Bulletin of the Psychonomic Society
1989, 27 (4), 379-381

Geographical knowledge throughout the lifespan

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The ability to locate cities on outline maps of the United States and of the local region of residence was studied in adults aged 20-92 years. For U.S. cities, accuracy increased with age, reaching asymptotic levels in the 50s and 60s. Beyond age 70, accuracy declined slightly for women but not for men. For cities in the local region, performance reached asymptote in the 30s and remained constant thereafter. Throughout the age range studied, men outperformed women and college-educated subjects performed better than persons with less education. Accuracy was positively correlated with travel history.

Previous studies of geographical memory (Beatty, 1988; Beatty & Spangenberger, 1988) suggest that accurate knowledge of the location of cities in regions in which one has formerly resided persists for many years without loss, even among elderly subjects. These observations suggest that remote memory for this form of visuospatial information may be more resistant to age-related loss than is memory for famous people or public events, which tends to decline after the age of 70 (Butters & Albert, 1982; Squire, 1974).

To examine this issue more systematically, geographical knowledge was measured in age groups that encompassed the adult lifespan. Both men and women were studied, since in a previous study (Beatty & Tröster, 1987) consistent gender differences in geographical knowledge were observed among undergraduate students.

METHOD

Subjects

A total of 567 persons (304 females, 263 males), who were community-dwelling residents of either North Dakota or western Minnesota, participated. Nearly all the subjects were lifelong residents of the U.S.; most were long-term residents of North Dakota or Minnesota as well. On the basis of demographic information they provided, the subjects were classified by age (20s, 30s, 40s, 50s, 60s, 70s, or older), education (college degree or less), and gender. The sample sizes for the resulting 24 groups ranged from 10 to 76. The majority of the subjects in their 20s and a few of the subjects in their 30s or 40s were students in introductory psychology courses at North Dakota State University who received extra credit for their participation. Other subjects were recruited from various community sources and served without compensation. The subjects were screened to exclude persons with a history of drug abuse or neurological or psychiatric disease. They provided informed consent and responded anonymously.

Procedure

The subjects completed the revised version of the Fargo Map Test (FMT-R) (Beatty, 1988) in small groups. This test requires one to locate 30 U.S. cities and 10 gross features of U.S. geography (e.g., the Atlantic Ocean) on an outline map of the U.S., and 18 cities on an outline map of the tristate region that includes North Dakota, South Dakota, and Minnesota. In addition, the subjects indicated which of the 48 contiguous states and which of the 18 target cities on the tristate map they had visited or traveled through on surface transportation at any time during their lives. The subjects were encouraged to guess if they didn't know the exact location of a city, and nearly all the subjects completed all the items.

RESULTS

Table 1 summarizes the average number of U.S. cities correctly located. Statistical analysis revealed significant main effects of age group [$F(5,543) = 10.18, p < .001$], gender [$F(1,543) = 26.04, p < .001$], and education level [$F(1,543) = 65.45, p < .001$]. Within each gender and education condition, accuracy increased with age, attaining asymptote in the sixth or seventh decade. Among subjects in the oldest age groups there was a slight decline in accuracy for women [$t(87) = 3.71, p < .001$, for comparison of 60-69-year-old women as opposed to women 70 and older], but not for men of the same age groups ($t < 1$). Despite the slight decline in performance among the elderly women, they still performed more accurately than women in their 20s [$t(131) = 2.37, p < .05$]. Men 70 or older also performed more accurately than men in their 20s [$t(121) = 2.50, p < .05$].

The mean number of U.S. states visited is shown in Table 2. On this measure of lifetime travel experience there were significant main effects of gender [$F(1,543) = 5.20, p < .05$], education level [$F(1,543) = 75.76, p < .001$], and age group [$F(5,543) = 38.31, p < .001$]. In general, older people had visited more states than younger people. Like knowledge of the location of U.S. cities, the extent of travel in terms of number of states visited reached asymptotic levels in the 50s and 60s for both men and women. Men in their 60s and men 70 or older did not differ in the number of states visited ($t < 1$), but women 70 and older had visited significantly fewer states than had women in their 60s [$t(87) = 4.97, p < .001$]. Thus, the pattern of age-related differences in travel history for men and women generally paralleled accuracy in locating U.S. cities. Across all subjects the number of

I thank Rose Ament, Jayne Fiedler, Gloria Rixen, Ernest Kemble, Ellyn Thiesse-Duffy, Ralph Kolstoe, and Barb Moquist for assistance in the data collection. Correspondence may be addressed to William W. Beatty, Department of Psychology, North Dakota State University, State University Station, Box 5075, Fargo, ND 58105-5075.

Table 1
Mean Number, and Standard Deviation, of U.S. Cities Correctly Located (out of 30)

	Females				Males			
	College Grad.		Not College Grad.		College Grad.		Not College Grad.	
Age	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
20-29	17.1	5.9	12.5	5.1	21.0	6.7	17.3	5.5
30-39	20.9	4.5	14.8	4.9	22.1	5.1	19.9	6.1
40-49	21.1	6.4	16.6	6.0	23.6	4.9	18.7	5.9
50-59	24.3	4.4	19.3	3.7	24.0	3.4	20.4	5.6
60-69	23.5	4.1	19.6	5.4	24.3	5.6	20.0	6.2
70 and older	20.0	4.8	14.2	7.0	22.8	4.6	21.2	5.6

Table 2
Mean Number, and Standard Deviation, of U.S. States Visited

	Females				Males			
	College Grad.		Not College Grad.		College Grad.		Not College Grad.	
Age	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
20-29	19.5	10.3	15.9	9.2	17.1	6.5	18.2	9.4
30-39	25.6	8.2	17.7	6.8	26.3	7.1	21.8	8.7
40-49	29.8	8.2	21.1	10.1	29.4	8.0	25.3	9.9
50-59	36.7	10.2	27.4	9.9	39.5	4.6	23.8	8.0
60-69	38.6	6.7	28.7	10.3	37.4	9.9	28.6	10.0
70 and older	28.3	10.5	20.0	9.7	36.6	6.7	28.3	7.8

U.S. cities correctly located was positively correlated with the number of states visited [$r = .54$, $p < .001$].

