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Most older pedestrians are unable to cross the road in time: a cross-sectional study

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Abstract

Objectives: to compare walking speed in the UK older population with the speed required to utilise pedestrian crossings (≥1.2 m/s), and determine health and socio-demographic associations with walking impairment.
Design: cross-sectional study using Health Survey for England 2005 data.
Setting: private households in England.
Participants: random population sample of 3,145 adults (1,444 men) aged ≥65 years.
Main outcome measures: walking speed was assessed by timing a walk of 8 feet at normal pace. Walking impairment was defined as walking speed <1.2 m/s or non-participation in the test due to being unsafe or unable.
Results: the mean walking speed was 0.9 m/s in men and 0.8 m/s in women; 84% of men and 93% of women ≥65 years had walking impairment. Female gender, increasing age, lower socio-economic status, poorer health and lower grip strength were predictors of walking impairment.
Conclusion: most older adults either cannot walk 8 feet safely or cannot walk fast enough to use a pedestrian crossing in the UK. The health impacts on older adults include limited independence and reduced opportunities for physical activity and social interaction. An assumed normal walking speed for pedestrian crossings of 1.2 m/s is inappropriate for older adults and revision of these timings should be considered.

: *walking speed, traffic collisions, safety, aged, socio-economic factors, older people*

Introduction

The ability to cross the road safely is important for the health of older people. Walking activity among older adults, which has direct health benefits, is greater in pedestrian-friendly neighbourhoods [1, 2]. An inability to cross the road safely may reduce access to goods, health services and social contacts and thus adversely affect health. The divisive effects a road has on local residents, known as 'community severance' [3], may have a disproportional impact on the health of older adults because they are more likely to avoid crossing busy roads than younger adults [4].

Older pedestrians are more likely to die [5–7] or be seriously injured [6] in road traffic collisions than younger people due to decreased walking speed, slower decision-making and perceptual difficulties [8].

Having enough time is important for crossing the road safely. UK pedestrian crossing timings assume a minimum walking speed of 1.2 m/s (2.7 miles/h). Normal gait speeds of healthy people range from 0.94 m/s (2.1 miles/h) for women aged 80–99 to 1.43 m/s (3.2 miles/h) in men aged 40–49 [9]. However, these norms are not representative of the population who would like to use pedestrian crossings.

Studies in Ireland [10], the USA [11, 12], South Africa [13] and Spain [14] have shown that older adults have insufficient time at pedestrian crossings. Yet most studies are limited by the 'healthy' sample [10], small size [13], non-random sample [10, 13] and/or selection only of individuals actually crossing the road [11, 13].

There is some evidence that walking speed is socially patterned [15], suggesting that the negative health impacts of inappropriate crossing timings may be greatest among more deprived groups.

This cross-sectional study aims to describe mean 'normal' walking speeds of older adults in the UK and the proportion of the older population who were able to walk at ≥1.2 m/s, to assess the appropriateness of this speed as the basis for pedestrian crossing timings. We also investigated socio-demographic and health predictors of walking impairment.

Method

The Health Survey for England (HSE) is an annual, cross-sectional survey of a nationally representative sample of adults and children living in private households in England. HSE 2005 included a boost sample of people aged ≥65 [16, 17]. The London Multi-centre Research Ethics Committee approved the study.

Household response rates were 71% in the core and 74% in the boost samples. Data collection took place at an interview and a nurse visit. Totally, 4,269 people (1,897 men) aged ≥65 were interviewed, of whom 74% had a nurse visit.

'Normal' walking speed was assessed by timing how long it took the participant to walk 8 feet at their normal pace. The test was not carried out if they were unable to walk the distance, were unsafe, were unwilling, if there was no suitable space, or if their walking aid was unavailable. The walk was carried out twice, and the mean result used. Maximal grip strength was measured with a gripometer on alternate hands. Walking speed and grip strength measurement followed standard protocols [18].

At the interview, data were collected on health (self-reported health, limiting longstanding illness, mobility, falls, functional limitations and BMI), health behaviours (smoking and alcohol consumption) and demographic information (age, sex and ethnicity). Area deprivation was assessed using the Index of multiple deprivation (IMD) 2004 [19]. Further details of the sampling, recruitment and data collection have been reported [16].

Statistical analysis

The median, mean and standard deviation of walking speed and the proportion of participants with a walking speed <1.2 m/s were calculated. Walking impairment was defined as the participant being unable or unsafe to take the walking speed test or having a walking speed <1.2 m/s.

Logistic regression modelling was used to determine the associations with walking impairment. Possible explanatory variables were tested; significant variables were included in the final model. Statistics were adjusted for clustered stratified sampling and weighted to reduce non-response bias, except when describing participant characteristics. Statistical analysis was conducted in Stata Version 11.0.

Results

A total of 3,145 older adults (46% men) received a nurse home visit. Supplementary data are available in *Age and Ageing* online; Table w1 shows participants' characteristics.

