

Perceived Barriers to Walking in the Neighborhood Environment: A Survey of Middle-Aged and Older Adults

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The authors investigated whether low levels of walking among older adults in the UK were associated with demographic and health characteristics, as well as perceived environmental attributes. Survey data were obtained from self-administered standard questionnaires given to 680 people age 50+ (mean age 64.4 yr) attending nationally led walking schemes. Items concerned with demographic characteristics and perceived barriers to neighborhood walking were analyzed using multiple logistic regression. Citing more than 1 environmental barrier to walking, versus not, was associated with significantly reduced levels of (leisure) walking (MET/hr) in the preceding week ($Z = -2.35$, $p = .019$), but physical activity levels overall did not differ significantly ($Z = -0.71$, $p = .48$). Citing a health-related barrier to walking significantly adversely affected overall physical activity levels ($Z = -2.72$, $p = .006$). The authors concluded that, among older people who favor walking, health problems might more seriously affect overall physical activity levels than perceived environmental barriers.

Key Words: METs, cross-sectional survey, health problems

Undertaking regular moderate-intensity physical activity (e.g., cycling, brisk walking, and some forms of house and gardening work) reduces the risk of chronic ill health (Halbert et al., 1997) and leads to physical and psychological benefits in all age groups (Berlin & Colditz, 1990; Dalsky, 1989; Ernst, 1998; Fisher & Li, 2004; Ford & Herman, 1995; Gunnarsson & Judge, 1997; Haapanen, Miilunpalo, Vuori, Oja, & Pasanen, 1997; Schnohr, Gronbaek, Petersen, Hein, & Sorensen, 2005; Thune, Brenn, Lund, & Gaard, 1997; Thune & Lund, 1996). Regular physical activity is particularly important for older people to maintain mobility and personal independence (Department of Health, 2003). Generally, it is recommended that people undertake at least 30 min of moderate-intensity physical activity (which includes brisk walking) on at least 5 days of the week (Hillsdon & Thorogood,

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1996; Pate et al., 1995; Wannamethee & Shaper, 2002; World Health Organization, International Federation of Sports Medicine, 1995). In England, approximately three fifths of men and three quarters of women have activity levels that are lower than this (Department of Health, 2003), although levels generally decrease with increasing age, so older adults tend to be particularly inactive (Crombie et al., 2004).

Ecological models of health behaviors have recently emerged to explain a broad range of influences on individuals' and communities' health behaviors. These models include the individual components of health-behavior theories and the broader perspective of social-cognitive theories but place them within the context and influences of the environment (Marcus & Forsyth, 1999; McLeroy, Bibeau, Steckler, & Glanz, 1988; Sallis & Owen, 1997; Stokols, 1992). Components of these models seek to identify which aspects of the environment could be related to different physical activities (Sallis & Owen, 1999).

More recently, a number of studies in Australia and the United States have highlighted the importance of older peoples' perceptions regarding various built-environment, social-cognitive, and health-related influences on their walking behavior and physical activity levels more generally (Booth, Owen, Bauman, Clavisi, & Leslie, 2000; Fisher, Li, Michael, & Cleveland, 2004; Howze, Smith, & DeGilio, 1989; Li, Fisher, & Brownson, 2005). Thus, important associations have been found between aspects of the built and social environment and walking, such as satisfaction (or otherwise) with neighborhood walking amenities (for example, pavement), access to local walking programs, and fear of crime. Only one U.K. study has been published to date examining the relationship between the perceptions of English adults and their level of walking. Only 30% of that study's sample, however, were over 50 years old (Foster, Hillsdon, & Thorogood, 2004).

Brisk walking is the activity most amenable to change in a sedentary population (Hillsdon & Thorogood, 1996) and is particularly relevant to older people because it is low risk and free, can be done alone, and requires no special equipment, training, clothing, or venue. Understanding the potential environmental and sociodemographic barriers to walking might help improve the short-term effectiveness of individual approaches to physical activity promotion (Hillsdon, Thorogood, & Foster, 2005).

In this study we examined demographic factors associated with specific barriers to walking and compared the impact of environmental and health-related barriers to walking in middle-aged and older U.K. adults. Specifically, using a large cross-sectional survey of people attending newly set-up walks in U.K.-based walking schemes, the main aims of this article are to identify characteristics of the neighborhood that discourage older adults from walking, identify the sociodemographic characteristics of individuals identifying specific barriers, and compare environmental and health-related variables as barriers to walking.

Methods

The study was approved by the Oxford Brookes University School of Health and Social Care Research Ethics Committee.

