

Gender Differences in Wayfinding Strategies and Anxiety About Wayfinding: A Cross-Cultural Comparison

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Two studies examined gender and cultural differences in wayfinding strategies and anxiety about wayfinding. Men in both Hungary and the United States reported greater preference for a strategy of orienting to global reference points, whereas women reported greater preference for a strategy based on route information. A higher level of wayfinding anxiety was reported by Americans, and women in both countries reported greater wayfinding anxiety than did men. Women in the United States, but not in Hungary, reported less childhood wayfinding experience than did men; women in both countries reported feeling less safe than did men. Feeling of personal safety and wayfinding strategy preferences mediated the gender difference in wayfinding anxiety.

KEY WORDS: gender; wayfinding; spatial cognition.

Abstract measures of spatial ability, such as mental rotation, have produced the largest and most consistent gender differences (favoring males) in the area of cognition (Halpern, 2000; Linn & Petersen, 1985, 1986). Research interest has recently focused on whether these gender differences in spatial ability have implications for real world behavior, such as finding one's way in the physical environment.

One possible implication of gender differences in spatial ability is that women and men may differ in success at finding destinations in three-dimensional environments. Some researchers have found that men are more efficient at finding destinations: men were faster than women at locating targets with the aid of a map and compass in a military orienteering test (Malinowski, 2001) and faster at locating a hidden platform in a computer-simulated maze (Astur, Ortiz, & Sutherland, 1998). However, in another study using a computer-simulated maze, men were faster at finding the target only when landmarks present during

training were removed or randomly presented during testing; no gender difference was evident when landmarks remained stable (Sandstrom, Kaufman, & Huettel, 1998). Yet, in another study, women and men were found to be equally efficient in finding their way to a destination in a building, even though men were more accurate in pointing toward the destination before starting out (Lawton, Charleston, & Zieles, 1996).

Another possible implication of gender differences in spatial ability is that women and men may differ in strategies for finding a destination. Women are more likely than men to report that they rely on landmark-based route information, whereas men are more likely to report that they orient to global reference points, such as the cardinal directions (North, South, East, West) or the position of the sun in the sky (Lawton, 1994, 1996). A difference in type of spatial information preferred is also seen in the way people give directions to others. Women tend to refer more often than men to landmarks, whereas men refer more often than women to the cardinal directions (Dabbs, Chang, Strong, & Milun, 1998; Denis, 1997; Harrell, Bowlby, & Hall-Hoffarth, 2000; Lawton, 2001; Miller & Santoni, 1986; Montello, Lovelace, Golledge, & Self, 1999; Schmitz, 1997;

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Ward, Newcombe, & Overton, 1986). Also, women tend to be better at remembering landmarks and their locations (Eals & Silverman, 1994; Galea & Kimura, 1993; Montello et al., 1999; Silverman & Eals, 1992). Men, on the other hand, tend to be more accurate at pointing in the direction of unseen landmarks (Bryant, 1982; Holding & Holding, 1989; Lawton, 1996; Lawton et al., 1996; Lawton & Morrin, 1999), although not all researchers have found a gender difference in pointing accuracy (Golledge, Dougherty, & Bell, 1995; Golledge, Ruggles, Pellegrino, & Gale, 1993; Montello & Pick, 1993; Sadalla & Montello, 1989).

Yet another possible implication of gender differences in spatial ability is that women and men may differ in the way they feel about performing tasks that appear to require a "sense of direction." Women tend to report a higher level of anxiety than do men about performing tasks such as trying a new shortcut without the aid of a map or figuring out which way to turn when emerging from a parking garage (Lawton, 1994, 1996). Higher levels of environmental confusion are reported by women than by men (LaGrone, 1969), and women perceive wayfinding while driving to be more difficult than do men (Burns, 1998). Women reported less confidence than men when asked to draw maps of a floor plan (O'Laughlin & Brubaker, 1998) and greater feelings of uncertainty about wayfinding in a building (Lawton et al., 1996), despite the fact that actual performance did not differ between the genders in these two studies.

Thus, evidence suggests that gender differences occur not only in performance on laboratory tests of spatial ability, but also in behaviors and feelings related to navigation in the three-dimensional world. To what extent might experiential factors play a role in these gender differences? In a previous study, the tendency for both women and men to refer to North, South, East, and West when giving directions depended on the region of the United States in which they lived, although overall men tended to refer to the cardinal directions more than did women, regardless of region (Lawton, 2001). In the current research, we extend the investigation of environmental influences by examining the possible role of social and cultural factors in gender differences in wayfinding strategy preference and wayfinding anxiety.

One factor that may contribute to gender differences in wayfinding strategy and anxiety is differences in early wayfinding experience. A number of findings indicate that girls are given less freedom to explore the outside environment than are boys during childhood

and early adolescence. Boys range further from home in their neighborhoods than do girls (Anderson & Tindall, 1972; Hart, 1979; Herman, Heins, & Cohen, 1987; Matthews, 1986; Webley, 1981), and boys are less likely than girls to be chaperoned by adults when visiting outside places, such as movie theaters or parks, or when riding the bus (Medrich, Roizen, Rubin, & Buckley, 1982; Newson & Newson, 1987). Even in technologically less developed cultures, boys range further from home than do girls in both free-time activities and assigned chores, such as cattle herding (Edwards, 2000; Munroe & Munroe, 1971, 1997; Nerlove, Munroe, & Munroe, 1971). Greater childhood experience in the outside environment may lead men to feel more comfortable than women in performing wayfinding tasks, and may also help to explain the gender difference in wayfinding strategy preference. When traversing a wide-ranging area, orienting to global reference points (e.g., North) is likely to be helpful because, unlike landmarks, global reference points remain fixed across locales. Therefore, boys may be more likely to develop an orientation wayfinding strategy because of their wayfinding experience further from home.