90% of men and 87% of women took the walking speed test. 5.7% of men and 7.2% of women did not participate because they were unable to walk short distances or felt unsafe and 133 (4.3%) participants were not tested because of unwillingness (1.8%) or technical problems (2.5%).

The mean 'normal' walking speed was 0.9 m/s in men and 0.8 m/s in women, with a decrease in speed as age increased (See supplementary data available in *Age and Ageing* online, Figures w1 and w2); 76% men and 85%

Table 1. Walking speed test performance by age and sex ($n = 3,145$)

	Age					
	65–69	70–74	75–79	80–84	85+	All 65+
Men						
Unable to do test[a] (%)	5	6	7	6	13	6
Walking speed <1.2 m/s (%)	73	76	80	85	85	76
Total walking impaired[a] (%)	*77*	*82*	*87*	*91*	*98*	*84*
Walking speed (m/s)[b]						
Mean (standard deviation)	1.0 (0.3)	0.9 (0.3)	0.9 (0.3)	0.8 (0.3)	0.7 (0.2)	0.9 (0.3)
Standard error	0.01	0.02	0.02	0.02	0.03	0.01
Median (inter-quartile range)	1.0 (0.4)	0.9 (0.3)	0.9 (0.4)	0.8 (0.4)	0.7 (0.4)	0.9 (0.4)
Women						
Unable to do test[a] (%)	5	5	7	14	17	8
Walking speed <1.2 m/s (%)	82	84	89	84	83	85
Total walking impaired[a] (%)	87	89	96	98	100	93
Walking speed (m/s)[b]						
Mean (standard deviation)	0.9 (0.3)	0.9 (0.3)	0.8 (0.3)	0.7 (0.2)	0.5 (0.2)	0.8 (0.3)
Standard error	0.02	0.01	0.02	0.02	0.02	0.01
Median (inter-quartile range)	0.9 (0.4)	0.9 (0.4)	0.8 (0.4)	0.7 (0.5)	0.5 (0.3)	0.8 (0.4)

[a]Including those who felt unable or unsafe to perform the test.
[b]Among those doing the walking speed test.

women had a walking speed <1.2 m/s; 93% of woman and 84% of men had walking impairment (Table 1).

After mutual adjustment, functional disabilities (excluding walking disabilities), alcohol consumption and falls were not associated with walking impairment, and so were excluded from the final model. Female gender, current smoking, living in a deprived area, fair or poor self-reported health, low grip strength and limiting longstanding illness were associated with walking impairment in the unadjusted and fully adjusted analyses (Table 2).

Discussion

The mean walking speed in both men and women was below the speed required to use a pedestrian crossing in the UK and many other countries [10, 12, 13]; 93% of women and 84% of men aged ≥65 years either could not walk 8 feet safely or their normal walking speed was too slow to cross the road in time.

The mean walking speeds were lower than established norms [9], possibly because our study did not exclude

Table 2. Prevalence of walking impairment and univariable and multivariable associations

Variable	Walking impairment (%)	Univariable associations OR (95% CI)	*P*-value	Multivariable associations[a] OR (95% CI)	*P*-value
Sex					
Male	1,105 (84)	1	<0.001	1	<0.001
Female	1,566 (93)	2.40 (1.89–3.05)		2.64 (2.02–3.34)	
Age (years)					
65–69	730 (83)	1	<0.001	1	<0.001
70–74	653 (86)	1.26 (0.96–1.66)		1.09 (0.81–1.45)	
75–79	563 (92)	2.33 (1.65–3.28)		1.54 (1.07–2.22)	
≥80	726 (97)	6.63 (3.89–11.28)		3.65 (2.12–6.27)	
Index of multiple deprivation (IMD, 2004)					
0.59 ≤8.35 (least deprived)	574 (83)	1	<0.001	1	<0.001
8.35 ≤21.16 (middle tertile)	1,141 (87)	1.41 (1.06–1.86)		1.40 (1.03–1.89)	
21.16–86.36 (most deprived)	956 (94)	3.40 (2.37–4.86)		2.50 (1.70–3.68)	
Highest educational qualification[b]					
University degree	185 (74)	1	<0.001	—	—
Other qualification	917 (85)	1.91 (1.39–2.61)		—	
None	1,566 (94)	5.20 (3.74–7.23)		—	
Smoking status					
Never smoker	1,238 (87)	1	0.010	1	0.012
Ex-smoker	1,109 (89)	1.20 (0.94–1.53)		1.39 (1.06–1.82)	
Current smoker	322 (93)	1.99 (1.24–3.19)		1.84 (1.11–3.05)	
Alcohol consumption (estimated units consumed on heaviest drinking day in last week)					
None	702 (92)	1	<0.001	—	—
Less than or equal to recommended limit[c]	1,272 (86)	0.54 (0.40–0.72)		—	
Over recommended limit	267 (84)	0.47 (0.33–0.66)		—	
General health					
Good or very good	1,402 (83)	1	<0.001	1	<0.001
Fair	892 (95)	4.41 (3.14–6.20)		2.87 (1.99–4.14)	
Poor or very poor	377 (99)	36.32 (8.98–146.99)		15.99 (3.96–64.51)	
Longstanding illness					
No longstanding illness	704 (83)	1	<0.001	1	0.012
Non-limiting longstanding illness	681 (84)	1.10 (0.82–1.46)		0.98 (0.72–1.34)	
Limiting longstanding illness	1,286 (95)	4.04 (2.95–5.54)		1.54 (1.10–2.15)	
Functional disabilities[d]					
0	2,189 (88)	1	0.005	—	—
≥1	481 (92)	1.66 (1.16–2.38)		—	
Fall in previous 12 months					
No	1,928 (88)	1	0.001	—	—
Yes	742 (92)	1.63 (1.21–2.19)		—	
Grip strength[e]					
Median or above	1,161 (82)	1	<0.001	1	<0.001
Below median	1,407 (95)	4.44 (3.36–5.85)		2.49 (1.84–3.37)	

