

A workplace-based intervention to increase levels of daily physical activity: the Travel to Work cluster RCT

Suzanne Audrey, Harriet Fisher, Ashley Cooper, Daisy Gaunt, Chris Metcalfe, Kirsty Garfield, William Hollingworth, Sunita Procter, Marie Gabe-Walters, Sarah Rodgers, Fiona Gillison, Adrian Davis and Philip Insall



**National Institute for
Health Research**

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Abstract

A workplace-based intervention to increase levels of daily physical activity: the Travel to Work cluster RCT

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Background: There may be opportunities for working adults to accumulate recommended physical activity levels (≥ 150 minutes of moderate-intensity physical activity in bouts of ≥ 10 minutes throughout the week) during the commute to work. Systematic reviews of interventions to increase active transport indicate that studies are predominantly of poor quality, rely on self-report and lack robust statistical analyses.

Objectives: To assess the effectiveness, cost and consequences of a behavioural intervention to increase walking during the commute to work.

Design: A multicentre, parallel-arm, cluster randomised controlled trial incorporating economic and process evaluations. Physical activity outcomes were measured using accelerometers and GPS (Global Positioning System) receivers at baseline and the 12-month follow-up.

Setting: Workplaces in seven urban areas in south-west England and south Wales.

Participants: Employees ($n = 654$) in 87 workplaces.

Interventions: Workplace-based Walk to Work promoters were trained to implement a 10-week intervention incorporating key behaviour change techniques.

Main outcome measures: The primary outcome was the daily number of minutes of moderate to vigorous physical activity (MVPA). Secondary outcomes included MVPA during the commute, overall levels of physical activity and modal shift (from private car to walking). Cost-consequences analysis included employer, employee and health service costs and consequences. Process outcomes included barriers to, and facilitators of, walking during the daily commute.

Results: There was no evidence of an intervention effect on MVPA at the 12-month follow-up [adjusted difference in means 0.3 minutes, 95% confidence interval (CI) –5.3 to 5.9 minutes]. The intervention cost was on average, £181.97 per workplace and £24.19 per participating employee. In comparison with car users [mean 7.3 minutes, standard deviation (SD) 7.6 minutes], walkers (mean 34.3 minutes, SD 18.6 minutes) and public transport users (mean 25.7 minutes, SD 14.0 minutes) accrued substantially higher levels of daily MVPA during the commute. Participants who walked for ≥ 10 minutes during their commute were more likely to have a shorter commute distance ($p < 0.001$). No access to a car ($p < 0.001$) and absence of free workplace car parking ($p < 0.01$) were independently related to walking to work and using public transport. Higher quality-of-life scores were observed for the intervention group in a repeated-measures analysis (mean 0.018, 95% CI 0.000 to 0.036; scores anchored at 0 indicated ‘no capability’ and scores anchored at 1 indicated ‘full capability’).

Conclusions: Although this research showed that walking to work and using public transport are important contributors to physical activity levels in a working population, the behavioural intervention was insufficient to change travel behaviour. Broader contextual factors, such as length of journey, commuting options and availability of car parking, may influence the effectiveness of behavioural interventions to change travel behaviour. Further analyses of statistical and qualitative data could focus on physical activity and travel mode and the wider determinants of workplace travel behaviour.

Trial registration: Current Controlled Trials ISRCTN15009100.

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List of abbreviations

accGPS	combined accelerometer and Global Positioning System	ICECAP-A	ICEpop CAPability measure for Adults
ANOVA	analysis of variance	ID	identifier
aOR	adjusted odds ratio	MVPA	moderate to vigorous physical activity
BCT	behaviour change technique	NICE	National Institute for Health and Care Excellence
BMI	body mass index	NIHR	National Institute for Health Research
BRTC	Bristol Randomised Trials Collaboration	OR	odds ratio
CI	confidence interval	PHR	Public Health Research
c.p.m.	counts per minute	RCT	randomised controlled trial
DVD	digital versatile disc	SD	standard deviation
GIS	geographic information system	UKCRC	UK Clinical Research Collaboration
GP	general practitioner		
GPS	Global Positioning System		
ICC	intracluster correlation coefficient		

Plain English summary

Adults are recommended to do at least 150 minutes of moderate-intensity physical activity in bouts of at least 10 minutes throughout the week. One way to achieve this is through brisk walking during the journey to work. This could be the whole journey, or part of a journey if people live further away and combine walking with public transport or drive part of the way. The aim of this study was to find out if a 10-week programme, based in different workplaces, could increase employees' physical activity levels and encourage more people to walk to work. The study took place in south-west England and south Wales, and involved 87 workplaces and 654 employees. At the beginning of the study, the activity levels of people who were taking part were measured using activity monitors, GPS (Global Positioning System) receivers and questionnaires. It was found that people who walked to work and people who used public transport were much more likely to meet the government guidelines for physical activity. Then, in half of the workplaces a Walk to Work promoter was trained and given booklets, newsletters and optional pedometers to give to people in their workplaces who were taking part in the study. Booklets were also given to employers with ideas about how they could support people who wanted to increase walking in their journey to work. The other half of the workplaces did not take part in the programme and carried on as usual. After 12 months, physical activity levels were measured again. There was no evidence that the programme increased people's physical activity levels or encouraged more people to walk to work. The length of journey, child-care responsibilities, the availability and reliability of public transport and whether or not there was car parking were important factors influencing the way people travel to work.

Scientific summary

Background

There may be opportunities for working adults to accumulate recommended physical activity levels (≥ 150 minutes of moderate-intensity physical activity in bouts of ≥ 10 minutes throughout the week) during the commute to work. Systematic reviews of interventions to increase active transport indicate that studies predominantly rely on self-report and lack robust statistical analyses.

Objectives

To evaluate the effectiveness, cost and consequences and mechanisms of impact of a workplace intervention to increase walking during the commute to and from work.

Primary outcome

Does the intervention lead to an increase in the daily number of minutes of moderate to vigorous physical activity (MVPA) after 12 months compared with the control group?

Secondary outcomes

The secondary objectives relating to physical activity and travel mode were:

1. Does the intervention lead to an increase in overall physical activity compared with the control group?
2. Does the intervention decrease the daily number of minutes of sedentary time compared with the control group?
3. Does the intervention lead to an increased number of journeys in which walking to work is the major mode of travel compared with the control group?
4. Does the intervention increase the MVPA attributable to walking on the commute compared with the control group?