Restrictions on the freedom of girls in the outdoor environment may result from parents' concern about safety risks for their daughters. Newson and Newson (1987) found that more mothers of girls than boys said they worried when their children were outside the home, especially about the possibility of sexual molestation. This theme of female vulnerability is reflected in research on fear of crime among adults, which is typically measured by rating how safe one feels when outside alone at night. Women consistently report a greater fear of crime than do men (Box, Hale, & Andrews, 1988; Braungart, Braungart, & Hoyer, 1980; Maxfield, 1987; Riger & Gordon, 1981; Weinrath & Gartrell, 1996), particularly violent personal crime (Haghighi & Sorenson, 1996; LaGrange & Ferraro, 1989; Warr, 1984). Women perceive their risk of being attacked by a stranger as significantly higher than do men, and both women and men see the likelihood of stranger attack as higher for the average woman than for the average man (Harris & Miller, 2000), despite the fact that risk of homicide by strangers is far lower for women than for men (Kellerman & Mercy, 1992). Nevertheless, the perception of greater vulnerability for women may lead parents to restrict the wayfinding experience of their daughters more than of their sons, and may cause women to be more anxious than men about wayfinding, particularly in unfamiliar and possibly unsafe areas.

Research across cultures that differ in crime rate might help to clarify whether gender differences in wayfinding strategies and anxiety are attributable to variables such as personal safety concern and childhood wayfinding experience. Although much of the research on gender differences in wayfinding has been conducted in the United States, several studies suggest that gender differences in wayfinding strategies and wayfinding anxiety may exist in other countries as well. In studies with German adolescents and adults, Schmitz (1997, 1999) found that women preferred to include landmark information when describing a maze or a route traveled in a building, and this preference was associated with anxiety about getting lost. Burns (1998) surveyed drivers in Britain and found women more likely than men to report difficulty in wayfinding. However, no researchers have yet directly compared such gender differences across cultures, and it is not clear whether these gender differences would be of equal magnitude across cultures.

In the current studies, we compared wayfinding strategies and wayfinding anxiety in college students from two cities: one in central Hungary, and other in the midwestern United States. Although the cities were approximately equivalent in population size, there was a much higher rate of personal crime in the American city (mean per year, 1990–1999, in the American and Hungarian cities, respectively: 24 vs. 4.5 homicides; 358.9 vs. 190 assaults; 108.7 vs. 7.5 rapes; 526.7 vs. 50.2 robberies; Central Statistical Office of Hungarian Government, 1990–1999; Federal Bureau of Investigation, 1990–1999). A high crime rate may increase concern for personal safety and lead to greater anxiety about becoming lost in unfamiliar and potentially dangerous areas. Therefore, it was hypothesized that American participants would report greater wayfinding anxiety than would Hungarian participants. It was also of interest to determine whether gender differences in wayfinding strategy preferences and wayfinding anxiety, previously found in the United States, would also be found in Hungary.

STUDY 1

The purpose of the first study was to determine whether gender differences in wayfinding strategies and wayfinding anxiety would be found to a similar degree in Hungarian and American samples. On the basis of previous findings with American samples, women in both countries were expected to re-

port less preference for the orientation wayfinding strategy, greater preference for the route strategy, and greater anxiety about wayfinding than were men. We also sought to determine whether there would be a difference between the two countries in overall level of anxiety about wayfinding, which might provide clues as to the underlying causes of this anxiety. A measure of trait anxiety (Spielberger et al., 1979) was included to control for the possibility that any cross-cultural difference in wayfinding anxiety might simply be due to a cultural difference in reporting of anxiety, regardless of its relevance to wayfinding.

Method

Participants

The participants in Study 1 were 299 American students (185 women and 114 men) at a commuter university (enrollment: 10,700) in a midwestern city, and 214 Hungarian students (110 women and 104 men) also at a commuter university (enrollment: 24,800) in a city in central Hungary. All participants were enrolled in an Introductory Psychology course at their respective institutions; the American students received course credit for their participation, whereas the Hungarian students participated on a voluntary basis. The mean age of the American students was 21.15 ($SD = 5.43$, range: 18–51); the mean age of the Hungarian students was 22.07 ($SD = 2.25$, range: 18–33). The American sample was 86.2% White, 5.4% Black, 5% Hispanic, and 3.3% other minorities; the Hungarian participants were White. Population size was 206,000 for the American city and 180,000 for the Hungarian city.

Materials and Procedure

A questionnaire was used to assess, in order, participants' age and gender, wayfinding strategies, wayfinding anxiety, and trait anxiety. No time limits were imposed on any section of the questionnaire. The questionnaire was translated from English to Hungarian, and then back-translated to English to ensure consistency between the two versions.

Wayfinding Strategies. Items from Lawton's Wayfinding Strategy Scale and Indoor Wayfinding Strategy Scale (Lawton, 1994, 1996) were combined and reworded to develop a cross-cultural measure of wayfinding strategy. The original scales assessed 14 strategies for finding one's way to a location in a

city or town and 10 strategies for finding one’s way in a building or large complex. All references to “driving” in the original items were changed to the more general “traveling” so that these items did not apply exclusively to travel by car. A 5-point rating scale, which ranged from *Not at all true* to *Very true*, was used to rate the degree to which participants thought that each strategy applied to themselves.

American and Hungarian responses on the 24 items were combined and subjected to a principal components analysis (oblimin rotation) with a two-factor solution specified. Seven strategies were eliminated because they did not load substantially (.40 or above) on either factor or loaded equally on both. Table I shows the factor loadings obtained when the remaining strategies were reanalyzed. The first factor consisted of 11 strategies related to maintaining a sense of direction as one travels (alpha coefficient = .79); responses on these items were added together to derive the orientation strategy score. The second factor consisted of six strategies related to directions about the specific route to be taken (alpha coefficient = .70); responses on these items were summed to produce the route strategy score. The principal components analysis on the initial 24 items was also conducted separately for the American and Hungarian samples, and similar factor structures were obtained in the two samples.

Wayfinding Anxiety. Lawton’s Spatial Anxiety Scale (Lawton, 1994) was revised for cross-cultural use in the current study. The list consisted of eight wayfinding tasks that might produce anxiety in a participant, such as finding one’s way to an appointment in an unfamiliar area of a town or city. Anxiety was rated on a 5-point scale, which ranged from *Not at all anxious* to *Very anxious*. References to “driving” were replaced with “traveling,” and an item about locating one’s car in a parking garage was replaced with an item about deciding which way to walk after coming out of a train/bus/metro station or parking garage.

The eight items were subjected to a principal components analysis (oblimin rotation). All of the items loaded on one factor (alpha coefficient = .87). The factor loadings are shown in Table II. Similar factor loadings were obtained when the items were analyzed separately for the Hungarian and American samples, with a one-factor solution specified. The eight items were added together to obtain a wayfinding anxiety score for each participant.