Study Setting and Sample

The study sample was recruited from two national walking initiatives. Most participants ($n = 601$) were recruited via Walking the Way to Health, a joint initiative of the British Heart Foundation (charity) with The Countryside Agency (The Countryside Agency, 2005) that began in October 2000 in England. Additional participants ($n = 149$) were recruited from the Paths to Health project based in Scotland, which has close links with Walking the Way to Health. These initiatives aim to encourage sedentary adults to become more active by attending health walks. Walking the Way to Health and the Paths to Health project generally employ trained walk leaders to set up, organize, and lead walks in local schemes across the country, assisted by volunteers.

It was envisaged that between 60 and 70 new locally led health-walk schemes would be set up annually from the summer of 2001 onward. The study aimed to recruit all people attending individual walks, representing a similar proportion of large and small schemes with good geographical spread, during a 2-year period.

New walking schemes were awarded funding and then set up throughout the study recruitment period, so information about all future walks was not available at the start of the study. This precluded the adoption of a random-sampling method. Instead, when the research officer was informed about newly funded schemes (together with the dates when individual health walks were to take place), the decision to include a particular walk in the study was made based on the characteristics of that scheme/walk—in terms of its size, urban versus rural characteristics, and geographical region—in comparison with the characteristics of all walks recruited to date, with efforts made to maintain both balance and diversity in the sample.

Data were obtained by self-completed questionnaires distributed by the research officer to all walkers as each walk ended. Although some were completed immediately, most people (~95%) completed their questionnaires at home and returned them in prepaid envelopes. The researcher took part in all walks included in the study (in England and Scotland) and spent time, during and after each walk, talking about the study to walkers and encouraging them to take part. After the walk, she explained how the questionnaire should be completed and dealt with any further questions from people about completing the questionnaire. Respondents could also telephone her if they had any subsequent queries. An estimate of the response rate exceeded 75% (this was based on the number of completed returns vs. the numbers of questionnaires distributed).¹ Participants who did not speak fluent English or had other difficulties with completing a questionnaire were encouraged to obtain assistance from a relative or friend (anecdotally, this represented very few).

Study Questionnaire

The study questionnaire contained the British Heart Foundation's Daily Activities Questionnaire, which is adapted from a validated American measure (Taylor et al., 1978) with subsequent tests of its repeatability and validation conducted in

1. This rate represents the minimum estimate and is imprecise because walk leaders often asked to be given a small number of extra questionnaires to give out to people who attended the same walk the following week but who had not attended on the first occasion. Few walk leaders kept a reliable record of the additional number of questionnaires distributed or the number that they had left over at the end.

the United Kingdom. The content of the questionnaire appeared acceptable and unambiguous to study participants during face-to-face interviews in a previous study conducted with older adults ($n = 69$; Nanchanal, Hillsdon, & Morris, 2001). Here, the reliability of the measure was found to be satisfactory in comparison with concurrent measures of motion-sensor data (reliability coefficient .71), and the Spearman correlation coefficient for kcal/hr for repeat questionnaire completions conducted over two consecutive 7-day periods was $r = .76$; this measures the amount of physical activity that a person has engaged in during the preceding 7 days. Studies have generally shown that people can recall levels of physical activity within the previous 7 days with an acceptable degree of accuracy (Craig et al., 2003; Department of Health, 2000; Timperio, Salmon, & Crawford, 2003). Participants were asked to recall the frequency, duration, and intensity of 53 physical activities under 10 categories: travel to work by cycle or by walking; activity at work, at home (types of housework), and in the garden; other activities around the home (types of do-it-yourself); walking or outdoor cycling for leisure; stair climbing; sports; and recreation. Each activity was assigned a metabolic-equivalent (MET) value using published tables (Ainsworth et al., 1993). One MET is the rate at which adults expend 1 kcal at rest; this is approximately 1 kcal per kilogram body weight per hour (expressed as $1 \text{ kcal} \cdot \text{kg}^{-1} \cdot \text{hr}^{-1}$). Two METs indicates that the energy expended is twice that at rest, and so on. Thus, METs are a measure of the absolute intensity of a physical activity.² For each activity, MET hours per week were calculated by combining the frequency, duration, and intensity of the activity.

The questionnaire also included demographic items such as age, gender, and marital status, as well as items to assess a person's socioeconomic status, namely, working status and postal code. In addition, individual questions asked about general health status and past and present smoking behavior. These included three items asking whether the person had been ill or bereaved or had had an operation during the preceding 12 months and one item asking "How would you rate your general health?" with response options *excellent*, *very good*, *good*, *fair*, and *poor*.