Economic outcomes

There were three key economic outcomes of interest:

1. What are the intervention costs to participating employers and employees?
2. Does the intervention lead to increased or decreased costs in terms of health-care use, commuting costs and productivity losses?
3. Does the intervention lead to improved well-being?

Process outcomes

The aim of the process evaluation was to examine the context, delivery and response to the intervention. There were two main outcomes of interest:

1. What were the barriers to, and facilitators of, walking during the daily commute?
2. Was there evidence of social patterning in the uptake of the intervention, particularly in relation to socioeconomic status, age and gender?

Methods

Trial design

The study was a multicentre, parallel-arm cluster randomised controlled trial incorporating health economic and process evaluations.

Workplace and participant recruitment

Using available lists of employers, workplaces in seven urban areas in south-west England and south Wales were sent information about the study and asked for expressions of interest. Workplaces with fewer than five staff were considered too small to deliver the intervention at a reasonable cost, and workplaces with plans to significantly downsize or relocate, or in which most staff were on short-term or zero-hours contracts, were not eligible because of the need for a 12-month follow-up. Within participating workplaces, employers were asked to provide all employees with an information leaflet describing the study and eligibility criteria. Employees who always walked or cycled to work already were ineligible, as were those who were disabled in relation to walking, intended to leave the workplace within the following 12 months or whose job required regular driving. All eligible employees were invited to participate in the study.

The Walk to Work intervention

The 10-week Walk to Work intervention was supported by the inclusion of nine behaviour change techniques (BCTs): providing information (about the benefits of walking to work), encouraging intention formation, identifying barriers and solutions, goal-setting, self-monitoring (with travel diaries and optional pedometers), providing general encouragement, identifying social support, reviewing goals and relapse prevention.

Employers were asked to identify a suitable Walk to Work promoter within the workplace. The research team delivered a training session, lasting approximately 1 hour, to the Walk to Work promoters at their workplaces. The training was based on a DVD (digital versatile disc), developed by the research team, which promoters retained after the session. The training included information about the benefits of walking, using BCTs to promote increased walking during the whole route or as part of a mixed-mode journey, providing support and accessing relevant websites for information and resources. Walk to Work promoters were given booklets, also developed by the research team, to assist them in the role.

Walk to Work promoters were given details of participating employees in their workplace and were asked to (1) provide the employees with Walk to Work booklets and an optional pedometer, (2) highlight benefits of increased walking, (3) discuss barriers and solutions to walking during the commute, (4) identify routes and methods of incorporating walking in their journeys and (5) provide ongoing support through four contacts over the following 10 weeks. Walk to Work promoters were prompted and encouraged in their role through four newsletters from the research team over the 10-week intervention period. These were provided by e-mail or in paper form to suit the workplace. Promoters were reminded to contact their colleagues, pass on the newsletters and encourage the use of relevant BCTs to increase walking. Posters and booklets with ideas about how to support the Walk to Work intervention were provided for employers.

Sample size calculation

Using findings from the feasibility study, the sample size for the trial was based on an average cluster size of eight, an intracluster correlation coefficient of 0.15, participant attrition of 25% and equal numbers of workplaces in the intervention and the control groups. It was calculated that 339 individuals were needed per study group to detect a 15% difference in MVPA [equal to a difference of 0.36 standard deviations (SDs)] with 80% power at the 5% significance level. Therefore, 678 employees were required from 84 workplaces (42 for the intervention group and 42 for the control group).

Physical activity measures

Physical activity was measured using accelerometers (ActiGraph GT3X+; ActiGraph, Pensacola, FL, USA). Validated accelerometer thresholds were used to compute daily time spent in MVPA and being sedentary. To identify physical activity during the commute, participants wore a GPS (Global Positioning System) receiver (Qstarz BT-1000X; Qstarz International Co., Ltd, Taipei, Taiwan) during their journeys. GPS data were time-matched with accelerometer data and visualised in a geographic information system (ArcMap version 10.2.2; Environmental Systems Research Institute, Inc., Redlands, CA, USA). Journeys were manually identified and segmented for other data to provide a measure of duration of the journey and associated MVPA.

Health economic costs and consequences

The cost–consequences analysis included employer, employee and health service costs and consequences with well-being measured using the ICECAP-A (ICEpop CAPability measure for Adults).

Process evaluation

A mixed-method process evaluation included survey questions and semistructured interviews to explore the context, delivery and response to the Walk to Work intervention.

Randomisation procedures

Randomisation took place at the workplace level after baseline data collection. Workplaces were randomly allocated to either the Walk to Work intervention or a usual practice control. Assignment of workplaces was undertaken at the Bristol Randomised Trials Collaboration by a statistician not involved in workplace recruitment. Allocation was based on random number generation, such that one workplace from a matched set (based on location, size and type of business) was randomised to the control and one (or two in a triple) to the intervention. Given the nature of the intervention, it was not possible to blind participants following randomisation.

Statistical methods

Individuals providing a measurement of the primary outcome were included in the primary analysis that compared intervention or usual practice workplaces as allocated. The treatment effect was estimated as a mean difference using multivariable linear regression, including treatment group, baseline MVPA, workplace size, location and type of business as covariates, and the workplaces as a normally distributed random effect (to take account of clustering). This approach was adapted to the secondary outcome measures, with a zero-inflated negative binomial regression model, with robust standard errors, estimating treatment effect on the modal shift measure (number of journeys when walking was the major mode of travel).

Sensitivity analyses were pre-planned to assess (1) the impact on the primary analysis of any imbalance in baseline covariates, (2) any non-normality in the distribution of the primary outcome and (3) different quality-assurance thresholds for accelerometer data. The third analysis included a greater number of participants in the primary analysis and so explored the influence of missing values. Subgroup analyses of the primary outcome measure explored whether or not age at baseline (above/below the median), gender (male/female) and household income (above/below £30,000) modified the intervention effect; these analyses proceeded by adding interaction terms to the regression models used in the primary analysis.

Separate multivariable logistic regression models were developed to examine factors associated with physical activity during the commute and mode of travel to work.

Ethics approval

Ethics approval for the study was obtained from the Faculty of Health Sciences Research Ethics Committee at the University of Bristol.