Trait Anxiety Scale. General anxiety was measured using the 10 trait anxiety items from Spielberger et al.’s State-Trait Personality Inventory (Spielberger

Table I. Factor Loadings for the Wayfinding Strategies in Study 1 (*n* = 512)

Strategy	Factor	
	I	II
Orientation strategy		
I kept track of the direction (north, south, east, or west) in which I was going	.70	—
I always kept in mind the direction from which I had entered the building or complex (e.g. north, south, east, or west side of the building)	.69	—
I thought of my location in the building or complex in terms of north, south, east, and west	.67	—
I kept track of where I was in relation to the sun (or moon) in the sky as I went	.61	—
Whenever I made a turn, I knew which direction I was facing	.60	—
I asked for directions telling me whether to go east, west, north, or south at particular streets or landmarks	.54	—
I kept track of where I was in relation to a reference point, such as the center of town, lake, river, or mountain	.51	—
As I went, I made a mental note of the mileage/distance I traveled on different roads	.51	—
I visualized a map or layout of the area in my mind as I went	.48	—
I kept track of the relationship between where I was and the next place where I had to change direction	.47	—
I could visualize what was outside the building or complex in the direction I was heading inside the building	.42	—
Route strategy		
Clearly visible signs pointing the way to different sections of the building or complex were important to me	—	.68
I appreciated the availability of someone (e.g., a receptionist) who could give me directions	—	.63
Clearly labeled room numbers and signs identifying parts of the building or complex were very helpful in finding my way	—	.63
I asked for directions telling me how many streets to pass before making each turn	—	.62
I asked for directions telling me whether to turn right or left at particular streets or landmarks	—	.60
I found maps of the building or complex, with an arrow pointing to my present location, to be very helpful	—	.60

et al., 1979). The items consisted of statements about how one might feel if anxious, such as *I feel nervous and restless*. Participants were to rate how often they felt the way indicated in the statement; the choices were *Almost never; Sometimes; Often; Almost always* (alpha coefficient in current study = .82). The 10 items were added together to produce a trait anxiety score for each participant.

Table II. Factor Loadings for Wayfinding Anxiety in Study 1 (*n* = 511)

Deciding which direction to walk in an unfamiliar city or town after coming out of a train/bus/metro station or parking garage	.77
Finding my way to an appointment in an unfamiliar area of a city or town	.76
Leaving a store that I have been to for the first time and deciding which way to turn to get to a destination	.76
Finding my way back to a familiar area after realizing I have made a wrong turn and become lost while traveling	.74
Finding my way in an unfamiliar shopping mall, medical center, or large building complex	.72
Finding my way out of a complex arrangement of offices that I have visited for the first time	.71
Trying a new route that I think will be a shortcut, without a map	.69
Pointing in the direction of a place outside that someone wants to get to and has asked for directions, when I am in a windowless room	.65

Results

Correlations Among Variables

Correlations among the variables for the combined Hungarian/American sample and for each national sample separately are shown in Table III. In the combined sample, wayfinding anxiety was significantly negatively correlated with age and orientation strategy preference, but significantly positively correlated with trait anxiety and route strategy preference. There were no other significant correlations among

Table III. Correlations Among Variables in Study 1 for Combined Sample (Top Row), American sample (Second Row), and Hungarian sample (Third Row)

	1	2	3	4	5
1. Age	—				
	—				
	—				
2. Orientation strategy	.02	—			
	.02	—			
	.01	—			
3. Route strategy	.04	.03	—		
	.06	.07	—		
	.05	-.01	—		
4. Trait anxiety	.03	-.04	-.04	—	
	.05	-.10	-.04	—	
	-.07	.05	-.03	—	
5. Wayfinding anxiety	-.12**	-.14***	.22***	.21***	—
	-.08	-.17**	.26***	.29***	—
	-.09	-.14*	.10	.35***	—

p* < .05. *p* < .01. ****p* < .001.

the variables. The same pattern of findings existed for the national samples separately, except that the correlation between wayfinding anxiety and age was not significant in either the American or Hungarian sample, and the correlation between wayfinding anxiety and route strategy was not significant in the Hungarian sample.

Effects of Gender and Country

Two-factor between-subjects ANOVAs were used to test effects of gender and country on each of the dependent variables: orientation strategy, route strategy, wayfinding anxiety, and trait anxiety. Mean scores and standard deviations for each of the variables, along with ANOVA results, are shown in Table IV.

Analysis of orientation strategy scores revealed significantly higher ratings for men than for women. There was no significant main effect of country on orientation strategy, and no significant interaction between gender and country.

Route strategy scores were significantly higher for women than for men. There was no significant main effect of country, but there was a significant interaction between gender and country. Route strategy scores were higher for American women than for American men, and higher for Hungarian women than for Hungarian men; however, post hoc Student–Newman–Keuls tests showed that the difference between American women and men was significant, whereas the difference between Hungarian women and men was not.

Wayfinding anxiety scores were significantly higher in women than in men, and significantly higher in the American sample than in the Hungarian sample. There was no significant interaction between gender and country on wayfinding anxiety. Effects of gender and country on wayfinding anxiety were also analyzed with trait anxiety as a covariate; this analysis did not appreciably alter the effects of gender and country on wayfinding anxiety. Analysis of trait anxiety scores themselves produced no significant effect of gender or country, and no significant interaction between gender and country.

Discussion

Study 1 tested the prediction that gender differences in wayfinding strategy preferences and wayfinding anxiety would be found in both Hungary

Table IV. Mean Scores and Standard Deviations of Variables by Gender and Country in Study 1

Variable	Women	Men	Total	df	F		
					Gender effect	Country effect	Country × Gender
Orientation strategy				1, 508	27.63***	<1	<1
American	25.35 (7.19)	29.32 (7.27)	26.87 (7.46)				
Hungarian	25.78 (7.65)	28.83 (7.46)	27.26 (7.69)				
Total	25.51 (7.36)	29.09 (7.35)					
Route strategy				1, 509	15.41***	2.82	7.97**
American	23.78 (3.85)	21.22 (4.58)	22.81 (4.32)				
Hungarian	22.07 (4.32)	21.65 (4.19)	21.87 (4.25)				
Total	23.15 (4.11)	21.43 (4.40)					
Trait anxiety				1, 495	1.28	1.83	3.35
American	19.40 (5.22)	19.74 (5.80)	19.53 (5.44)				
Hungarian	20.93 (4.50)	19.51 (5.29)	20.24 (4.94)				
Total	19.99 (5.01)	19.63 (5.54)					
Wayfinding anxiety				1, 507	34.44***	262.53***	<1
American	24.04 (5.39)	21.41 (5.72)	23.04 (5.65)				
Hungarian	16.49 (5.36)	13.54 (4.18)	15.06 (5.03)				
Total	21.21 (6.50)	17.64 (6.39)					

** $p < .01$. *** $p < .001$.

and the United States. Across both countries, men reported greater preference for the orientation wayfinding strategy than did women, and women reported greater preference for the route strategy and greater wayfinding anxiety than did men. The gender effect for route strategy preference, however, interacted with country: American women favored the route strategy significantly more than did American men, whereas there was a nonsignificant trend in the same direction for Hungarian women and men. There was no significant difference between the two countries in overall level of orientation strategy preference, nor route strategy preference. However, wayfinding anxiety was significantly higher in the United States than in Hungary.

