Journal of Transport & Health xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Journal of Transport & Health

journal homepage: www.elsevier.com/locate/jth

Associations of mode of travel to work with physical activity, and individual, interpersonal, organisational, and environmental characteristics

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ARTICLE INFO

Keywords:
Physical activity
Walking
Active travel
Commute
Workplace policies

ABSTRACT

Introduction: Encouraging walking during the daily commute is a potential strategy for increasing physical activity levels. This study aimed: (i) to examine, and compare by travel mode, the objectively measured physical activity of a working adult population, and, (ii) to identify associations between mode of travel to work and a range of individual, interpersonal, organisational and environmental characteristics.

Methods: Employees (n = 654) recruited from 87 workplaces in geographically distinct areas provided data through accelerometers, Global Positioning System (GPS) receivers, travel diaries and questionnaires. Separate multivariable logistic regression models were developed to examine factors associated with physical activity during the commute and mode of travel to work.

Results: In comparison to car users (7.3 minutes ± Standard Deviation 7.6), walkers (34.3 ± 18.6) and public transport users (25.7 ± 14.0) accrued substantially higher levels of daily moderate to vigorous physical activity during the commute. Combined accelerometer and GPS data showed that participants who walked at least ten minutes during their commute were more likely to have a shorter commute distance ($p < 0.001$), occupy a sedentary job ($p < 0.01$), and be classified as 'underweight or normal weight' ($p < 0.03$). No car access ($p < 0.001$), and absence of free work car parking ($p < 0.01$) were independently related to walking to work and using public transport. Shorter commuting distances were also related to walking to work ($p < 0.001$). Public transport users were more likely to be younger ($p = 0.04$), have more positive environmental perceptions ($p = 0.01$), and less likely to combine their commute with caring responsibilities ($p = 0.03$).

Conclusions: This study shows that walking to work and using public transport are important contributors to physical activity levels in a working population. Planning, transport and behavioural interventions to promote walking during the commute should take into account the wider determinants. Reducing availability of free work car parking is one possible strategy to discourage car use.

List of abbreviations: SD, Standard Deviation; UK, United Kingdom; GPS, Global Positioning System; MVPA, Moderate to Vigorous Physical Activity; CPM, Counts per minute; AccGPS, Combined Accelerometer and GPS data; GIS, Geographical Information System; SNR, Signal to Noise Ratio; OR, Odds Ratio; aOR, Adjusted Odds Ratio; CI, Confidence Interval

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https://doi.org/10.1016/j.jth.2018.01.009
Received 19 October 2017; Received in revised form 19 January 2018; Accepted 23 January 2018

1. Introduction

Global physical activity recommendations state that adults should accumulate at least 150 minutes of moderate physical activity per week in bouts of ten minutes or more to accrue health benefits (Haskell et al., 2007; World Heath Organisation, 2010; Department of Heath, 2011). However, there are concerns that due to increasing sedentary lifestyles many adults do not achieve this (Hallal et al., 2012). For example, in the United Kingdom (UK) 41% of adults aged 40 to 60 years old reported no occasions where they walk for ten minutes continuously at a brisk pace each month (Public Health England, 2017).

Evidence from systematic reviews suggests that adult populations who use active modes of transport (walking and cycling) for commuting have overall higher physical activity than car commuters, and also have decreased risk of cardiovascular disease and all-cause mortality (Hamer and Chida, 2008; Saunders et al., 2013; Kelly et al., 2014). Similarly, there is also evidence that people who use public transport, where a portion of the journey is by foot, accumulate more physical activity than car users (Wener and Evans, 2007; Lachapelle and Frank, 2009; Lachapelle and Noland, 2012; Rissel et al., 2012). The majority of primary studies have depended on self-report measures of both physical activity and mode of travel, which may not provide reliable estimates (Prince et al., 2008; Tully et al., 2014).

A number of studies have used objective methods (combining accelerometer or heart rate data and Global Positioning System (GPS) data) to investigate physical activity and mode of travel (Audrey et al., 2014; Costa et al., 2015; Miller et al., 2015; Audrey et al., 2015b). For example, in a population of 103 employees, those who walked to work accumulated more moderate to vigorous physical activity (MVPA) than car drivers on the days that they commuted (78.1 minutes per day, Standard Deviation (SD) 24.9 vs 49.8 minutes per day, SD 25.2), with no difference in weekend physical activity between the groups (Audrey et al., 2014; Audrey et al., 2015b).

Increasing the proportion of people who commute to work by walking or cycling has considerable potential to increase population-wide levels of physical activity, in addition to contributing to environmental benefits (British Medical Association, 2012). Despite being frequently combined as 'active travel', walking and cycling are discrete behaviours appealing to different population groups and requiring different strategies to increase their use as mode of travel (National Institute for Health and Care Excellence, 2012). However, walking may be perceived as an easier, safer and cheaper option, especially for those who are least active. Walking is a more familiar activity, does not require special equipment, and is less likely to involve direct competition for road space with motorised traffic (Morris and Hardman, 1997; Ogilvie et al., 2004). Because morbidity and mortality related to physical inactivity disproportionately affects socioeconomically deprived communities, encouraging and enabling walking as physical activity may help to address health inequalities.

In the UK, there are substantial opportunities to increase walking by replacing short journeys undertaken by car. For example, the 2016 National Travel Survey showed 24.5% of all car trips were shorter than two miles (3.2km), while 13% of trips of less than one mile (1.6km) were made by car (Department for Transport, 2017). Although levels of physical activity and personal travel modes may be considered a matter of individual choice, ecological models recognize the importance of a range of factors which constrain or support behaviour change. These have been conceptualized as operating at different levels: individual, interpersonal, organizational, community and public policy [14, 21].

Here, we examine baseline data from the Travel to Work multi-centre cluster randomised controlled trial (Audrey et al., 2015a). There are two aims for this cross-sectional study: (i) to examine, and compare by travel mode, the objectively measured physical activity of a working adult population, and, (ii) to identify associations between mode of travel to work and a range of individual, interpersonal, and organizational characteristics.

2. Materials and methods

2.1. Overview of the data collection methodology

We analysed baseline data obtained from 654 employees in 87 workplaces in urban areas of the south west of England and south Wales. Workplaces were recruited in two phases (May to July 2015 and March to May 2016). The methods of recruitment and sampling for the study have been described elsewhere in the study protocol paper (Audrey et al., 2015a). According to Office for National Statistics area classifications (Office for National Statistics 2011), the majority of recruited workplaces were located in 'larger towns and cities' (n = 45, 51.7%), followed by 'services, manufacturing and mining legacy' (n = 20, 23.0%) and 'town living' (n = 13, 14.9%) areas. Workplaces were diverse in relation to their function and included public administration, professional and scientific organisations, retail, services and manufacturing. The workplaces also varied in size: 45 (51.7%) were small (fewer than 50 employees); 22 (25.3%) were medium (50–249 employees), and; 20 (23.0%) were large (250 or more employees).

Employees from participating workplaces were provided with information about the study and invited to participate. Those who provided written consent were asked to wear accelerometers (Actigraph GT3X +) for seven days during waking hours and a personal GPS receiver (QStarz BT1000XT), set to record positional data at ten second intervals, during their commute. They were also asked to complete travel diaries and questionnaires to collect individual and sociodemographic characteristics, psychological measures, factors relating to car use and perceptions of the commute. Participants who returned the equipment were provided with a £10 gift voucher to acknowledge their contribution to the study. Ethical approval for the study was obtained from the Faculty of Health Sciences Research Ethics Committee at the University of Bristol.