Results

Recruitment and retention

Recruitment took place in two phases: during May to July 2015 and March to May 2016. Invitations for expressions of interest were sent to approximately 9800 workplace addresses. A total of 271 expressions of interest were received and, after screening for eligibility and giving further information about the study, 87 workplaces were recruited: 10 micro-sized (5–9 employees), 35 small (10–49 employees), 22 medium-sized (50–249 employees) and 20 large (≥ 250 employees). Within the workplaces, 654 participants who were predominantly qualified to degree level or above (60%) and lived > 2 km from their place of work (89%) were recruited. Following the baseline data collection, 44 workplaces (331 participants) were randomised to receive the intervention and 43 workplaces (323 participants) were randomised to the control group. At the 12-month follow-up, 84 workplaces (41 intervention, 43 control) and 477 employees (73% of those originally recruited to the study) took part in data-collection activities.

Process evaluation

All workplaces randomised to the intervention group received the Walk to Work promoter training session and relevant booklets and resources. Following the loss of two workplaces, the Walk to Work promoters in 41 workplaces received four newsletters over the 10-week intervention period to disseminate to participating employees. Descriptive statistics from survey questionnaires suggest that participants in the intervention group of the study were aware of the Walk to Work promoters in their workplaces and attempts were made to encourage increased walking during the commute. Employer support for the intervention tended to focus on the provision of information rather than improvements to facilities or incentives with cost implications. Key factors influencing whether or not participants increased walking during the commute were identified through the behavioural questionnaires and qualitative interviews. These included commuting distance and workplace location; availability and cost of alternatives to private car use; caring responsibilities; and stress during the commute.

Outcomes and estimation

There was no evidence of an intervention effect on MVPA at the 12-month follow-up [adjusted difference in means 0.3 minutes, 95% confidence interval (CI) -5.3 to 5.9 minutes]. There was no evidence that the effect of the intervention differed between different age groups, between males and females or between participants differing in household income. In the intervention group, 142 out of 331 participants (43%) provided a measure of the primary outcome (accelerometer data for ≥ 3 days and for 10 hours per day); in the control group, 180 out of 323 participants (56%) provided that measure. This is clearly a limitation to the strength of conclusions that can be drawn, but we do not believe that the missing measurements caused the study results to be misleading. Measuring the primary outcome for participants who provided at least 1 day of accelerometer data provided an outcome measure for 189 out of 331 participants (57%) in the intervention group and for 217 out of 323 participants (67%) in the control group; repeating the analysis with these data led to the same conclusion of no intervention effect.

Economic evaluation

The cost of the intervention was, on average, £181.97 per workplace and £24.19 per participating employee. There was no clear association between workplace size and cost per employee. Estimated productivity lost from self-rated productivity at work scores suggest that participants in the control group had more lost productivity due to ill health, with an adjusted difference in wages of $-\text{£}231.35$ (95% CI $-\text{£}424.77$ to $-\text{£}37.92$). Intervention participants had a marginally higher quality of life over the follow-up period than the control participants (average 0.018, 95% CI 0.000 to 0.036; scores anchored at 0 indicated 'no capability' and scores anchored at 1 indicated 'full capability'). However, the lack of improvement in MVPA or active commuting, and the higher loss to follow-up in the intervention group, cautioned against overinterpreting these findings.

Physical activity and mode of travel to work

In comparison with car users (mean 7.3 minutes, SD 7.6 minutes), walkers (mean 34.3 minutes, SD 18.6 minutes) and public transport users (mean 25.7 minutes, SD 14.0 minutes) accrued substantially higher levels of daily MVPA during their commutes. Combined accelerometer and GPS data indicated that participants who walked ≥ 10 minutes during their commute were more likely to have a shorter commute distance ($p < 0.001$). No access to a car ($p < 0.001$) and absence of free workplace 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 less likely to combine their commute with caring responsibilities ($p = 0.03$). Analyses of qualitative interviews identified several key influences on travel mode: commuting distance and workplace location; availability, reliability and cost of alternatives to private car use; and child-care responsibilities.

Conclusions

This study, incorporating objective measures of physical activity and a 12-month follow-up period, addresses some of the concerns of those who have called for greater rigour in assessing the effectiveness of active travel interventions. However, although the target for workplace recruitment was achieved, this was after a large mailout to workplaces across seven urban areas. It was not possible to check if all workplaces on the lists were extant, whether or not addresses and contact details were accurate or if the information reached someone with the authority to decide about study participation. Nevertheless, with only 271 responses from > 9000 letters, it can be concluded that this study, clearly related to workplace travel behaviour, was not of interest to a majority of employers. Furthermore, within workplaces, participant recruitment was also limited. Issues of recruitment, context and reach will be further explored through the process evaluation.

Implications for policy and practice

It has been shown that walking to work, either the whole route or combined with public transport, is an important contributor to objectively measured physical activity levels in a large sample of adult employees recruited from diverse workplaces and settings in the UK. We believe that the picture is sufficiently clear to assert that supporting walking during the daily commute (either as the main mode or as part of a mixed-mode journey) is important for both transport and health providers. The findings suggest that interventions to increase walking to work should take the wider determinants of commuting behaviour into account, and consideration needs to be given to commuting distances, availability of car parking and access to convenient and reliable public transport. This places the emphasis on interactions between the correlates of physical inactivity, rather than individual behaviour.

Recommendations for future research

It is recommended that future research should consider targeted interventions for particular subgroups, or interventions that operate at organisational, environmental and policy levels, including (1) the feasibility, effectiveness and cost-effectiveness of targeting interventions at micro-sized workplaces, (2) examining the links between the school run and the commute to work, (3) the acceptability, impact and cost-effectiveness of interventions relating to the reduction or relocation of workplace parking and (4) the impact of infrastructure changes to the walking environment on travel mode. Consideration should also be given to research design as studies relating to infrastructure or policy changes may be suited more to good-quality natural experiments and realist evaluation methods than other study designs.

Trial registration

This trial is registered as ISCTRN15009100.

Funding

Funding for this study was provided by the Public Health Research programme of the National Institute for Health Research. Living Streets, a UK charity promoting everyday walking, provided funding for the intervention booklets and free pedometers for distribution to participants in the intervention group.