A final section asked respondents about barriers to walking around their neighborhood. Each of the items in this section was preceded by the words "I would walk more around my neighborhood, but. . . ." A list of possible reasons was then provided, such as ". . . there is nowhere green or pleasant to walk near my home," together with simple yes/no response options. The statements and responses chosen for this section were similar to questions developed and used in other studies (Ball, Bauman, Leslie, & Owen, 2001; Booth et al., 2000; Carnegie et al., 2002; Corti, Donovan, & Holman, 1997; Foster et al., 2004; Humpel, Owen, & Leslie, 2002).

Deprivation and Postal-Code Data

We obtained an index of multiple-deprivation (IMD 2004) rating for study participants, based on their individual postal codes (Scotland produces a similar—but not identical—index to the rest of the United Kingdom, which we obtained and applied

2. MET-based recommendations for physical activity advise that adults undertake at least 30 min of moderate-intensity physical activity (that is, an activity with an energy expenditure of 3–6 METs) on at least 5 days of the week. Examples of moderate-intensity MET values (3–4 METs) are walking at a brisk pace (1 mile in ~20 min) and playing golf. Vigorous-intensity activities (>6–10 METs) include running, swimming laps moderately fast to fast, and cycling 10–16 miles/hr.

to the postal codes of Scottish participants in the study. It was then possible to map one system onto the other and produce five equivalent groupings (quintiles) for the whole sample. The IMD 2004 represents the most recent and comprehensive index (Jordan, Roderick, & Martin, 2004) and measures multiple deprivation at the small-area level, based on the idea of distinct dimensions of deprivation that are experienced by individuals living in an area. It is conceptualized as a weighted area-level aggregation of seven specific dimensions of deprivation: income and employment; health and disability; education, skills, and training; barriers to housing and services; living environment; deprivation; and crime (Office of the Deputy Prime Minister, 2006). IMD 2004 ratings were grouped into five quintiles, of which Quintile 1 represented the most affluent quintile, and Quintile 5, the most deprived.

Statistical Analysis

The association of various sociodemographic and health-related characteristics with reported barriers to walking (each having yes/no response options) was examined using Pearson's chi-square test. Continuous forms of data (e.g., MET hr/week) were generally highly skewed; therefore, analyses of continuous data involving comparisons between groups (such as men vs. women) employed nonparametric tests (e.g., Mann–Whitney U).

Using multiple logistic regression, with simultaneous forced-entry method, we investigated associations between independent variables—individual characteristics and energy expenditure (physical activity levels, MET hr/week)—in relation to perceived barriers to walking in a person's neighborhood as the dependent variable, with barriers combined into a dichotomous variable reflecting any versus no barriers. Univariable analyses preceded any multiple logistic-regression modeling, and factors with a p value $\leq .3$ in univariable analyses were entered into the multiple-variable model to adjust for confounding effects. Model fit was assessed using the Hosmer and Lemeshow goodness-of-fit test, and the classification statistic (proportion of observations correctly classified) was computed (Hosmer & Lemeshow, 2000).

Questionnaire data were entered directly into SPSS 11.5 analytical software (SPSS Inc., 2004). Ten percent of data were reentered and checked for accuracy. The significance level was set at two-sided $p < .05$ throughout.

Results

The study recruited 750 adult respondents with a median age of 66 years (range 23–93). Sixty-three people (8.5%) were under the age of 50, and they were removed from all subsequent analyses (together with 7 people whose age was unknown), because the focus of this study was on middle-aged and older people. The remaining 680 respondents, recruited from 85 different walks (69 in England and 16 in Scotland), had a median age of 67.0 years (M 66.6, SD 7.5), and their residential addresses represented 591 different postal codes. Table 1 details demographic and health-related characteristics of the sample. Nearly three quarters (492, 72.4%) of the respondents were women, and a high proportion (302, 45.2%) described themselves as widowed, divorced, separated, or never married. Eighty (12.3%) individuals had been bereaved in the preceding 12 months.

**Table 1 Demographic and Health-Related Characteristics
of the Sample**

Characteristic		<i>n</i>	%
Demographic			
sex	female	492	72.4
age group	under 65	260	38.2
	65–74	323	47.5
	75+	97	14.3
ethnic origin	White	648	96.0
	other	27	4.0
country	England	538	79.1
	Scotland	142	20.9
marital status	married/living as married	365	54.7
	widowed/divorced/separated	261	39.1
	single (never married)	41	6.1
education	degree or equivalent	130	20.4
	some qualifications	227	35.6
	no qualifications	280	44.0
employment status	full-time (30+ hr)	15	2.2
	part-time	96	14.2
	retired	518	76.6
	other	47	7.0
accommodation	own home	568	86.2
	rented	91	13.8
use of car or van		497	75.9
deprivation index	1— <i>most affluent</i>	130	19.4
	2	141	21.1
	3	135	20.2
	4	134	20.0
	5— <i>most deprived</i>	129	19.3
Health-related			
self-rated general health	excellent	63	9.4
	very good	230	34.4
	good	273	40.9
	fair/poor	102	15.3
ill for whole week in last 12 months		162	24.3
bereaved in last 12 months		80	12.3
had operation in last 12 months		61	9.3
registered disabled		40	6.1
smoking	regular smoker ^a	27	4.0
	exsmoker	235	34.5
	nonsmoker	418	61.5