The finding of a gender difference in orientation strategy preference in both the United States and Hungary raises the question of why this difference would occur cross-culturally. One possibility is that differences in wayfinding experience for boys and girls, found in many cultures (Anderson & Tindall, 1972; Edwards, 2000; Hart, 1979; Herman et al., 1987; Matthews, 1986; Medrich et al., 1982; Munroe & Munroe, 1971, 1997; Nerlove et al., 1971; Newson & Newson, 1987; Webley, 1981), lead to the development of different wayfinding strategies in the two genders. Perhaps the more extensive home range of boys allows them greater opportunity to develop an orientation wayfinding strategy. Further support for this explanation, however, requires evidence that orientation strategy preference is related to degree of wayfinding experience.

A striking finding of Study 1 was that women in both the United States and Hungary reported greater wayfinding anxiety than did men, despite very different overall levels of wayfinding anxiety in the two countries. This finding is consistent with the possibility that concern about personal safety may underlie anxiety about wayfinding. Most of the items that measure wayfinding anxiety refer to wayfinding in unfamiliar environments; although these environments are not explicitly stated to be dangerous, individuals who feel more vulnerable to crime may perceive greater risks to personal safety in environments they do not know well. Thus, Americans, who live in a high-crime society, and women, who perceive themselves to be vulnerable to personal crime (Harris & Miller, 2000), may worry more than Hungarians or men about the consequences of becoming lost in unfamiliar environments.

STUDY 2

The purpose of Study 2 was to determine whether a gender difference in childhood wayfinding experience (based on retrospective self-report) might account for the gender difference in orientation strategy preference across cultures, and whether a difference in perception of personal safety might account for the gender difference in wayfinding anxiety. Personal safety was assessed by ratings of how safe one would feel when alone at home, at school or work, or when walking alone in one's neighborhood. Hypotheses

examined were:

1. Men would report more extensive childhood wayfinding experience than would women, and this difference would at least partially account for men's greater preference for the orientation strategy.
2. Women would report a lower sense of personal safety than would men, and this difference would at least partially account for the higher level of wayfinding anxiety in women.

Method

Participants

Participants in Study 2 were 423 American students (274 women and 149 men) and 263 Hungarian students (140 women and 123 men) from the same university populations as in Study 1. The mean age of the American students in the current sample was 22.08 ($SD = 6.38$, range: 17–54); the mean age of the Hungarian students was 22.21 ($SD = 2.00$, range: 19–29).

Materials and Procedure

In addition to the measures used in Study 1, the questionnaire included measures of childhood wayfinding experience and feelings of personal safety. Measures were arranged in the following order: demographics (e.g., age, gender), wayfinding experience, wayfinding strategies, general trait anxiety, wayfinding anxiety, and feeling of personal safety. As before, there were no time limits for completing the questionnaire, and the Hungarian version of the questionnaire was created by first translating from English to Hungarian and then back-translating to English to check for consistency across versions.

Wayfinding Strategies. The revised Wayfinding Strategy Scale, described in Study 1, was used in the current study. One of the orientation strategy items was inadvertently left off the questionnaire; nonetheless, the internal reliability of the remaining 10 orientation strategy items was the same as that for the 11 items used in the first study ($\alpha = .79$). The alpha was .72 for the route strategy items in the current study.

Anxiety Scales. The revised Wayfinding Anxiety Scale from Study 1 was used in the current study; the alpha was .89. The alpha for the trait anxiety scale (Spielberger et al., 1979) in the current study was .86.

Table V. Factor Loadings for Childhood Wayfinding Experience in Study 2 ($n = 684$)

Experience in Study 2 ($n = 684$)	
Frequency of going on errands alone	
Ages 11–13	.84
Ages 8–10	.81
Ages 14–15	.78
Distance allowed to go alone	
Ages 11–13	.76
Ages 14–15	.70
Ages 8–10	.68

Childhood Wayfinding Experience. Six items were used to assess childhood wayfinding experience. Three items asked participants how far from home they were allowed to go by themselves on foot, skates, or bicycle at each of three different ages: 8–10, 11–13, and 14–15. Response alternatives for distance from home were presented in miles for the American sample and kilometers for the Hungarian sample: *less than 1/4 mile (1/2 km)*, *1/2 mile (1 km)*, *1–2 miles (2–3 km)*, *3–4 miles (4–7 km)*, *5 miles (8 km)* or *more*. Three other items asked how often participants went on errands by themselves at each of these ages. Response alternatives for frequency of running errands were *almost never*, *1–3 times/year*, *4–11 times/year*, *1–3 times/month*, *once/week* or *more*. Answers to each of the six questions were converted to a 5-point scale. The six items were then subjected to a principal components analysis, with a one-factor solution specified; factor loadings are presented in Table V. The alpha for this scale was .85. Answers to the six items were added together to produce a childhood wayfinding experience score.

Personal Safety. Feeling of personal safety was measured by six items that asked participants how safe they would feel walking alone in their neighborhood, being at home alone, or being at work or school alone; each situation was rated separately for daytime and nighttime. A 5-point scale rating scale was used, from *Not at all safe* to *Very safe*. The coefficient alpha was .80.