Chapter 1 Introduction

Physical activity and health

Physical inactivity increases the risk of many chronic diseases, including coronary heart disease, type 2 diabetes mellitus, obesity and some cancers.^{1,2} It is currently recommended that adults should aim to undertake ≥ 150 minutes of moderate-intensity physical activity in bouts of ≥ 10 minutes throughout the week.^{3,4} However, because of increasingly sedentary lifestyles, there are concerns that many adults in high-income countries do not achieve this.^{1,4-6} For example, in the UK, 41% of adults aged 40–60 years reported no occasions in which they walked continuously for 10 minutes at a brisk pace each month.⁵ Increasing physical activity levels, particularly among the most inactive people, is an important aim of the current public health policy in the UK.^{1,7}

In addition, there is increasing interest in the relationship between time spent sedentary [defined as any waking, sitting or lying behaviour with low energy expenditure (≤ 1.5 metabolic equivalents of task)] and health outcomes.⁸ A large amount of time spent sitting has been associated with a greater risk of cardiovascular disease, type 2 diabetes mellitus, and cardiovascular and all-cause mortality. The amount of objectively measured sedentary time has been associated with a poorer metabolic profile in healthy adults and those at risk of and who have developed type 2 diabetes mellitus.⁹ It is of note that these associations are independent of the level of moderate to vigorous physical activity (MVPA) and, consequently, UK health guidelines recommend that adults should minimise the amount of time spent sedentary (sitting) in addition to increasing physical activity.¹

Walking as active travel

Evidence from systematic reviews suggests that adult populations that use active modes of transport (walking and cycling) for commuting have overall higher physical activity levels than car commuters, and also have a decreased risk of cardiovascular disease and all-cause mortality.^{10,11} Similarly, there is also evidence that people who use public transport, when a portion of the journey is by foot, accumulate more physical activity than car users.¹²

Walking is a popular, familiar, convenient and free form of exercise that can be incorporated into everyday life and sustained into older age.¹³ It is also a carbon-neutral mode of transport that has declined in recent decades in parallel with the increase in car use.¹ Even walking at a moderate pace of 5 km per hour (3 miles/hour) expends sufficient energy to meet the definition of moderate-intensity physical activity.¹⁴ Hence, there are compelling reasons to encourage people to walk more, not only to improve their health but to address the problems of climate change.¹⁵⁻¹⁸

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 that 24.5% of all car trips were shorter than 2 miles (3.2 km), and 13% of trips of less than 1 mile (1.6 km) were made by car.¹⁹ An opportunity for working adults to accumulate the recommended moderate activity levels is through the daily commute, and, in addition, replacing using a car with walking for short journeys is likely to reduce sedentary time. Experts in many World Health Organization countries agree that significant public health benefits can be realised through greater use of active transport modes.²⁰

Systematic reviews have examined the effectiveness of interventions to promote physical activity in general,²¹⁻²⁴ but there is less evidence about how best to promote walking to work. A systematic review of interventions to promote change from car to active transport²⁵ examined 19 studies that included

workplace-based interventions, architectural and urbanistic adjustments, population-wide interventions and bicycle-renting systems. Sixteen studies reported positive effects on modal shift, but the reviewers concluded that the methodologies used were not of high quality and the interventions were poorly described.²⁵

Available systematic review evidence has focused on interventions that promote walking, interventions that promote walking and cycling as an alternative to car use and the effectiveness of workplace physical activity interventions. None focuses specifically on employer-led interventions that promote walking to work, although the studies that have been undertaken are included within the available systematic review evidence.

Workplace physical activity interventions

A systematic review of the literature regarding the effectiveness of workplace physical activity interventions, commissioned by the National Institute for Health and Care Excellence (NICE) graded 14 studies as being high quality or good quality.²⁶ Three public sector studies provided evidence that workplace walking interventions using pedometers can increase daily step counts. One good-quality study reported a positive intervention effect on walking-to-work behaviour (active travel) in economically advantaged female employees. There was strong evidence that workplace counselling influenced physical activity behaviour but the reviewers indicated that there was a dearth of evidence for small- and medium-sized enterprises.

The NICE public health guidance on workplace health promotion concluded that although a range of schemes exist to encourage employees to walk or cycle to work, little is known about their impact.²⁷ Few studies used robust data-collection methods to measure the impact of workplace interventions on employees' physical activity levels (most use self-report) and there is a lack of studies examining how workplace physical activity interventions are influenced by the size and type of workplace and the characteristics of employees.²⁸

Measuring physical activity

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.^{29,30} A systematic review comparing direct measures with self-report measures for assessing physical activity in adults found that self-report measures were higher than objective measures in some cases and lower in others.³⁰ This calls into question the reliability of self-report measures, and indicates that there is no approach to correcting for self-report measures that will be valid in all cases. However, few studies have objectively measured the contribution of walking, particularly walking to work, to adult physical activity levels.^{28,31}

In Sweden, two studies examined the association between neighbourhood walkability [measured using a geographic information system (GIS)] and objective physical activity (measured using accelerometers).^{32,33} Both studies demonstrated how increased walking rates translated directly to increased MVPA levels. In the USA, a cross-sectional study³⁴ included 2364 participants enrolled in the Coronary Artery Risk Development in Young Adults (CARDIA) study who worked outside the home during year 20 of the study (2005–6) and found active commuting to be positively associated with fitness in men and women, and inversely associated with body mass index (BMI), obesity, triglyceride levels, blood pressure and insulin levels in men. The authors concluded that active commuting should be investigated as a means of maintaining or improving health. In the UK, researchers used accelerometers to examine associations between walking or cycling to work and objective MVPA levels and found that women who reported undertaking ≥ 150 minutes of active commuting per week achieved an estimated 8.50 additional minutes [95% confidence interval (CI) 1.75 to 51.26 minutes; $p = 0.01$] of daily MVPA compared with those who reported no time in active commuting, but no overall associations were found in men.³⁵

Costs and benefits of walking as active travel

Experts agree that significant public health benefits can be realised through greater use of active transport modes, and the ratio of benefits to costs is high.³⁶ However, more evidence is required on the costs and benefits of active travel interventions; a systematic review of interventions to promote walking included 19 randomised controlled trials (RCTs) and 29 non-randomised controlled studies but only six studies included even rudimentary economic evaluation.³⁷ Despite studies demonstrating the health benefits of active commuting, assessments of the cost-effectiveness of these interventions are relatively scarce. When economic evaluations have been undertaken, cost-effectiveness analyses have been conducted³⁸ and benefit-to-cost ratios have been calculated.^{39,40}