Note. *N* = 680, but the *N* varies with each variable (to a small extent) because of some missing responses to individual questions.

^aAt least one cigarette a day.

Physical Activity Levels

Most participants ($n = 667$, 98%) provided details of their physical activity during the preceding 7 days. These are shown in Table 2 as MET hr/week for various activities, by gender and for the sample as a whole. The most common activity reported was leisure walking (median MET hr/week of walking = 10.83, $M = 20.88$, $SD = 34.03$), with similar levels for men and women. Men and women's total physical activity levels differed, however, with men significantly more active overall (men: median MET hr/week = 63.25, $M = 76.95$, $SD = 65.50$; women: median = 45.00, $M = 67.50$, $SD = 78.45$; $Z = -2.92$, $p = .004$). Men's and women's physical activity levels also differed significantly with regard to home activities/housework, do-it-yourself activities, and leisure cycling, with home activities chiefly engaged in by women (men: median MET hr/week = 00.00, $M = 5.63$, $SD = 13.70$; women: median = 4.50, $M = 11.68$, $SD = 22.74$; $Z = -7.03$, $p < .001$) and do-it-yourself and cycling activities chiefly by men (do-it-yourself: men, median MET hr/week = 3.75, $M = 11.89$, $SD = 27.61$; women, median = 0.00, $M = 6.00$, $SD = 30.25$; $Z = -8.08$, $p < .001$; leisure cycling: men, median MET hr/week = 0.00, $M = 3.73$, $SD = 15.20$; women, median = 0.00, $M = 0.68$, $SD = 4.07$; $Z = -3.58$, $p < .001$).

Barriers to Walking Around the Neighborhood

A high proportion of respondents ($n = 603$, 88.7%) answered questions concerning perceived barriers to walking around their neighborhood, and 320 people (53.1%) cited at least one barrier. Table 3 provides details and compares men's and women's responses. Between a quarter and a third of the sample, but significantly more women than men, expressed worries about personal safety or reported that they had no one to walk with. Health problems that hindered walking were cited by a fifth of participants ($n = 117$, 19.9%) and almost one quarter of the men (24.1%).

Table 4 details the multiple logistic-regression analysis to examine whether reporting any (vs. no) environmental barriers (i.e., excluding ill health) to walking related to any particular respondent characteristics. Results show that women (vs. men) respondents who were not currently married (vs. married) and those with a health problem that affected walking (vs. none) were significantly more likely to report an environmental barrier to walking around their neighborhood.

Analyses shown in Table 5 explored respondent characteristics in relation to individual cited barriers to walking. Each column of results represents a separate multivariable analysis, with simultaneous adjustment made for country, age, sex, marital status, educational level, home ownership, and position on the deprivation index in each case (more detail was provided in the Statistical Analysis section). Being in the age group 65–70 (compared with <65 years) was associated with being less likely to report having no one to walk with (odds ratio [OR] = 0.62, 95% confidence interval [CI] = .39–.97). Men were less likely to report individual barriers to walking than women, apart from having (increased) concerns about a lack of pavement (OR = 4.84, 95% CI = 1.12–27.50). Being unmarried, single, and not cohabiting were highly associated with having no one to walk with (OR = 2.86, 95% CI = 1.83–4.49), and people who rented accommodation (vs. home owners) were more than twice as likely to report a health problem that affected walking (OR = 2.33, 95% CI = 1.30–4.19) and had concerns about too much traffic (OR = 1.88, 95% CI = 1.02–3.46), each representing a barrier to neighborhood walking.