Results

Correlations Among Variables

Table VI shows the correlations between variables for the combined Hungarian and American sample and each nationality separately. Results for the combined sample replicated those of Study 1. Wayfinding anxiety was positively correlated with

Table VI. Correlations Among Variables in Study 2 for Combined Sample (Top Row), American Sample (Second Row), and Hungarian Sample (Third Row)

	1	2	3	4	5	6	7
1. Age	—	—	—	—	—	—	—
2. Childhood wayfinding experience	.10**	—	—	—	—	—	—
	.12*	—	—	—	—	—	—
	.13*	—	—	—	—	—	—
3. Orientation strategy	.18***	.13***	—	—	—	—	—
	.21***	.19***	—	—	—	—	—
	.15*	.09	—	—	—	—	—
4. Route strategy	-.02	-.18***	-.03	—	—	—	—
	-.02	-.08	-.09	—	—	—	—
	-.04	-.09	.06	—	—	—	—
5. Personal safety	.04	.18***	.19***	-.11**	—	—	—
	.02	.19***	.20***	-.09	—	—	—
	.16**	.26**	.17**	-.13*	—	—	—
6. Trait anxiety	-.12**	-.04	-.14***	-.01	-.22***	—	—
	-.13**	-.09	-.16***	.01	-.24***	—	—
	-.15*	-.24***	-.08	.03	-.20***	—	—
7. Wayfinding anxiety	-.08*	-.37***	-.22***	.27***	-.37***	.29***	—
	-.07	-.15**	-.27***	.20***	-.36***	.35***	—
	-.24***	-.25***	-.20***	.22***	-.47***	.42***	—

* $p < .05$. ** $p < .01$. *** $p < .001$.

trait anxiety and route strategy, but negatively correlated with age and orientation strategy. In addition, wayfinding anxiety was negatively correlated with childhood wayfinding experience and feeling of personal safety. Orientation strategy was positively correlated with childhood wayfinding experience and feeling of personal safety. The same general pattern of relationships was found in each country separately, although correlations were not significant between orientation strategy and childhood wayfinding experience in the Hungarian sample, nor between wayfinding anxiety and age in the American sample.

Effects of Gender and Country

Mean scores and standard deviations for childhood wayfinding experience, wayfinding strategies, personal safety feeling, trait anxiety, and wayfinding anxiety are shown in Table VII as a function of gender and country. Two-way between-subjects ANOVAs were used to test gender and country effects on each variable separately; results of these analyses are also shown in Table VII.

Childhood Wayfinding Experience. Men reported significantly more childhood wayfinding experience than did women, and the Hungarian sample reported significantly more wayfinding experience than did the American sample. The interaction be-

tween gender and country was also significant; post hoc Student–Newman–Keuls tests revealed significantly higher wayfinding experience in American men than in American women and a nonsignificant difference in the same direction between Hungarian men and women.

Wayfinding Strategies. As found in Study 1, men were significantly more likely than women to report using the orientation wayfinding strategy; there was no significant difference between countries and no interaction between gender and country. Women were significantly more likely to report using the route strategy, as in Study 1. The effect of country on route strategy preference, although not significant in Study 1, was significant in the current study; Americans were more likely than Hungarians to report the route strategy. The interaction between gender and country for route strategy was not significant in the current study, unlike Study 1, in which the gender difference in route strategy was significant for the Americans but not the Hungarians.

Personal Safety. Women's ratings of personal safety were significantly lower than those of men. There was no significant effect of country and no significant interaction between gender and country on feeling of personal safety.

Anxiety. As in Study 1, there was no significant gender difference for trait anxiety. Unlike Study 1,

Table VII. Mean Scores and Standard Deviations of Variables by Gender and Country in Study 2

Variable	Women	Men	Total	df	F		
					Gender effect	Country effect	Country × Gender
Childhood wayfinding experience				1, 682	15.29***	268.83***	5.41*
American	18.71 (5.75)	21.13 (5.27)	19.57 (5.70)				
Hungarian	25.99 (3.66)	26.60 (2.95)	26.27 (3.35)				
Total	21.17 (6.19)	23.61 (5.15)					
Orientation strategy				1, 681	48.08***	<1	<1
American	23.80 (7.22)	27.85 (7.16)	25.23 (7.44)				
Hungarian	23.38 (6.41)	27.16 (7.25)	25.15 (7.06)				
Total	23.66 (6.95)	27.54 (7.19)					
Route strategy				1, 682	22.28***	21.22***	2.70
American	24.32 (3.86)	22.15 (4.25)	23.56 (4.13)				
Hungarian	22.19 (4.47)	21.15 (4.77)	21.70 (4.63)				
Total	23.60 (4.19)	21.70 (4.52)					
Personal safety				1, 681	92.25***	<1	2.26
American	23.80 (4.07)	27.25 (3.09)	25.02 (4.09)				
Hungarian	24.09 (4.36)	26.60 (3.73)	25.26 (4.26)				
Total	23.90 (4.16)	26.96 (3.40)					
Trait anxiety				1, 679	2.69	8.45**	<1
American	22.40 (5.65)	21.60 (6.81)	22.12 (6.08)				
Hungarian	23.68 (4.80)	22.98 (5.33)	23.35 (5.06)				
Total	22.83 (5.40)	22.23 (6.21)					
Wayfinding anxiety				1, 681	24.96***	146.42***	<1
American	21.34 (6.15)	18.67 (5.60)	20.40 (6.09)				
Hungarian	15.42 (5.40)	13.52 (5.10)	14.53 (5.34)				
Total	19.34 (6.53)	16.33 (5.95)					

* $p < .05$. ** $p < .01$. *** $p < .001$.

however, Hungarians in Study 2 had significantly higher ratings for trait anxiety than did Americans. The interaction between gender and country on trait anxiety was not significant.

Again, the results replicated those of Study 1: women reported significantly greater wayfinding anxiety than did men, and Americans reported significantly greater wayfinding anxiety than did Hungarians. There was no significant interaction between gender and country for wayfinding anxiety.

Mediation of Gender Difference in Orientation Strategy Preference

A regression analysis was used to test the hypothesis that childhood wayfinding experience might mediate the relationship between gender and orientation strategy preference. Variables were added to the regression equation in blocks; any added variables that reduced the effect of gender to nonsignificance would meet one of the criteria for serving as mediators between gender and orientation strategy (Baron & Kenny, 1986). Gender by itself in the equation (adjusted $R^2 = .07$) had a significant effect on orienta-

tion strategy preference (Std $b = -.26$, $p < .001$). The variables of age, country, and wayfinding anxiety were added next to the equation (adjusted $R^2 = .13$; trait anxiety, route strategy, and personal safety had initially been included in this block, but were dropped because they were not significant predictors); gender remained a significant predictor of orientation strategy (Std $b = -.22$, $p < .001$). Finally, childhood wayfinding experience was added to the equation (adjusted $R^2 = .13$), but had no effect on significance of gender as a predictor of orientation strategy (Std $b = -.21$, $p < .001$).