There are potential benefits to walkers from reduced commuting costs and greater certainty about the timing of the journey to work. Because morbidity and mortality related to physical inactivity disproportionately affect socioeconomically deprived communities, encouraging and enabling walking as physical activity may help to address health inequalities. The potential benefits to employers who promote walking to work may include reduced in sickness costs and absenteeism, improved staff performance and productivity and reduced staff turnover.⁴¹

Using behaviour change techniques to encourage active travel

Behaviour change techniques (BCTs) have been defined as the 'active ingredients' within an intervention designed to change behaviour that are observable, replicable and irreducible components, which can be used alone or in combination.⁴² A taxonomy of 26 BCTs was identified in 2008,⁴³ with subsequent work undertaken to improve labels and definitions and to reach a wider consensus of agreed distinct BCTs.⁴⁴ The 2008 taxonomy has been successfully used to categorise the BCTs used in healthy eating and physical activity interventions with 'self-monitoring' combined with at least one other technique identified as the most effective.^{45,46}

A systematic review of workplace physical activity interventions confirmed that goal-setting, providing instruction and prompting self-monitoring were the main BCTs used.²⁸ A systematic review and random-effects meta-analysis assessed the effectiveness of 37 worksite interventions and reported that, overall, worksite interventions have small, positive effects on physical activity: those promoting walking as opposed to other forms of physical activity were more effective, and there was some evidence that goal-setting and goal review techniques may enhance fitness gains.⁴⁶ Another systematic review of interventions to promote walking³⁷ identified two general characteristics of interventions found to be effective: targeting and tailoring. A systematic review of promoting walking and cycling as alternatives to using cars²⁷ identified 22 studies that met the inclusion criteria and found some evidence that targeted behaviour change programmes can change the behaviour of motivated subgroups.

Of the 46 walking and cycling controlled interventions coded for BCTs by Bird *et al.*,⁴⁷ 21 reported a statistically significant effect using a mean number of BCTs of 6.43 [standard deviation (SD) 3.92].³⁸ The most commonly used techniques were 'self-monitoring' and 'intention formation'.⁴⁷ NICE has issued recommendations advising that interventions should use BCTs based on goals and planning, feedback and monitoring and social support.⁴⁸

The Walk to Work feasibility study

Aim and objectives

The current cluster RCT incorporated lessons learned from the Walk to Work feasibility study [National Institute for Health Research (NIHR) Public Health Research (PHR) project number 10/3001/04].⁴⁹ The aim of the feasibility study was to build on existing knowledge and resources to develop an employer-led scheme

to increase walking to work and to test the feasibility of implementing and evaluating it in a full-scale cluster RCT. The objectives were to (1) explore with employees and employers the barriers to, and facilitators of, employer-led schemes to promote walking to work, (2) use existing resources and websites to develop a Walk to Work information pack to train work-based Walk to Work promoters, and (3) conduct an exploratory RCT of the intervention to pilot workplace and employee recruitment procedures, examine retention rates, pilot cost and outcome measures and inform a sample size calculation for a full RCT.

Study design

The feasibility study comprised two phases of the Medical Research Council's framework for evaluating complex interventions.⁵⁰ During phase I, a review of resources that promote walking (and in particular the benefits of walking to work) was undertaken. In addition, three focus groups were conducted with employees, and interviews were conducted with three employers, in one small, one medium-sized and one large workplace outside Bristol to finalise the intervention design. Phase II comprised an exploratory randomised trial incorporating process evaluation and an assessment of costs. A cluster trial was required because randomisation of individual employees would risk contamination of the control group: the intervention was to be delivered within workplaces with the potential for employees to share information about the intervention and in which employers would be encouraged to support walking to work.

Recruitment

Workplaces were approached through Bristol Chambers of Commerce for initial expressions of interest. Fifty-five workplaces expressed an interest and were asked to complete a short questionnaire about the size and type of the business. Because the intervention initially aimed to focus on employees within 'walking distance' of their workplace, employers were also asked to identify how many of their employees lived within 2 miles of the workplace. This process was aided by the research team supplying the first four digits of postcodes likely to contain employees living within the required range, and an instruction leaflet of how to calculate distance using the website walkit.com (accessed 28 February 2019). Nevertheless, some workplaces found this burdensome and it may have affected recruitment. Of the 55 workplaces initially expressing an interest, 19 were recruited and 17 completed the study. Two workplaces left the study after randomisation to the intervention group: one because of downsizing and one because of heavy workload.

Within participating workplaces, employees living within 2 miles of the workplace were given information about the study and invited to participate. As the study progressed, it was felt that this was too restrictive, and a second round of recruitment was undertaken to include people who lived further away and might be willing to incorporate some walking as part of a mixed-mode commute. A total of 187 participants were recruited to the study: 147 living within 2 miles of the workplace and 40 living further away. In the intervention group, study participants were asked to sign an additional consent form before receiving the intervention. This was also considered to be restrictive and was not thought necessary for a future full-scale trial.

It was felt that naming the study Walk to Work may have restricted interest among some employers and may have encouraged the control group to consider walking to work. Therefore, it was decided to name the full-scale trial the Travel to Work study and to name the intervention the Walk to Work intervention.

Data collection

At baseline, all participating employees were asked to complete a questionnaire giving basic personal data and providing information relating to travel behaviour, costs and health. Participants were also asked to wear accelerometers during waking hours for 7 days to provide an objective measurement of physical activity, and to carry a personal GPS (Global Positioning System) receiver during the commute to confirm the duration of the journey and quantify its contribution to overall physical activity. Post intervention, questionnaires were administered again to explore views and experiences of walking to work, and additional questions about the acceptability of the intervention were included for the intervention group only. The questionnaires, accelerometers and GPS receivers were administered again across the intervention and the control groups

(as per the baseline protocol) at a 12-month follow-up data collection point. To examine key issues in more depth, baseline and post-intervention interviews were conducted with employers, Walk to Work promoters and a purposive sample of employees.