Table 2 Physical Activity Levels in MET hr/Week for Various Activities

		Cycle to work	Walk to work	Home activities	Gardening activities	DIY	Leisure walking ^a	Leisure cycling	Sport activities	Total
Female	<i>n</i>	487	487	487	487	487	485	487	484	484
	<i>M</i>	0.06	0.24	11.68	14.81	6.00	21.42	0.68	12.78	67.50
	<i>SD</i>	0.65	2.22	22.74	25.51	30.25	37.65	4.07	23.57	78.45
Male	median	0.00	0.00	4.50	5.00	0.00	10.50	0.00	4.00	45.00
	<i>n</i>	184	184	184	184	184	184	184	183	184
	<i>M</i>	0.00	0.77	5.63	19.34	11.89	20.38	3.73	15.30	76.95
Total	<i>SD</i>	0.00	5.16	13.70	30.18	27.61	22.57	15.20	30.03	65.50
	median	0.00	0.00	0.00	7.25	3.75	12.63	0.00	4.08	63.25
	<i>n</i>	680	680	679	679	679	677	680	676	671
	<i>M</i>	0.04	0.38	9.90	15.86	7.53	20.88	1.49	13.29	70.09
	<i>SD</i>	0.55	3.28	20.73	26.82	29.48	34.03	8.72	25.38	75.19
	median	0.00	0.00	3.00	5.33	0.00	10.83	0.00	4.00	49.00

Note. DIY = do-it-yourself. Nonparametric test of significance (Mann–Whitney U) comparing men and women: cycle to work, $Z = -1.38$, $p = .17$; walk to work, $Z = -1.31$, $p = .19$; home activities, $Z = -7.03$, $p < .001$; gardening activities, $Z = -1.89$, $p = .06$; DIY, $Z = -8.08$, $p < .001$; leisure walking, $Z = -1.61$, $p = .11$; leisure cycling, $Z = -3.58$, $p < .001$; sport activities, $Z = -0.61$, $p = .55$; total MET hr/week, $Z = -2.92$, $p = .004$.
^aLeisure walking only includes walking at an intensity of 3 METs or more (i.e., excludes slow walking).

Table 3 Perceived Barriers to Walking in the Neighborhood With Comparison Between Men’s and Women’s Responses

	Everyone		Women		Men		χ^2 test <i>p</i>
	<i>N</i>	%	<i>n</i>	%	<i>n</i>	%	
I have problems with my health (e.g., breathlessness, dizziness, or painful joints). <i>N</i> = 589.	117	19.9	76	18.1	41	24.1	.10
There is no one to go walking with me around where I live. <i>N</i> = 595.	149	25.0	128	30.1	21	12.4	<.001
There is nowhere green/pleasant to walk near my home. <i>N</i> = 648.	42	7.1	29	6.9	13	7.6	.75
There are no pavements around where I live. <i>N</i> = 592.	8	1.4	3	0.7	5	2.9	.09
There is nowhere to go around where I live (e.g., shops, pub, church, park). <i>N</i> = 593.	20	3.4	15	3.5	5	2.9	.71
I worry about my personal safety around where I live (e.g., being attacked). <i>N</i> = 594.	170	28.6	147	34.6	23	13.6	<.001
I worry about being knocked down by a cyclist riding on the pavement. <i>N</i> = 591.	63	10.7	44	10.5	19	11.2	.80
I worry about tripping over broken paving stones. <i>N</i> = 590.	108	18.3	78	18.6	30	17.5	.76
There is too much traffic on the roads around where I live. <i>N</i> = 594.	98	16.5	66	15.6	32	18.7	.36
There is too much pollution around where I live. <i>N</i> = 646.	65	11.1	41	9.8	24	14.1	.13

Being at the lower end (generally) of the deprivation index was also significantly associated with reporting a number of barriers to neighborhood walking, particularly concern about personal safety (OR = 3.48, 95% CI = 1.81–6.72).

Finally, we examined whether citing any (vs. none) environmental barriers to walking or citing a health-related barrier to walking was related to peoples’ MET hr/week of leisure walking and overall physical activity levels. Our finding was that those who cited at least one environmental barrier to walking exhibited significantly fewer MET hr/week of leisure walking in the preceding week than those who cited none (median MET hr/week walking 10.5 vs. 11.9, respectively; *Z* = –2.35, *p* = .019), but their physical activity levels overall did not differ significantly (median total MET hr/week 47.8 vs. 50.8, respectively; *Z* = –0.71, *p* = .48).