Table 3 summarizes the mean number of cities in the tristate region that were correctly located. Statistical analysis revealed main effects of gender [$F(1,543) = 22.94$, $p < .001$], education level [$F(1,543) = 22.98$, $p < .001$], and age group [$F(5,543) = 4.23$, $p < .001$]. Subsequent analyses indicated that knowledge of these geographical details in the home region matured in the 30s and was maintained at asymptotic levels thereafter. The slight drop in performance by women 70 or older was not statistically significant [$t(87) = 1.23$, for comparison of the two older groups of females].

The mean number of cities in the tristate region visited is shown in Table 4. Significant main effects of age group [$F(5,543) = 18.51$, $p < .001$] and education level [$F(1,543) = 12.64$, $p < .001$], as well as a significant interaction between these variables [$F(5,543) = 2.48$, $p < .05$], were observed. In general, more highly educated persons had visited more tristate cities, but this effect was not observed for the youngest age group. There was no significant influence of gender [$F(1,543) = 3.37$,

Table 3
Mean Number, and Standard Deviation, of Tristate Cities Correctly Located (out of 18)

	Females				Males			
	College Grad.		Not College Grad.		College Grad.		Not College Grad.	
Age	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
20-29	13.3	2.6	9.3	3.7	14.1	3.7	12.6	3.1
30-39	14.4	3.3	11.5	4.7	14.3	2.6	14.6	3.1
40-49	13.7	3.6	12.5	3.3	15.4	2.6	13.2	2.7
50-59	14.6	1.7	12.9	3.7	15.7	3.3	13.6	3.3
60-69	14.0	3.0	13.1	4.2	14.9	3.0	14.6	2.7
70 and older	13.8	4.0	11.5	4.4	15.0	2.8	15.2	2.5

Table 4
Mean Number, and Standard Deviation, of Tristate Cities Visited

	Females				Males			
	College Grad.		Not College Grad.		College Grad.		Not College Grad.	
Age	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
20-29	9.2	3.1	10.1	5.9	10.0	3.9	10.8	3.0
30-39	12.5	2.5	10.2	3.4	12.1	3.5	13.2	3.1
40-49	13.6	2.6	12.2	4.2	13.5	3.7	12.1	4.0
50-59	14.5	2.4	13.5	2.4	15.1	3.1	11.2	4.8
60-69	15.1	3.0	12.5	4.0	15.1	3.4	14.5	2.9
70 and older	14.3	2.5	12.4	3.6	16.1	1.8	13.9	2.9

$p > .05$]. Subsequent analysis of the age effect indicated that the mean number of regional cities visited increased until the 50s and remained stable thereafter. The correlation between the number of tristate cities visited and accuracy in locating these cities was significant ($r = .48$, $p < .001$).

Nearly all of the females with a college degree and almost all of the males (regardless of education) correctly located all 10 of the gross features of U.S. geography. Group means ranged from 9.7–9.9 items correct, and there was no effect of age. By contrast, women without a college degree averaged 9.2 items correct, but again there was no influence of age. As a result, the main effects of gender, education level, and the interaction of these variables were significant [Fs(1,543) > 8.79, ps < .01] on this measure.

DISCUSSION

In contrast to the consistent pattern of age-related deficits on tasks that require memory for newly acquired spatial information (Charness, 1981; Light & Zelinski, 1983; Pezdek, 1983), the present findings demonstrate that the accuracy of geographical knowledge increased until middle age and was maintained thereafter, even in persons who were quite elderly. The slight drop in the accuracy of locating U.S. cities by women 70 and older, which was not observed in men 70 and older, is likely to be a cohort effect related to differences in travel experience. Travel history was shown to be positively correlated with accuracy of geographical knowledge, and the oldest group of women had visited fewer U.S. states than had women in their 50s and 60s; but no differences on this measure of travel history were observed among groups of men 50 and older. Furthermore, there was no significant loss of accuracy in locating cities on the tristate map among men or women 70 and older, and the oldest groups of men and women had visited as many tristate cities as had the groups of men and women in their 50s and 60s.

Moderate deficits in identifying famous persons or past public events have been reported for subjects over 70 (Butters & Albert, 1982; Squire, 1974), but geographical knowledge of the sort tapped by the FMT seems more resistant to age-related decline. Tests of remote memory that require the identification of famous people or the recall of past events place a premium on naming ability, which is known to decline after age 70 (Albert, Duffy, & Naeser, 1987). Since performance on the FMT places no obvious demand on naming, this may explain why geographical knowledge as measured by the FMT seems more resistant to age-related loss.

In the present study, more highly educated subjects demonstrated more accurate geographical knowledge than did subjects who were less well educated. While it is possible that the better educated subjects remembered information acquired in college courses, this explanation seems unlikely, since asymptotic performance on the geography tests was not reached until the subjects were in their 50s. More likely, the more extensive travel experiences of the college-educated subjects contributed to their better performance, but numerous other factors may also have been important.

Beatty and Tröster (1987) have reported that male college students outperformed female undergraduates on the same measures of geographical knowledge used in the present study. The present results extend the earlier findings to older and more highly educated subjects. Although the generality of the gender difference in geographical knowledge now seems certain, the reasons why males outperform females remain obscure.

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(Manuscript received November 28, 1988.)