[a]All results are mutually adjusted.
[b]Education was not included in the multivariable model due to collinearity with area level deprivation (IMD, 2004) [19].
[c]Four units for men, three units for women.
[d]Excluding walking disabilities.
[e]Median grip strength 36 kg in men, 21 kg in women.

unhealthy participants. Our findings are consistent with other studies in showing that many older pedestrians have insufficient time to use pedestrian crossings [10, 12, 14]. The walking speeds determined in this study were generally similar to, or lower than, those found in other studies.

It is well established that walking speed is lower in women and decreases with age [9, 20]. In addition to women, and the 'oldest old', those in deprived areas, smokers, those with poor grip strength [indicative of sarcopenia (loss of muscle mass)] and those whose general health is only fair or worse or who had longstanding illness were most likely to have walking impairment. The walking impaired participants may therefore be characterised as 'frail' [21], though definitions of this term vary. Grip strength is known to be an independent predictor of walking impairment [10]. However, poor mobility and a history of falls have also been found to be risk factors [10], but falls were not significant in our multivariable model.

Similar patterns of social inequality in walking speed have also been found in early old age [15]. Residual confounding by health problems not captured in our study [16, 22] may explain some of the association between low socioeconomic status and walking impairment. However, only one-third of observed social inequality in walking speed can be explained by health conditions or demographic, psychosocial, biological and behavioural factors [15].

The main strength of this study is that it provides an accurate picture of the proportion of people aged ≥65 years in the general population who are likely to be unable to use pedestrian crossings safely. The large sample size, random sample and the fact that participants were not excluded on the basis of disability mean that the data are representative of the older population who may wish to use a pedestrian crossing.

A further strength is that those people who were unable or for whom it was unsafe to participate in the walking speed test were included in the analysis (classed as walking impaired alongside those with gait speed <1.2 m/s). The advantage of using a general population sample rather than surveying people using a pedestrian crossing [11, 13, 23] is that those people who have difficulty using pedestrian crossings, and are therefore not utilising them, are captured.

A limitation of this study is the non-response bias that would result from differential participation in the survey. It is likely that older people with worse health were less likely to respond (including those temporarily in hospital). This study could have underestimated the prevalence of walking impairment, although the data were weighted to adjust for non-response.

Insufficient crossing time among older adults may not increase the risk of pedestrian fatalities, which are uncommon at pedestrian crossings, but it is likely to deter this group from even trying to cross the road. For older people, maintenance of mobility outside the home not only has direct health benefits but is also an important way to maintain independence and social networks [3, 24, 25]. Physical activity in older people may depend on the ability to negotiate their local environment, including crossing the road safely. The groups we have identified as being most likely to having walking impairment are also those least likely to have access to other, more expensive, forms of transport. Puffin crossings (with timings regulated by sensors) may enable older adults to cross in time, but more are needed and their profile must be raised for benefits to be realised.

The assumed 'normal' walking speed of 1.2 m/s is utilised internationally as the basis for pedestrian crossing timings. Our results show that pedestrian crossings requiring a walking speed of 0.8 m/s may be more appropriate, as this would allow the 'average' man or woman ≥65 years sufficient time to cross. The current assumed walking speed excludes most of the older population in England from using pedestrian crossings and therefore should be revised.

Key points

- The vast majority of people over 65 years old in England are unable to walk fast enough to use a pedestrian crossing.
- Those affected are more likely to be from deprived areas.
- It is important for older adults to be able to cross the road safely to keep physically active and maintain social contacts.
- Current pedestrian crossing timings should therefore be reviewed.

Conflicts of interest

None declared.

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Supplementary data

Supplementary data mentioned in the text is available to subscribers in *Age and Ageing* online.

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