People who cited a health-related barrier to walking, however, exhibited significantly fewer MET hr/week of leisure walking in the preceding week than those who cited none (median MET hr/week walking 7.3 vs. 12.0, respectively; *Z* = –4.15,

Table 4 Associations Between Factors Individually Associated With Any (vs. No) Reported Environmental Barriers to Walking Around in the Neighborhood (Logistic Regression Analysis), N = 602

Variable	Unadjusted				Adjusted ^a			
	χ^2 , <i>df</i>	OR	95% CI	<i>p</i>	χ^2 , <i>df</i>	OR	(95% CI)	<i>p</i>
Country								
England		1.00	Referent			1.00	Referent	
Scotland		0.82	0.56–1.21	.30		0.84	0.55–1.30	.44
Age group	2.52, 2			.28	0.29, 2			.87
<65 years		1.00	Referent			1.00	Referent	
65–70 years		1.27	0.90–1.80	.17		1.09	0.74–1.61	.66
75+ years		1.39	0.82–2.35	.22		0.97	0.52–1.81	.91
Gender								
female		1.00	Referent			1.00	Referent	
male		1.73	1.21–2.48	.003		0.67	0.44–1.00	.05
Marital status								
married/cohabiting		1.00	Referent			1.00	Referent	
other		2.35	1.68–3.28	<.001		2.00	1.35–2.97	.001
Education	9.85, 2			.007	2.67, 2			.26
degree		1.00	Referent			1.00	Referent	
some qualifications		1.77	1.13–2.78	.01		1.43	0.89–2.31	.14
no qualifications		1.98	1.28–3.06	.002		1.44	0.89–2.31	.14
Accommodation								
home owner		1.00	Referent			1.00	Referent	
renter (private/council)		1.59	0.98–2.60	.06		1.01	0.57–1.79	.97
Deprivation index	8.2, 3			.08	6.15, 3			.19
(most affluent) 1		1.00	Referent			1.00	Referent	
2		1.07	0.64–1.77	.80		1.00	0.58–1.71	1.00
3		0.94	0.56–1.55	.80		0.91	0.53–1.58	.91
4		1.07	0.64–1.80	.78		1.07	0.61–1.88	1.07
(most deprived) 5		1.85	1.10–3.13	.02		1.78	0.98–3.23	1.78
Health problem								
no		1.00	Referent			1.00	Referent	
yes		1.84	1.21–2.81	.005		1.94	1.21–3.10	.006

Note. Significance test (χ^2) for the variable as a whole is shown where a variable has more than two categories. Estimate of variance accounted for in the analysis: Cox and Snell $R^2 = .081$, Nagelkerke $R^2 = .108$. Goodness-of-fit statistic: Hosmer and Lemeshow test $\chi^2 = 10.836$, $df = 8$, $p = .211$.

^aEach variable in the model has been adjusted for all other variables in the table.

Table 5 Odds Ratios (OR) of Reporting Particular Barriers to Walking in the Neighborhood by Sample Characteristics

Sample characteristic	Perceived Barrier				Nowhere to go (e.g., shop, pub, church)
	Health problem	No one to walk with	Nowhere green or pleasant	No pavement	
Age group					
<65 years	1.00	1.00	1.00	1.00	1.00
65–70 years	0.68 (0.42–1.10)	0.62 (0.39–0.97)*	0.54 (0.26–1.11)	1.21 (0.28–5.33)	0.99 (0.36–2.74)
75+ years	1.74 (0.90–3.38)	0.76 (0.39–1.48)	0.32 (0.09–1.20)	0.00 (0.00–0.01)	0.00 (0.00–>99.99)
Gender					
female	1.00	1.00	1.00	1.00	1.00
male	1.39 (0.86–2.23)	0.39 (0.23–0.68)**	1.20 (0.56–2.57)	4.84 (1.03–22.8)2*	1.27 (0.42–3.87)
Marital status					
married/cohabiting	1.00	1.00	1.00	1.00	1.00
other	0.80 (0.49–1.31)	2.86 (1.83–4.49)***	2.19 (1.05–4.59)*	1.94 (0.41–9.21)	3.54 (1.18–10.61)
Accommodation					
home owner	1.00	1.00	1.00	1.00	1.00
renter	2.33 (1.30–4.19)**	0.98 (0.54–1.80)	1.33 (0.55–3.24)	3.85 (0.76–19.48)	1.60 (0.45–5.66)
Deprivation index					
1 (most affluent)	1.00	1.00	1.00	1.00	1.00
2	1.20 (0.60–2.39)	0.74 (0.39–1.40)	2.08 (0.62–7.02)	0.92 (0.12–6.99)	0.52 (0.14–1.94)
3	0.94 (0.46–1.92)	1.27 (0.69–2.33)	1.28 (0.35–4.73)	0.36 (0.03–4.22)	0.23 (0.04–1.19)
4	1.21 (0.60–2.46)	0.56 (0.28–1.12)	1.69 (0.47–6.02)	0.41 (0.04–4.77)	0.12 (0.01–1.05)
5 (most deprived)	1.48 (0.73–2.99)	1.30 (0.68–2.46)	2.95 (0.88–9.92)	0.57 (0.07–4.82)	0.59 (0.16–2.20)