The Walk to work intervention

There were several stages of the intervention. Walk to Work promoters, either volunteers or nominated by participating employers, were identified in each workplace in the intervention group of the study. A training session for the Walk to Work promoters was run by experts in the research team and focused on the benefits of walking to work and resources available to promote this, identifying walking routes with participating employees and building confidence to encourage other employees to walk to work. The Walk to Work promoters were provided with the booklets and optional pedometers to assist them in their role. Employees participating in the study were then contacted by the Walk to Work promoter and those who were interested in walking to work were asked to consent to the intervention. The role of the Walk to Work promoter was to distribute booklets and optional pedometers, help identify walking routes, discuss barriers and solutions and encourage goal-setting. The promoters were also asked to provide support through four contacts (face-to-face, e-mail or telephone contacts, as appropriate) with participants over the following 10-week intervention period.

Findings from the process evaluation suggested that the intervention materials were acceptable to participants, with different individuals finding some BCTs more helpful than others. This suggested that a range of BCTs was required to enable participants to choose a 'package' to suit their individual needs. Some Walk to Work promoters were more proactive than others. One promoter did not perform the role at all owing to the pressure of work, and others felt that they needed additional support and encouragement during the 10-week intervention period, similar to that provided during the four contacts with study participants. It was also suggested that additional support at an organisational level should be encouraged.

Economic evaluation

All costs (including time, materials, equipment and travel) involved in the intervention were documented. Self-reported general health service use, productivity, absence from work and weekly commuting costs were also measured. The average cost of the intervention for participating workplaces was £441 (with a wide range from £66.33 to £958.38). Costs varied because of different numbers of promoters in each workplace, the number of employees participating in the intervention and the location of promoter training. Mean daily commuting costs were slightly lower in the intervention group than in the control group at follow-up [£2.66 (SD £4.32) vs. £3.64 (SD £12.16)] and mean self-assessed productivity was somewhat better in the intervention group than in the control group [1.51 (SD 1.41) vs. 2.07 (SD 2.24)] (based on a scale of 1 to 10, with 1 being 'health problems had no effect on my work' and 10 being 'health problems completely prevented me from working'), but the study was not powered to provide strong evidence on these outcomes.

Physical activity outcomes

The primary outcome response rate was 80% (149 out of 187 participants) immediately post intervention and 71% (132 out of 187 participants) at the 12-month follow-up. Although not powered to measure effectiveness, the accelerometer data suggested that overall weekday physical activity was lower in the intervention group [434.6 ± 165.0 counts per minute (c.p.m.)] than in the control group (441.9 ± 190.0 c.p.m.) at baseline, but higher in the intervention group (452.0 ± 188.7 c.p.m.) than in the control group (400.6 ± 120.0 c.p.m.) at the 12-month follow-up. MVPA was similar in the intervention (63.4 ± 28.6 minutes per day) and the control

(63.3 ± 28.5 minutes per day) groups at baseline, and was higher in the intervention group (61.3 ± 28.4 minutes per day) than in the control group (55.8 ± 22.2 minutes per day) at the 12-month follow-up.

Intraclass correlation coefficient and sample size calculation for a full-scale cluster randomised controlled trial

The intraclass correlation coefficient (ICC) for the feasibility study was calculated to be 0.12 (95% CI 0.00 to 0.30) and the average cluster size was 8. Based on an ICC of 0.15 to allow for some imprecision in the estimate, it was calculated that 678 participants across 84 workplaces would be required to give 80% power with a 5% significance level to detect a 15% increase in mean MVPA.

Summary

There are strong public health reasons to promote walking during the commute to and from work, yet there is a paucity of robust evidence relating to the effectiveness of workplace interventions to promote walking to work. A feasibility study showed that a Walk to Work intervention and its evaluation were feasible and acceptable to participants but suggested a need to simplify recruitment procedures and give additional support to the Walk to Work promoters during the 10-week intervention. Qualitative and statistical evidence suggested sufficient evidence of promise to justify a follow-on full-scale cluster RCT. To our knowledge, the Travel to Work cluster RCT is the first study to objectively measure (using accelerometers and GPS receivers) the effectiveness of a workplace intervention to promote walking during the commute to and from work, and to quantify the contribution of walking during the commute to adult physical activity.

Chapter 2 Study design

Trial design

The study was a multicentre, parallel-arm, cluster RCT incorporating process and economic evaluations. The trial protocol was published at the beginning of the study.⁵¹

Aim

The focus of the trial was to evaluate the effectiveness of a workplace-based intervention to increase walking during the commute for adults working in urban and suburban areas.

Primary outcome

Does the intervention lead to an increase in the daily number of minutes of MVPA after 12 months compared with the control group?

Secondary outcomes

As well as the primary outcomes, there were several secondary objectives relating to physical activity and travel mode. These were:

1. Does the intervention lead to an increase in overall physical activity compared with the control group?
2. Does the intervention decrease the daily number of minutes of sedentary time compared with the control group?
3. Does the intervention lead to an increased number of journeys in which walking to work is the major mode of travel compared with the control group?
4. Does the intervention increase MVPA attributable to walking on the commute compared with the control group?

Economic outcomes

There were three key economic outcomes of interest:

1. What are the intervention costs to participating employers and employees?
2. Does the intervention lead to increased or decreased costs in terms of health-care use, commuting costs and productivity losses?
3. Does the intervention lead to improved well-being, as measured by the ICEpop CAPability measure for Adults (ICECAP-A) questionnaire?⁵²

Process outcomes

The purpose of the process evaluation was to examine the context of, delivery of and response to the intervention from the perspectives of employers, Walk to Work promoters and employees. There were two main outcomes of interest:

1. What were the barriers to, and facilitators of, walking during the daily commute?
2. Was there evidence of any social patterning in the uptake of the intervention, particularly in relation to socioeconomic status, age and gender?

Sample size and justification

Using the findings from the feasibility study, the sample size for the full-scale trial was based on an average cluster size of eight, an ICC of 0.15 and participant attrition of 25%. The calculation needed to allow equal numbers of workplaces in the intervention and the control groups. We calculated that we needed 339 participants per study group to detect a 15% difference in MVPA levels (equal to a difference of 0.36 SDs) with 80% power at the 5% significance level. Therefore, 678 employees were required from 84 workplaces.

Setting

The aim was to recruit a variety of workplaces from different urban and suburban settings. Workplace recruitment in the first year of the study was in three areas: South Gloucestershire, Bath and Swansea. This was expanded for the second year of recruitment to include Bristol, Swindon, Neath Port Talbot and Newport. A brief overview of each of these areas is provided in the following sections. The workplace characteristics are described in *Chapter 3*.

