consumer environment. Although these adaptations originated for activities related to food production, we expect them to generalize to a wider range of consumer products. Women will rely on object oriented navigation strategies more so than

Euclidean navigation strategies, whereas men will demonstrate the opposite pattern. Women will report shopping strategies and experiences that resemble gathering skills and behaviors more so than men. Men, in turn, will report shopping strategies and experiences that resemble hunting skills and behaviors to a greater degree than women. Additionally, women will see shopping as both recreational and socialization events more so than men, and should be more likely to see newly encountered areas as opportunities for shopping.

Table 1. Proposed differential attributes of gathering and hunting

Attribute	Gathering	Hunting
Sex	Mostly by women	Mostly by men
Distance	Smaller range	Larger range
Navigation	Landmarks	Cardinal directions, distance
Frequency	Daily	Periodic
Location	More familiar & routine	More variable
Regeneration	Patches regenerate	Prey are mobile
Quantity	Multiple patches	Large kills preferable
Quality	More attention to detail	Less attention to detail
Time taken	Benefits from browsing	Return quickly after kill
Seasonality	More complexity	Less complexity
Sharing	Not shared outside kin	Shared outside kin
Social status	Little benefit	Benefits social status
Socializing	Conversation opportunity	Silent, pragmatic
Child care	Fairly easy	Difficult

Methods

Participants

Undergraduate students (N = 467, 298 females and 169 males) at two large Mid-Western American public universities and who were enrolled in introductory psychology classes participated in an institutionally approved on-line survey at their convenience. The higher number of female participants is due to their higher levels of enrollment in psychology courses. Participants' mean age was 19 years old (SD = 1), with a range from 17 to 26 years old. Participants reported their ancestries as Western European (46%); Eastern European (24%), East Asian or Pacific Islander (8%), African-American (4%), Latino/Latina (3%), South Asian (3%), Native American (2%), Middle Eastern/Arab (1%) and Other (8%). The vast majority (91%) of participants were born in the United States or Canada. Participants described their religious affiliation as Catholic (35%), Protestant Christian (17%), Jewish (13%), Hindu (2%), Orthodox Christian (2%), Muslim

(1%), Buddhist (1%), and Other (11%); 19% of participants indicated that they did not have a religious affiliation. Other than these demographic variables, no potentially identifying information was recorded.

Materials and Procedure

Seven scales were developed to assess sex differences in shopping experiences and behaviors consistent with ancestral foraging patterns: Euclidean navigation strategies, object oriented navigation strategies, gathering skills and behaviors, hunting skills and behaviors, shopping as recreation, shopping as socialization, and new areas as shopping opportunities. Items pertaining to Euclidean navigation strategies were designed to contrast with items pertaining to object oriented navigation strategies. Although the contents of the scales were qualitatively distinct, scores on gathering skills and the associated behavioral items were expected to contrast with hunting skills and the associated behavioral items. Because women were expected to score higher on the remaining scales, at least one reverse scored item was included in each of these scales to assess tendencies to choose higher scores across items regardless of the content.

Euclidean navigation strategies items included: When in a large unfamiliar shopping center, I try to get my bearings (e.g., figure out where I am in relation to other shops or the entrance) as quickly as possible; I can often remember exactly where I entered a store, and can easily figure out how to get back to that entrance, even without retracing my steps; I navigate my way around stores by thinking about where a department is located in relation to the general layout of the store. Object oriented navigation strategies items included: I can often remember exactly where certain products are in a store based on what they are near; I can usually find my way around an unfamiliar store because I know what types of products are usually near each other; I navigate my way around stores by the items I see along the way. Several parallel navigation style items were created. For example, items included "If a friend asked me where to find an item in a large store, I would first tell them what department to go to, and where that department is located" for Euclidean navigation and "If a friend asked me where to find an item in a large store, I would give directions in terms of what items they'll see along the route" for object oriented navigation.

Gathering skills and behaviors items included: I like to see a large assortment of colors and styles, and then I can pick the one(s) that are most like what I want; I sometimes remember an expensive item that I like, and go back when I know the store is having a big sale; When I decide on an item I want, I carefully inspect the ones available to get the one in the best condition. Hunting skills and behaviors items included: I like shopping better when I am looking for something big (a substantial purchase like a computer or car) rather than lots of little things; I try to organize shopping trips so I can get lots of things in one trip rather than having to go several times; When I am going shopping for a big item, I like to have help from friends.

Shopping as recreation items included: I feel good after I've been shopping; The experience of shopping is at least as important to me as what I end up buying; When I shop, I try to go in and get what I want as quickly as possible (reverse scored). Shopping as socialization items included: When my friends and I get together, one of the things we like to do is go shopping; Being with friends is one of the important parts of shopping for me; I prefer to shop alone (reverse scored). New areas as shopping opportunities items

included: When I go to a new city for the first time, I like to check out what stores are there and what they have; If I was on vacation in a foreign country, I would make sure to check out their stores; When I am on vacation, shopping around for things is not a priority (reverse scored).