	Personal-safety worries	Worry about cyclists on pavement	Tripping over broken paving stones	Too much traffic	Too much pollution
Age group					
<65 years	1.00	1.00	1.00	1.00	1.00
65–70 years	0.79 (0.51–1.21)	1.57 (0.84–2.94)	1.28 (0.78–2.10)	1.18 (0.72–1.94)	1.33 (0.74–2.39)
75+ years	0.61 (0.31–1.23)	1.27 (0.50–3.23)	1.53 (0.74–3.14)	0.65 (0.27–1.54)	0.43 (0.12–1.52)
Gender					
female	1.00	1.00	1.00	1.00	1.00
male	0.34 (0.20–0.58)***	1.37 (0.73–2.56)	1.02 (0.61–1.69)	1.28 (0.77–2.14)	1.44 (0.80–2.62)
Marital status					
married/cohabiting	1.00	1.00	1.00	1.00	1.00
other	2.04 (1.33–3.14)**	1.82 (0.99–3.36)	1.42 (0.87–2.30)	1.16 (0.70–1.92)	0.94 (0.51–1.72)
Accommodation					
home owner	1.00	1.00	1.00	1.00	1.00
renter	1.10 (0.62–1.95)	1.45 (0.71–2.96)	1.62 (0.90–2.93)	1.88 (1.02–3.46)*	0.72 (0.30–1.74)
Deprivation index					
1 (most affluent)	1.00	1.00	1.00	1.00	1.00
2	1.33 (0.69–2.58)	2.70 (0.93–7.84)	1.47 (0.68–3.22)	1.77 (0.83–3.80)	0.36 (0.12–1.06)
3	1.52 (0.79–2.94)	1.40 (0.44–4.46)	1.18 (0.53–2.66)	1.16 (0.52–2.59)	1.01 (0.44–2.35)
4	1.88 (0.97–3.65)	3.32 (1.16–9.53)*	2.34 (1.10–4.98)*	1.25 (0.56–2.81)	1.21 (0.53–2.77)
5 (most deprived)	3.48 (1.81–6.72)***	3.01 (1.04–8.71)*	2.39 (1.11–5.11)*	1.98 (0.91–4.31)	1.53 (0.67–3.52)

Note. 95% confidence intervals (CI) are shown in parentheses. Each variable in the model has been adjusted for country, age, sex, marital status, education, accommodation, and position on deprivation index.

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

$p < .001$), and their overall physical activity levels were also significantly lower (median total MET hr/week 37.6 vs. 51.0, respectively; $Z = -2.72$, $p = .006$).

Discussion

This article reports findings from a large survey of middle-aged and older people, which achieved a good response rate. Surveys representing this age profile are rare in the United Kingdom, particularly any representing a large geographical area. Before the analysis, we hypothesized that the walking schemes would attract people who liked walking and, therefore, that respondents' walking and overall physical activity levels would tend to be above average compared with the general population. Our findings confirmed this to be the case, with the average amount of walking that respondents reported (median 10.8 MET hr in the preceding 7 days) well above the recommended minimum level of at least 2.5 hr of moderate-intensity walking (or equivalent level of activity) per week. Respondents' overall levels of physical activity were considerably higher than this recommended minimum (median 49.0).

Although study respondents represented a generally physically active population who favored walking, more than half (53%) nevertheless reported experiencing at least one barrier to walking in their neighborhood, with worries about personal safety and the lack of anyone to walk with being the most commonly reported issues. This higher proportion reporting barriers than in Foster et al.'s (2004) study might reflect the fact that our sample was older but more active. It has been found elsewhere that adults who walk more are more likely to report high numbers of environmental barriers in relation to walking than are adults who walk less (Humpel, Marshall, Leslie, Bauman, & Owen, 2004).

Multivariate analysis revealed that being female, unmarried (and not cohabiting), or having a health problem were all factors that remained independently associated with perceiving a barrier to walking in one's neighborhood. Further elaboration revealed that citing a health problem as a barrier to neighborhood walking was associated with living in rented accommodation (private or council), after adjustment for other factors. This latter association could have arisen for a number of reasons. It is quite likely, however, that living in rented accommodation and having poor health both represented indicators of some aspect of poorer socioeconomic position, because a number of studies have demonstrated consistent associations between area-level measures of deprivation, health, and health behavior (Macintyre & Ellaway, 1998; Sundquist, Malmstrom, & Johansson, 1999). Nonetheless, these suggestions remain speculative, and the specific manner in which such associations operate, with regard to people's perceptions about barriers to neighborhood walking, is likely to be complex. These findings might nevertheless represent useful themes worthy of further research. Future research should consider, in more detail, whether and in what ways factors such as type of accommodation, health status, and perceived barriers to walking might interact.