Mediation of Gender Difference in Wayfinding Anxiety

A regression analysis was also used to test the hypothesis that feeling of personal safety might mediate the relationship between gender and wayfinding anxiety. Gender by itself in the equation (adjusted $R^2 = .05$) had a significant effect on wayfinding anxiety (Std $b = .23$, $p < .001$). The variables of country, trait anxiety, and orientation and route strategy preferences were then added to the equation (adjusted $R^2 = .37$;

age and childhood wayfinding experience had initially been included in this block, but were dropped because they were not significant predictors); gender remained a significant predictor of wayfinding anxiety (Std $b = .09$, $p < .001$). Lastly, feeling of personal safety was added to the equation (adjusted $R^2 = .43$); at this point, the effect of gender was no longer significant (Std $b = .004$, $p = .90$). Further testing showed that the combination of wayfinding strategy preferences and feeling of personal safety was sufficient to reduce the effect of gender on wayfinding anxiety to nonsignificance (adjusted $R^2 = .21$; Std $b = .03$, $p = .42$).

Discussion

In Study 2, we sought to examine the roles that childhood wayfinding experience and feeling of personal safety might play in gender differences in orientation strategy preference and wayfinding anxiety. It was hypothesized that men would report more extensive childhood wayfinding experience than would women and that this difference would account for the men's greater preference for the orientation strategy. It was also hypothesized that women would report less feeling of personal safety than would men and that this difference would mediate the higher level of wayfinding anxiety in women.

With respect to the first hypothesis, we found that men reported significantly greater childhood wayfinding experience than did women in the combined American/Hungarian sample. This finding is consistent with previous research that showed greater childhood home range and unchaperoned travel for boys than for girls (Anderson & Tindall, 1972; Edwards, 2000; Hart, 1979; Herman et al., 1987; Matthews, 1986; Medrich et al., 1982; Munroe & Munroe, 1971, 1997; Nerlove et al., 1971; Newson & Newson, 1987; Webley, 1981). However, the size of the gender effect in the current study differed across the two countries. Men in the American sample reported significantly greater wayfinding experience than did women, but there was no significant difference between the genders in the Hungarian sample. Also, overall level of wayfinding experience was much higher in the Hungarian sample than in the American sample.

Childhood wayfinding experience was significantly correlated with orientation wayfinding strategy preference. However, the size of this correlation was relatively small, and lends only weak support to the idea that orientation strategy develops as a function of

past wayfinding experience. Furthermore, childhood wayfinding experience was not found to mediate the gender difference in orientation strategy preference.

In accordance with the prediction about feeling of personal safety, women felt less safe than did men when alone in various settings (at home, at work or school, or when walking alone in their neighborhoods). This gender difference was relatively large, and it was found in both the Hungarian and American samples. There was surprisingly little difference between the two countries in feeling of personal safety, despite the lower rate of crime in Hungary.

Feeling of personal safety was negatively correlated with wayfinding anxiety; that is, individuals who felt less safe were more anxious about finding their way in the environment. This correlation was found in both the United States and Hungary. A regression analysis showed that personal safety, along with wayfinding strategy preferences, eliminated the effect of gender on wayfinding anxiety. This finding supports the hypothesis that a gender difference in feeling of personal safety largely accounts for the higher level of wayfinding anxiety reported by women. It should be noted that feeling of personal safety is not simply the reverse of wayfinding anxiety. Personal safety refers to feeling of safety when alone in familiar environments (e.g. home, school, place of work, neighborhood) where wayfinding should not be an issue. Wayfinding anxiety, in contrast, refers to locating destinations or deciding which way to turn in unfamiliar environments, with no mention of the safety of these situations. The current findings, however, suggest that personal safety may be an underlying concern associated with wayfinding in an unfamiliar environment. Because they are more concerned about personal safety than men, women may worry more about possible dangers that may result from becoming lost in an unfamiliar environment, and hence experience greater anxiety about wayfinding.

GENERAL DISCUSSION

These studies represent the first direct cross-cultural comparison of gender differences in wayfinding strategy preferences and anxiety about wayfinding. In both the Hungarian and American samples, there was a higher level of wayfinding anxiety in women and greater preference for the orientation wayfinding strategy in men. Greater preference for the route wayfinding strategy was reported by women than by men across both countries, although the

gender difference in route strategy did not reach significance in the Hungarian sample in Study 1.

It was initially predicted that the greater preference for the orientation strategy in men might be attributed to their more extensive childhood wayfinding experience. This prediction appears to be discounted by the finding that Hungarian women and men differed in orientation strategy preference but not in childhood wayfinding experience. Furthermore, the gender effect on orientation strategy preference in the combined Hungarian/American sample was little affected by controlling childhood wayfinding experience or any of the other variables examined in Study 2. Future researchers might examine whether adult wayfinding experience (e.g., frequency of travel to unfamiliar areas, navigational responsibilities on family trips) plays a role in the gender difference in orientation strategy preference. Also, research with more diverse cultures may help to clarify whether experiential factors do indeed influence wayfinding strategies. In both of the current studies, orientation strategy preference appeared to be less affected by cultural differences than by gender differences; that is, orientation strategy preference was more similar within each gender across the two cultures than between genders in the same culture.

Unlike orientation strategy preference, anxiety about wayfinding differed both between genders and between cultures. The lower level of wayfinding anxiety reported by Hungarians does not seem to be due simply to a cultural difference in reporting of anxiety; no significant effect of country on trait anxiety was found in Study 1, and a significant country effect in the opposite direction was found in Study 2 (i.e., Hungarians reported greater trait anxiety). Yet, despite the lower overall level of wayfinding anxiety in the Hungarian sample, the difference between women and men in wayfinding anxiety was found equally in the Hungarian and American samples.