For this study, the instructions read: "Please read the following statements about shopping and indicate the degree to which they describe you. Please remember that there are no right or wrong answers, we are interested in how YOU feel about shopping." Participants selected an option ranging from 0% to 100% in increments of 10%. Missing data resulted in unequal sample sizes across scales.

Data from the Euclidean navigation strategies and object oriented navigation strategies scales were analyzed with a 2 (type of navigation) X 2 (participant sex) Analysis of Variance (ANOVA) for Mixed-Designs. Data from the gathering skills and behaviors versus the hunting skills and behaviors scales were analyzed with a 2 (type of foraging) X 2 (participant sex) ANOVA for Mixed-Designs. Interpretation of these results was assisted through the computation of 95% confidence intervals for scale scores for each sex. Sex differences in scores on shopping as recreation, shopping as socialization, and new areas as shopping opportunities scales were examined with independent samples *t*-tests.

Results

All scales except for hunting skills and behaviors demonstrated good or excellent inter-item reliability (see Table 2). Reverse scored items demonstrated a significant inverse relationship in every within-scale pair-wise correlation. There was a significant main effect for type of navigation, $F(1,412) = 90.17$, $p < .001$, partial $Eta^2 = .180$, and a significant interaction between participant sex and type of navigation, $F(1,412) = 20.31$, $p < .001$, partial $Eta^2 = .041$. The overall sex difference only approached significance, $F(1,412) = 3.59$, $p = .059$, partial $Eta^2 = .009$. Overall, participants were more likely to report using Euclidean navigation strategies. There was a weak tendency for males to rely on Euclidean navigation strategies more so than females; however the pattern of effects was largely driven by females reporting reliance on object oriented navigation strategies to a greater extent than males.

Table 2. Scale descriptives

Scale	Number of items	Cronbach's alpha	Effect size (*d*) of sex difference
Shopping as recreation	8	.851	.84
Gathering skills and behaviors	14	.861	.80
Shopping as socialization	5	.856	.75
New areas as shopping opportunities	4	.720	.61
Object oriented navigation strategies	10	.813	.52
Euclidean navigation strategies	8	.747	-.09
Hunting skills and behaviors	6	.518	-.28

Note: Effect sizes for the behavioral sciences are small, $d = .20$, medium, $d = .50$, and large, $d = .80$ (Cohen, 1988). Positive values indicate higher scores for females.

There was a significant interaction between participant sex and type of foraging, $F(1,424) = 102.67$, $p < .001$, partial $Eta^2 = .195$. The overall sex difference was also significant, $F(1,424) = 10.46$, $p < .001$, partial $Eta^2 = .024$. Females had higher scores overall, however scores exhibited a classic cross-over interaction where females scored higher on gathering skills and behaviors and lower on hunting skills and behaviors than males. Females utilized gathering skills and behaviors more so than hunting skills and behaviors, and males utilized hunting skills and behaviors more so than gathering skills and behaviors.

There were significant sex differences in the predicted direction for all remaining scales. Female respondents scored higher on shopping as recreation, $t(455) = 8.65$, $p < .001$, shopping as socialization, $t(457) = 7.70$, $p < .001$, and new areas as shopping opportunities, $t(459) = 6.27$, $p < .001$. Effect sizes indicated that the sex differences were moderate to strong.

Discussion

This paper examines consumer navigation strategies in light of sex-specific evolutionary adaptations for foraging. The introduction reviews the existing literature pertaining to sexually dimorphic resource acquisition strategies that were shaped during the course of human evolution. The available literature suggests that men have historically, and contemporarily in hunter-gatherer societies, provided meat by way of hunting, whereas women have provided vegetative matter through the act of gathering within the local vicinity. This division of labor resulted in the development of sex-specific spatial abilities, such that men are generally better at mental rotation, whereas women are generally better at object and location memory tasks (e.g., Silverman, Choi, & Peters, 2007). The current paper extends this literature and proposes that these differences influence other aspects of foraging psychology that are evident in contemporary shoppers.

It is well accepted that humans do not simply develop new behaviors for every new situation we encounter but instead modify or extend existing behaviors to suit the new situation. Thus, the behaviors we exhibit in a modern and recently developed (i.e., with respect to an evolutionary timeframe) shopping mall, should be based on previously developed behaviors and skills. We believe, and study findings support this belief, that modern shopping behaviors are an adaptation of our species' ancestral hunting and gathering skills.

In general, the data support the study's hypotheses. When reflecting upon past shopping experiences, women more so than men reported that they relied on object-oriented navigation strategies. This finding was predicted because object-oriented navigational strategies are considered to more effectively support foraging (McBurney, Gaulin, Devineni, & Adams, 1997). Women also scored higher on skills and behaviors associated with gathering, even though the gathering has been abstracted to a modern consumer shopping environment. Thus, there is evidence that women's role as gatherers continues to exist even though the environment and the objects being gathered have changed with respect to our ancestral environment. Also as predicted, men scored higher on skills and behaviors associated with hunting. Thus, even though the prey is now an expensive home theatre system, men are still applying the skills that were developed to obtain meat in a hunter-gatherer environment.