South Gloucestershire

South Gloucestershire, in the south-west of England, comprises multiple towns and population centres to the north and east of the city of Bristol. In 2016, the population of South Gloucestershire was estimated to be 277,600, of whom 174,700 people (62.9%) were aged 16–64 years and 146,700 (52.8%) were economically active.⁵³ Key employers are local and national government departments, engineering and manufacturing industries and large insurance companies.⁵⁴ Many employers are located between the northern edge of Bristol and the M5 motorway. This area includes a large regional shopping centre and surrounding retail and business parks. South Gloucestershire contains a network of roads serving the industries, distribution centres and retail centres in the area. The railway network in South Gloucestershire is connected to major cities and towns across the UK.

Bath

Bath is a city in the south-west of England. In 2016, the population aged 16–64 years in the parliamentary constituency of Bath (which includes the city and surrounding suburbs) was estimated to be 64,900, of whom 49,300 people were economically active.⁵⁵ The city has strong software, publishing and service-oriented industries. Other important economic sectors in Bath are education, health, retail, tourism and leisure and business and professional services.⁵⁶ Major employers are the NHS, the city's two universities and Bath and North East Somerset council. In an attempt to reduce car use in the historical centre of Bath, park-and-ride schemes have been introduced through which car drivers are encouraged to use car parks on the edge of the city and travel into the centre by bus. Nevertheless, underground city-centre parking was also provided for a recent large shopping centre development. Bath is served by a main railway station providing connections to major cities, as well as some suburban railway services and a network of bus routes to surrounding towns and cities.

Swansea

Swansea is a coastal city and county in south Wales and has the second highest population of the 22 Welsh local authorities.⁵⁷ In 2016, the population of the Swansea local authority area was 244,500, of whom 155,300 people (63.5%) were aged 16–64 years and 113,500 were economically active.⁵⁷ The Swansea economy has a proportionately large share of jobs in the public administration, health, hospitality, financial services and retail sectors. Of the people in employment, an estimated 87.5% are employed in the service sectors, with 28.2% working within the public sector. Other main business activities are in the construction and scientific and technical sectors. The M4 motorway and several major trunk roads link Swansea to other cities in Wales and England. Bus services include smaller bus and coach operators, a road-based rapid transport route and two park-and-ride services.⁵⁸ There is also a main railway station and three smaller suburban stations.

Bristol

Bristol is a city and county in the south-west of England. In 2016, the population of the city of Bristol was 454,200, of whom 309,900 people (68.2%) were aged 16–64 years and 255,400 were economically active.⁵⁹ The main employment opportunities are in wholesale and retail, health and social work, administrative and support services and professional, scientific and technical activities. Bristol is connected to London and other major UK cities by two motorways and connecting major roads, as well as through its main railway station. Sustrans (www.sustrans.org.uk; accessed 19 December 2017), a charity promoting sustainable transport, was founded in Bristol. In 2015, Bristol won the European Union's European Green Capital award (www.bristol2015.co.uk; accessed 19 December 2017), in which sustainable transport was an important focus.

Swindon

Swindon is a large town in the south-west region of England. In 2016, the Swindon area had a population of 217,900, of whom 139,800 people (64.2%) were aged 16–64 years and 120,600 were economically active.⁶⁰ The majority of employment opportunities are in manufacturing (including car production plants), wholesale and retail, administrative and support services, health and social work, and finance. Swindon is on the main railway line linking London with the south west of England and south Wales. The town can be accessed by a strategic road network including two junctions along the M4 motorway.⁶¹ The recent transport plan for Swindon indicates that the development of fast and efficient public transport has 'lagged behind' because of the relative ease of car use.⁶¹

Neath Port Talbot

Neath Port Talbot is a County Borough and Unitary Authority in central south Wales. The area stretches from the south coast to the borders of the Brecon Beacons National Park. The majority of the population lives in the principal towns of Neath and Port Talbot. In 2016, the population of Neath Port Talbot was recorded as 141,600, of whom 88,000 people (62.1%) were aged 16–64 years and 67,300 were economically active.⁶² Regeneration 'to make Neath Port Talbot a place that is better connected, better for business and a better place to live' is an important theme for the county borough council (reproduced with permission from Neath Port Talbot Council⁶³). The main employment opportunities are in manufacturing (including steelworks), wholesale and retail trades, and human health and social work. The towns of Neath and Port Talbot both have railway stations, connecting them to major cities in Wales and England, and are also served by a network of buses. The M4 motorway cuts through Port Talbot, linking it to towns and cities along the M4 corridor. The Port Talbot docks complex is used mostly for the import of iron ore and coal for use by the nearby steelworks.

Newport

Newport is a city and unitary authority area in south-east Wales. In 2016, the population of the city was 149,100, of whom 93,100 people (62.4%) were aged 16–64 years and 73,100 were economically active.⁶⁴ Newport was once Wales' largest coal-exporting port, but the docks declined in importance during the 20th century. The main employment opportunities are now in manufacturing, the wholesale and retail trade, and human health and social work. Newport lies within the M4 corridor and is accessed by a network of major roads. A railway line passes through the centre of the city and a network of buses also serves the city.⁶⁵

Research governance

Ethics committee approval

As the study was not a clinical trial, and did not involve patients or users of the NHS, it was not necessary to apply for NHS ethics approval. All protocols and relevant paperwork were submitted to the Faculty of Medicine and Dentistry Research Ethics Committee at the University of Bristol in February 2014 and ethics approval was granted on 20 April 2014.

Adverse events

The Walk to Work intervention was considered low risk, involving generally healthy adults, and no adverse events had been reported during the feasibility study. However, there are potential risks to pedestrians in relation to road traffic safety and personal safety. Furthermore, it was possible that people with low activity and no history of walking might suffer initial muscle stiffness. In most cases, this would be mild and a normal consequence of increased physical activity, but participants were made aware that some symptoms might require medical attention, for example when underlying joint weakness is exposed. Such incidents were monitored throughout the trial.

Participating employers, Walk to Work promoters and employees were provided with guidance about adverse events and how to report them. Because available adverse events forms for health research tended to relate to clinical trials rather than low-risk public health interventions, bespoke forms were designed for the current study and agreed with the University of Bristol Research Governance and Ethics officer (see *Appendix 1*).