The gender difference in wayfinding anxiety in the combined Hungarian/American sample was mediated by feeling of personal safety. Women in both countries reported feeling less safe than did men, despite the fact that personal crime rates are far lower in Hungary than in the United States. This finding suggests that the gender difference in feeling of personal safety is not closely linked to actual crime rate, in which case Hungarian women should report greater feeling of personal safety than should American women. Rather, the lower sense of personal safety expressed by women in both countries may be related to a universal perception that the world is

more dangerous for women than for men. Previous researchers have suggested several factors that might contribute to this perception: the socialization of dependency and fearfulness in women; the assumption that women, being smaller and less strong on the average than men, are less capable of self-defense; and the more serious threat of sexual assault for women than for men (Fattah, 1993; Haghghi & Sorensen, 1996; Harris & Miller, 2000; Riger, Gordon, & Le Bailly, 1979; Sacco, 1990). The theme of the world as a dangerous place for women, where they face attack by ruthless strangers, is also transmitted through various forms of popular culture, such as films (Bufkin & Eschholz, 2000) and video games (Dietz, 1998). Given the pervasiveness of such media images, it is likely that such depictions of women's vulnerability are found across many contemporary cultures and contribute to women's anxiety about personal safety and fear of getting lost.

Feminists view the threat of rape as a form of social control over women (Riger & Gordon, 1981). The fear of being victimized affects all women, even those who have not themselves been victimized, by causing women to take precautionary measures that limit their freedom, such as avoidance of going downtown or alone to the movies after dark (Riger et al., 1979). The current findings suggest that heightened concern about personal safety also results in increased anxiety about wayfinding, which in turn may affect women's sense of efficacy in the physical environment. For example, wayfinding anxiety might lead one to choose a longer, more familiar route over a potentially shorter but unfamiliar route, or to avoid jobs or careers that require travel to unfamiliar locations, or to avoid recreational trips by oneself to unfamiliar destinations, particularly after dark. Additional research is necessary to determine the extent to which wayfinding anxiety may alter aspects of wayfinding behavior, such as route planning or choice of destination. Future studies might also examine whether there are cultural stereotypes regarding gender differences in wayfinding capabilities that further contribute to gender differences in wayfinding anxiety.

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REFERENCES

- Anderson, J., & Tindall, M. (1972). The concept of home range: New data for the study of territorial behavior. In W. J. Mitchell (Ed.), *Environmental design: Research and practice* (Vol 1, pp. 1–7). Los Angeles: University of California Press.
- Astur, R. S., Ortiz, M. L., & Sutherland, R. J. (1998). A characterization of performance by men and women in a virtual Morris water task: A large and reliable sex difference. *Behavioural Brain Research*, *93*, 185–190.
- Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173–1182.
- Box, S., Hale, C., & Andrews, G. (1988). Explaining fear of crime. *British Journal of Criminology*, *28*, 340–356.
- Braungart, M. M., Braungart, R. G., & Hoyer, W. J. (1980). Age, sex, and social factors in fear of crime. *Sociological Focus*, *13*, 55–66.
- Bryant, K. J. (1982). Personality correlates of sense of direction and geographical orientation. *Journal of Personality and Social Psychology*, *43*, 1318–1324.
- Bufkin, J., & Eschholz, S. (2000). Images of sex and rape: A content analysis of popular film. *Violence Against Women*, *6*, 1317–1344.
- Burns, P. C. (1998). Wayfinding errors while driving. *Journal of Environmental Psychology*, *18*, 209–217.
- Central Statistical Office of Hungarian Government. (1990–1999). *Regional crime report for Baranya county*. Pécs, Hungary: KSHI Press.
- Dabbs, J. M., Chang, E.-L., Strong, R. A., & Milun, R. (1998). Spatial ability, navigation strategy, and geographic knowledge among men and women. *Evolution and Human Behavior*, *19*, 89–98.
- Denis, M. (1997). The description of routes: A cognitive approach to the production of spatial discourse. *Cahiers de Psychologie Cognitive/Current Psychology of Cognition*, *16*, 409–458.
- Dietz, T. L. (1998). An examination of violence and gender role portrayals in video games: Implications for gender socialization and aggressive behavior. *Sex Roles*, *38*, 425–442.
- Eals, M., & Silverman, I. (1994). The hunter-gatherer theory of spatial sex differences: Proximate factors mediating the female advantage in recall of object arrays. *Ethology and Sociobiology*, *15*, 95–105.
- Edwards, C. P. (2000). Children's play in cross-cultural perspective: A new look at the *Six Cultures* study. *Cross-Cultural Research*, *34*, 318–338.
- Fattah, E. A. (1993). Research on fear of crime: Some common conceptual and measurement problems. In W. Bilsky, C. Pfeiffer, & P. Wetzels (Eds.), *Fear of crime and criminal victimization* (pp. 45–70). Stuttgart: Ferdinand Enke Verlag.
- Federal Bureau of Investigation. (1990–1999). *Uniform crime reports for the United States*. Washington, DC: U.S. Government Printing Office.
- Galea, L. A. M., & Kimura, D. (1993). Sex differences in route-learning. *Personality and Individual Differences*, *14*, 53–65.
- Golledge, R. G., Dougherty, V., & Bell, S. (1995). Acquiring spatial knowledge: Survey versus route-based knowledge in unfamiliar environments. *Annals of the Association of American Geographers*, *85*, 134–158.
- Golledge, R. G., Ruggles, A. J., Pellegrino, J. W., & Gale, N. D. (1993). Integrating route knowledge in an unfamiliar neighborhood: Along and across route experiments. *Journal of Environmental Psychology*, *13*, 293–307.
- Haghighi, B., & Sorensen, J. (1996). America's fear of crime. In T. J. Flanagan & D. R. Longmire (Eds.), *Americans view crime and justice: A national public opinion survey* (pp. 16–30). Thousand Oaks, CA: Sage.
- Halpern, D. F. (2000). *Sex differences in cognitive abilities* (3rd ed.). Hillsdale, NJ: Erlbaum.
- Harrell, W. A., Bowlby, J. W., & Hall-Hoffarth, D. (2000). Directing wayfinders with maps: The effects of gender, age, route complexity, and familiarity with the environment. *Journal of Social Psychology*, *140*, 169–178.
- Harris, M. B., & Miller, K. C. (2000). Gender and perceptions of danger. *Sex Roles*, *43*, 843–863.
- Hart, R. (1979). *Children's experience of place*. New York: Irvington.
- Herman, J. F., Heins, J. A., & Cohen, D. S. (1987). Children's spatial knowledge of their neighborhood environment. *Journal of Applied Developmental Psychology*, *8*, 1–15.
- Holding, C. S., & Holding, D. H. (1989). Acquisition of route network knowledge by males and females. *Journal of General Psychology*, *116*, 29–41.
- Kellerman, A. L., & Mercy, J. A. (1992). Men, women, and murder: Gender-specific differences in rates of fatal violence and victimization. *Journal of Trauma*, *33*, 1–5.
- LaGrange, R. L., & Ferraro, K. F. (1989). Assessing age and gender differences in perceived risk and fear of crime. *Criminology*, *27*, 697–717.
- LaGrone, C. W. (1969). Sex and personality differences in relation to feeling for direction. *Journal of General Psychology*, *81*, 23–33.
- Lawton, C. A. (1994). Gender differences in way-finding strategies: Relationship to spatial ability and spatial anxiety. *Sex Roles*, *30*, 765–779.
- Lawton, C. A. (1996). Strategies for indoor wayfinding: The role of orientation. *Journal of Environmental Psychology*, *16*, 137–145.
- Lawton, C. A. (2001). Gender and regional differences in spatial referents used in direction giving. *Sex Roles*, *44*, 321–338.
- Lawton, C. A., Charleston, S. I., & Zieles, A. S. (1996). Individual- and gender-related differences in indoor wayfinding. *Environment and Behavior*, *28*, 204–219.
- Lawton, C. A., & Morrin, K. A. (1999). Gender differences in pointing accuracy in computer-simulated 3D mazes. *Sex Roles*, *40*, 73–92.
- Linn, M. C., & Petersen, A. C. (1985). Emergence and characterization of sex differences in spatial ability: A meta-analysis. *Child Development*, *56*, 1479–1498.
- Linn, M. C., & Petersen, A. C. (1986). A meta-analysis of gender differences in spatial ability: Implications for mathematics and science achievement. In J. S. Hyde & M. C. Linn (Eds.), *The psychology of gender: Advances through meta-analysis* (pp. 67–101). Baltimore: Johns Hopkins University Press.
- Malinowski, J. C. (2001). Mental rotation and real-world wayfinding. *Perceptual and Motor Skills*, *92*, 19–30.
- Matthews, M. H. (1986). Gender, graphicacy, and geography. *Educational Review*, *38*, 259–271.
- Maxfield, M. (1987). *Explaining fear of crime: Evidence from the 1984 British crime survey* [Home Office Research Study, No. 43]. London: Home Office.
- Medrich, E. A., Roizen, J., Rubin, V., & Buckley, S. (1982). *The serious business of growing up: A study of children's lives outside school*. Berkeley: University of California Press.
- Miller, L. K., & Santoni, V. (1986). Sex differences in spatial abilities: Strategic and experiential correlates. *Acta Psychologica*, *62*, 225–235.
- Montello, D. R., Lovelace, K. L., Golledge, R. G., & Self, C. M. (1999). Sex-related differences and similarities in geographic

