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Crossing the road in time: Inequalities in older people's walking speeds

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A R T I C L E I N F O

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A B S T R A C T

Pedestrian crossings in the UK and US require people to walk at 1.2 m/s to cross the road in time; however a large proportion of older people do not walk this fast, potentially discouraging walking or putting older people at risk of injury. We use longitudinal data to investigate changes in walking speed, and ability to cross the road in time, at older ages.

31,015 walking speed measurements were taken from 10,249 men and women aged 60+ years in waves 1–7 of the English Longitudinal Study of Ageing (2002–2014). Growth curve analyses were used to model how walking speed changes with increasing age, and predicted probabilities of being able to cross the road in time were estimated.

10% of measured walking speeds were fast enough to cross the road in time. Walking speed declined with age (-5.7×10^{-3}m/s/yr (95% CI -7.6×10^{-3}, -3.9×10^{-3})), and the decline accelerated with increasing age (-0.3×10^{-3}m/s/yr (-0.4×10^{-3}, -0.3×10^{-3})). Female, less wealthy and less healthy older people had slower walking speeds. For instance, predicted probability of crossing the road in time at age 60 was 14.8% (10.1, 18.5) and 2.7% (1.5, 3.8) for the richest and poorest men and 8.4% (6.0, 1.1) and 1.5% (0.9, 2.2) for the richest and poorest women, and at age 80 they were 7.1% (3.6, 10.5) and 1.0% (0.3, 1.7) for the richest and poorest men and 3.7% (1.6, 5.9) and 0.5% (0.1, 0.9) for the richest and poorest women.

Most older people do not walk fast enough to cross the road in time. Even the majority of the wealthiest and healthiest people aged 60 years and older do not walk fast enough to cross pedestrian crossings in the allocated time. Crossing times should be increased to allow for older peoples' slower walking speeds or other policies considered to improve walkability, and to help avoid injuries and social isolation.

1. Introduction

Pedestrian crossings in the UK and US require people to walk at 1.2 m/s to cross in time (Pedestrian Facilities at Signal-Controlled Junctions, 2005; Fitzpatrick et al., 2006), however a large proportion of older people cannot walk at this speed (Asher et al., 2012; Zaninotto et al., 2013; Brunner et al., 2009; Musselwhite, 2014): existing cross-sectional evidence suggests that only about 20% of those aged 65+ years walk this fast (Asher et al., 2012). An inability to walk fast enough to

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cross the road safely may put older pedestrians at risk of death or injury in a road traffic accident and may inhibit older people's activities, for example, the fear of falling can lead to risk avoidance (Zijlstra et al., 2007). If older people are inhibited from walking, their access to amenities will be reduced, and risks of physical inactivity and social isolation will be increased, with attendant implications for healthy ageing (Shankar et al., 2011).

Older people report a preference for using designated pedestrian crossings, but also that they are given inadequate time to cross (Shaw et al., 2002). Cross-sectional studies have identified that women, those aged 75+ years, living in more deprived areas, who smoked or were in poor health had slower walking speeds (Asher et al., 2012; Brunner et al., 2009; Musselwhite, 2014), but have not assessed how individual's walking speeds change over time. Those few longitudinal analyses which have addressed this have identified wealth and educational differentials in walking speed, and declines in walking speed with age (Zaninotto et al., 2013; Weber et al., 2016) but have not investigated older people's changing ability to cross the road safely.

Our study extends the existing literature by investigating changes over time in both older people's walking speeds and older people's ability to cross the road in time, using longitudinal data collected over 12 years. We will estimate predicted mean walking speeds and predicted probabilities of the ability to cross the road in time and will interpret our findings with reference to the current required walking speed at pedestrian crossings.

2. Methods

2.1. Study sample and measures

This study used data from seven waves (2002–2014) of the English Longitudinal Study of Ageing (ELSA) (Steptoe et al., 2013), a longitudinal study of people aged 50+ years living in England. Participants gave full informed consent to participate in the study, and ethical approval was obtained from the National Research Ethics Committee. Timed walks were measured biennially in participants aged 60+ years. Participants walked eight feet (2.44 m) and back at their usual walking pace, using walking aids if required. Walking speed was calculated in metres per second (m/s), and we used the mean of the two measurements as our outcome variable. The eligible sample is 12,472 people, all of whom provided at least one walking speed measurement, resulting in 42,135 walking speed measurements over a 12 year follow up period. Our analytic sample included 10,249 individuals (54.7% female) who provided 31,015 walking speed measurements with complete data on all covariates.

Covariates, drawn from the literature (Asher et al., 2012; Zaninotto et al., 2013; Brunner et al., 2009), which we hypothesise will influence older people's walking speeds and ability to cross the road in time were: age (years, centred on age 60), age squared (to account for the non-linear change in walking speed with age), sex, wealth quintiles, smoking (never, former, current), limiting longstanding illness (LLSI), and difficulties with activities of daily living (Katz, 1963) (ADL; 0, 1 or ≥ 2 of a possible six), all of which were allowed to vary with time.

2.2. Statistical analysis

Growth curves models were fitted to estimate changes in walking speed with age. Covariates and covariate interactions with age and age squared were added in a stepwise fashion to determine whether they affected the intercept (estimated mean walking speed at age 60), slope (change in walking speed per year increase in age) or rate of change in the slope (change in walking speed per unit increase in the square of age in years). Only those covariates and covariate interactions with age and age squared which improved the model fit, assessed using likelihood ratio tests, were retained. All tested variables were significantly associated with the intercept; participant sex, wealth and difficulties with ADLs were associated with the slope and sex was furthermore associated with the rate of change in the slope. Predicted probabilities of being able to cross the road in time were calculated. All analyses were carried out in Stata 13.1.

3. Results

Only 10% of measured walking speeds were fast enough for the required pedestrian crossing speeds of 1.2 m/s. The ability to walk fast enough was more common amongst male (12% vs. 8% female), younger (18% at 60 years vs. 3% at 80 years), wealthier (20% of wealthiest quintile vs. 3% of least wealthy) and non-smoking (12% of never smokers vs. 6% or smokers) older people, and those without a LLSI (14% without vs. 5% with) and no ADL difficulties (13% without difficulties vs. 3% with 2+ difficulties).

Coefficients and 95% confidence intervals for taken from growth curve modelling are shown in Fig. 1. This modelling predicted that mean walking speeds declined with age, and that this decline accelerated with advancing age. Walking speeds were slower for women, those with less wealth, former and particularly current smokers compared to never smokers, people with a LLSI compared to those without, and people with ≥ 1 compared to no ADL difficulties. Significant interactions with age indicated that women had a more rapid decline in walking speed than men, whilst those in the poorer wealth quintiles had a shallower decline in walking speed than those in the richer quintiles, and those with ADL difficulties