For the most part, contemporary stereotypes of women in modern industrial countries perceive women as enjoying shopping more than men. Our research provides evidence that this popular stereotype exists because most shopping activities have a greater similarity to women's traditional activities of foraging and gathering than they do to men's traditional activity of hunting. The results of our study show that shopping has significantly more in common with gathering than it does with hunting.

Women, more so than men, view shopping as more recreational and as a more social activity. In part, this difference could exist because women are, in general, more social than men. For example, in online environments women perform more social networking and tend to have more friends on average (Rapleaf Business Press, 2008). However, women are also more likely to relocate to a new community on the request of their mate (Towner, 2002). Thus, women will need to socialize to obtain information regarding the best local sources for specific resources. There is additional support for this view in that women also have a greater tendency, than do men, to view new locations as opportunities for shopping. As migrant women have a high need for socialization in order to obtain emotional support, assistance with childcare, and obtain other information (Preston & Man, 1999) and because gathering is highly time consuming due to the need for frequent daily trips in non-industrial societies (Hill & Hurtado, 1996), it is natural for these activities (i.e., socialization and foraging) to be performed in concert.

In contrast to the moderate and strong sex differences seen with the other scales, the male bias for Euclidean navigation strategies when shopping was quite weak. Modern shopping centers have shorter distances, more systematic layouts, and more straight lines of transit compared to the natural environments of ancestral foraging. Perhaps these factors enable women to use Euclidean navigation strategies more so than under foraging conditions. The distances and complexity of layout may be insufficient to generate male advantage. It is also possible that in a fully indoor environment a lack of cues such as position of the sun and direction of the prevailing wind prevent men from effectively applying a Euclidean strategy. Women demonstrated superior Euclidean orientation in a small but complex foraging environment. Perhaps even a shopping mall is too small for male advantage, considering that this advantage was developed to enable the chasing of prey over many miles (New, Krasnow, Truxaw, & Gaulin, 2007). Finally, it may be that men have not spent sufficient time within a shopping mall to obtain the local information needed to perform Euclidean orientation. Appleyard (1969) suggests that complex navigation strategies (e.g., use of a cognitive map) develop over time as familiarity with a locale is developed.

Consumer phenomena are related to multiple sets of adaptations and could not be accounted for by a single evolutionary selection pressure. Both men and women may purchase products in an effort to enhance their mate value, women using clothing or other ornamentation to enhance physical attractiveness, and men using costly items as a display of economic potential. There is a growing literature examining sex differences in why people shop and what people shop for using an evolutionary theoretical framework (for a review, see Saad, 2007). This paper focuses on explaining sex differences in how we shop, and why these differences are consistent with sex-specific evolved psychological adaptations. We also do not claim to provide a comprehensive overview of the foraging literature, as this would require a book length manuscript. As in many areas, there may be multiple citations for specific points; we do not claim to arbitrate amongst competing claims. We do not attempt to address every aspect of foraging, e.g., men tend to fish more

than women although fishing shows less sex specificity than hunting or gathering (Marlowe, 2007).

It must be noted that cultural and social norms likely impact on people's shopping experiences and behaviors, and the authors are not ruling against these influences. For example, with regards to navigation, it is quite possible that girls have fewer opportunities than boys to engage in activities that develop directional skills. Dogu and Erkip (2000) propose that women might be encouraged to shop more during their development, and thus, they view stores or malls differently than men and pay particular attention to objects, as stores revolve around the displaying of items. These authors propose that men, in contrast, might have more opportunities to develop their skills during other activities that happen outside of buildings, such as driving, and were not encouraged to the same extent during development to go shopping. Such explanations are certainly worth exploring and can be viewed in concert with an evolutionary perspective. However, explanations of this nature do not allow for a deeper, ultimate examination of sexually dimorphic abilities. Sex-specific differences have been found cross culturally (Silverman, Choi, & Peters, 2007) and regardless of past childhood experience (Lawton & Kallai, 2002), which indicates that there is likely an evolutionary component to navigation.

Understanding how people shop, and the differences in shopping behavior that result from evolutionary phenomena, is of vital importance to marketers. Such an understanding can lead to improved store and mall designs, more effective placement of navigational aids, better positioning of retail displays, or more effective sex-specific advertising, to name but a few opportunities. Further research may assess the degree to which marketers are aware of and respond to these sex differences in consumer strategies.

The authors believe that they have suggested novel motivations and influences on the psychology of consumer behavior. This paper elaborates on previously documented sex differences in consumer navigation strategies, using reports of naturalistic shopping experiences and behaviors in order to identify additional domains evincing sex differences in the consumer shopping experience. However, as well as identifying new sex-based differences in shopping behavior, this study uses the framework of evolutionary psychology to explain how these sex differences are rooted in ancestral roles of resource acquisition. Overall, the results of our study demonstrate the value of an evolutionary framework for understanding psychology in modern environments.

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