- and environmental spatial abilities. *Annals of the Association of American Geographers*, 89, 515–534.
- Montello, D. R., & Pick, H. L. (1993). Integrating knowledge of vertically aligned large-scale spaces. *Environment and Behavior*, 25, 457–484.
- Munroe, R. L., & Munroe, R. H. (1971). Effect of environmental experience on spatial ability in an East African society. *Journal of Social Psychology*, 83, 15–22.
- Munroe, R. L., & Munroe, R. H. (1997). Logoli childhood and the cultural reproduction of sex differentiation. In T. S. Weisner, C. Bradley, & P. L. Kilbride (Eds.), *African families and the crisis of social change* (pp. 299–314). Westport, CT: Bergin & Garvey.
- Nerlove, S. B., Munroe, R. H., & Munroe, R. L. (1971). Effect of environmental experience on spatial ability: A replication. *Journal of Social Psychology*, 84, 3–10.
- Newson, J., & Newson, E. (1987). Family and sex roles in middle childhood. In D. J. Hargreaves & A. M. Colley (Eds.), *The psychology of sex roles* (pp. 142–158). Cambridge, England: Hemisphere.
- O'Laughlin, E. M., & Brubaker, B. S. (1998). Use of landmarks in cognitive mapping: Gender differences in self report versus performance. *Personality and Individual Differences*, 24, 595–601.
- Riger, S., & Gordon, M. T. (1981). The fear of rape: A study in social control. *Journal of Social Issues*, 37, 71–92.
- Riger, S., Gordon, M. T., & Le Bailly, R. (1979). Women's fear of crime: From blaming to restricting the victim. *Victimology: An International Journal*, 3, 274–284.
- Sacco, V. F. (1990). Gender, fear, and victimization: A preliminary application of power-control theory. *Sociological Spectrum*, 10, 485–506.
- Sadalla, E. K., & Montello, D. R. (1989). Remembering changes in direction. *Environment and Behavior*, 21, 346–363.
- Sandstorm, N. J., Kaufman, S. A., & Huettel, S. A. (1998). Males and females use different distal cues in virtual environment navigation task. *Cognitive Brain Research*, 6, 351–360.
- Schmitz, S. (1997). Gender-related strategies in environmental development: Effects of anxiety on wayfinding in and representation of a three-dimensional maze. *Journal of Environmental Psychology*, 17, 215–228.
- Schmitz, S. (1999). Gender differences in acquisition of environmental knowledge related to wayfinding behavior, spatial anxiety, and self-estimated environmental competencies. *Sex Roles*, 41, 71–93.
- Silverman, I., & Eals, M. (1992). Sex differences in spatial abilities: Evolutionary theory and data. In J. Barkow, L. Cosmides, & J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 487–503). New York: Oxford University Press.
- Spielberger, C. D., Jacobs, G. E., Crane, R., Russell, S., Westberry, L., Barker, L., et al. (1979). *The preliminary manual for the State-Trait Personality Inventory*. Tampa, FL: University of South Florida.
- Ward, S. L., Newcombe, N., & Overton, W. F. (1986). Turn left at the church, or three miles north. *Environment and Behavior*, 18, 192–213.
- Warr, M. (1984). Fear of victimization: Why are women and the elderly more afraid? *Social Science Quarterly*, 65, 681–702.
- Webley, P. (1981). Sex differences in home range and cognitive maps in eight-year old children. *Journal of Environmental Psychology*, 1, 293–302.
- Weinrath, M., & Gartrell, J. (1996). Victimization and fear of crime. *Violence and Victims*, 11, 187–197.