Our final analyses revealed that people who perceived environmental barriers to walking in their neighborhood had significantly reduced levels of walking compared with people who perceived none—although their levels of physical activity overall were not unduly affected. This suggests that many people found other ways of exercising, either at home or at some distance away from their immediate neighborhood.

Those who cited a health problem as a barrier to walking in their neighborhood had significantly lower levels of both walking and overall physical activity than other people (with causality potentially operating in either or both directions over time).

The role that (and mechanisms through which) environmental influences play in relation to people's physical activity levels is known to be important but is poorly understood (Humpel et al., 2002), and, until recently, most research in this area has focused on younger people or men only (King, Blair, Bild, Dishman, & Dubbert, 1992). Although the ecological framework offers a structure for systematic examination of correlates of physical activity with the environment, this model does not offer any detail about the dimensions of this relationship. Environmental variables might have differential effects on various subgroups of the population; that is, men and women might respond differently to similar aspects of the environment or environmental changes (Humpel, Owen, et al., 2004).

Research specifically concerned with the neighborhood environment and health has stressed the importance of objective measures of deprivation, as well as aesthetic qualities (e.g., graffiti and greenery) that are associated with an area and the effect that these can have on health behaviors such as smoking and physical activity levels (Ellaway, Macintyre, & Bonnefoy, 2005; Sundquist et al., 1999). The current study has contributed confirmatory evidence of the importance of the neighborhood environment—and how it is perceived—in relation to people's levels of walking. We were also able to show, however, that the perceptions that people have about their neighborhood are independently associated with a number of demographic characteristics and that among people in early old age, perceived health status is also important.

Although most research on factors that influence walking and physical activity levels has focused on younger people, a few recent studies (conducted in the United States and Australia) have investigated older age groups and have reported that older adult regular walkers report more environmental barriers than older adults who walk less (Humpel, Marshall, et al., 2004). Others have reported that predictors of (or barriers to) physical activity appear to differ between young and older age groups, with poor health assuming increasing importance as a barrier with increasing age (Chao, Foy, & Farmer, 2000; Cohen-Mansfield, Marx, & Guralnik, 2003; King et al., 1992; Schutzer & Graves, 2004). There is a dearth of research in this area representing the United Kingdom, but our own analysis, based on a U.K. sample, complements these findings.

There are a number of limitations to this study. The first concerns the cross-sectional design, which precluded reaching any formal conclusions about the causality of the associations between variables, such as health problems versus physical activity levels. A second limitation concerns the lack of an interviewer approach to data collection, which meant that respondents could have been more likely to misunderstand questions and provide less accurate responses.

Another limitation concerns the sampling scheme. Recruiting participants from various walking schemes and geographical regions likely produced clustered data (i.e., individual participants nested within schemes and within regions), which threatens the assumption of independence of observations and potentially leads to incorrect or inefficient parameter estimates (Diggle, Liang, & Zeger, 1994). Nonetheless, with respondents representing 591 different postal codes and 85 different walks—all with very varied characteristics—it was far from clear what the most

appropriate unit of clustering requiring adjustment might be; we therefore simply raise this as a potential study limitation.

Regarding the representativeness of the sample, respondents were clearly relatively affluent, with 86% of people owning their homes. This compares with the 2003/04 General Household Survey figure of 70% of dwellings being owner occupied in Britain (Office for National Statistics, 2005) and 63% in Scotland specifically (General Register Office for Scotland, 2006). Nevertheless, home ownership is highest among those above pensionable age (Office for National Statistics), so the high level of home ownership, once again, reflected the older age profile of the study population.

More important, from the perspective of generalizability of the study findings, the sample had above-average levels of walking. The implications of this are that respondents could have been more exposed to, and therefore more likely to notice, environmental barriers to walking. Nonetheless, this sample could be viewed as particularly useful for investigating perceived barriers to walking, because if *these* people (with above average levels of physical activity) experienced disincentives to walking in their neighborhood, with associated reductions in walking, the likelihood is that other, less motivated individuals would be considerably more discouraged.

The environment can influence people's ability to be active (Department of Health, 2004). Improvements in the urban infrastructure could support the current walking levels of older adults and improve the experience of walking. For example, the design and layout of neighborhoods and towns can encourage or discourage access on foot or by bike, and crime-reduction strategies and improved street lighting could improve perceptions of safety. Many components of the environment can be modified by public-sector agencies through changes to policy and practice including urban planning, local transport planners, and community groups.

Further research should look to assess the relative contribution of individual, environmental, and social variables to different types of and overall physical activity specifically for older people (Humpel et al., 2002).

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