It was agreed that adverse events would be recorded by the key researcher for each site and collated by the study manager and principal investigator. When appropriate, adverse events would be reported to the University of Bristol Research Ethics Committee and the chairperson of the Trial Steering Committee. If adverse events were attributable to the intervention, relevant participants would be informed immediately (e.g. if an incident had happened on a particular route, work colleagues using the same route would be provided with relevant information).

It was also acknowledged that Walk to Work promoters might experience difficulties due to disruption to usual working relationships or employers' concerns about time taken out of usual work activities. The intervention activities might also present problems for employers and employees, such as disruption to work routines as a result of permitting elements of the intervention during working hours. These issues were considered through the qualitative research undertaken as part of the process evaluation.

Participant recompense

A small amount of recompense, a £10 gift voucher, was given to study participants who returned accelerometers and GPS monitors at the baseline and the 12-month data collections, in recognition of their contribution to the research. Interview participants were also given a £10 gift voucher. This was handled discretely by providing relevant individuals with a plain envelope containing the gift voucher thanking them for their help with the study.

Data storage

All data relating to workplaces and research participants are stored at the University of Bristol in accordance with the Data Protection Act 2018⁶⁶ and University of Bristol research governance requirements. Information collected from the paper questionnaires was transferred onto the study database, which is held on secure file storage at the University of Bristol and protected by a combination of user accounts and file access control lists, limiting access to agreed members of the research team. The data set will be kept, with limited access by agreed members of the research team, for 10 years from the end of the study. Following the transcription of interview recordings, all potentially identifiable personal information was removed to ensure anonymity. Personal information required for routine contact was stored on a separate database that could be linked using the unique participant identification number. The hard copies of the questionnaires and consent forms will be kept at the University of Bristol in a locked filing cabinet for at least 3 years after termination of the study.

Trial management and scrutiny

An overview of the study management structure is provided in *Figure 1*.

Trial Steering Committee

The Trial Steering Committee met with key members of the research team twice a year throughout the study and comprised an independent chairperson, statistician and health economist plus additional independent experts in travel behaviour, research evaluation, physical activity and health promotion.

Study co-applicant group

The research co-applicant group met on a quarterly basis throughout the study and was chaired by the principal investigator. The group comprised co-applicants from each of the research sites (Bristol, Bath and Swansea), the study manager, a representative of the Bristol Randomised Trials Collaboration (BRTC) and co-applicants with expertise in physical activity measurement, statistical analysis, health economics and sustainable transport.

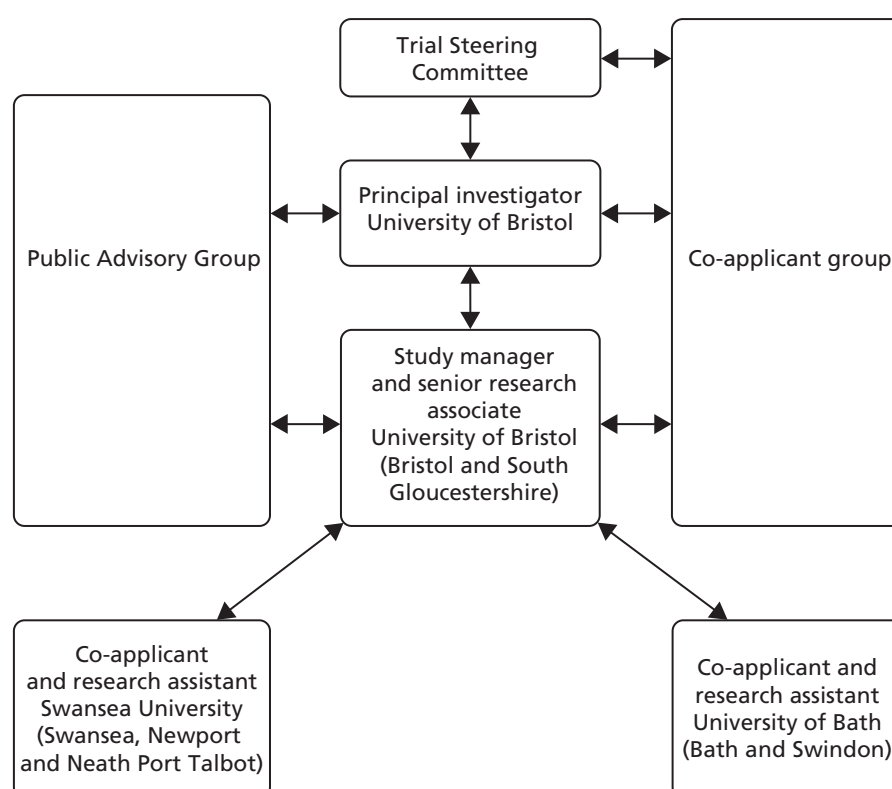


FIGURE 1 Travel to Work study management structure.

Research team

A research co-applicant and researcher were based at each research centre (Bristol, Bath and Swansea) and the team met on a quarterly basis. There was frequent and ongoing communication, by e-mail or telephone, between the research sites throughout the trial.

Study registration

The study was listed on the ISRCTN (International Standard Randomised Controlled Trial Number) registry with trial number ISRCTN15009100.⁶⁷

Participant and public involvement

The application for a full-scale trial followed on from a feasibility study that included phase I development of the intervention and a phase II exploratory trial.⁴⁹ During phase I, focus groups were conducted with employees in three workplaces; their views were sought on the design of the Walk to Work intervention and its evaluation, including the use of accelerometers and GPS monitors. Further interviews were conducted during phase II. A feedback event from the feasibility study was attended by employees, employers and Walk to Work promoters at which the research team presented findings, participants were invited to give feedback on the intervention and its evaluation and we obtained contact details of participants who would consider joining a Public Advisory Group should an application for a full-scale trial be successful.

Data from focus groups, interviews and feedback events helped to shape the intervention and its evaluation for the main trial: the recruitment process was simplified, the arrangements for Walk to Work promoter training were changed to allow group training at an external venue or in-house individual training to suit the workplace and additional booklets were developed that contained information for employers in the intervention group about changes they can make in the workplace to support employees who increase the amount of walking on their commute.

Research co-applicants from non-academic organisations also influenced the feasibility study. A director of Sustrans advised on promoting active travel and a transport consultant with Bristol City Council helped design and implement the training programme. These representatives continued as co-applicants throughout the main trial.

At the beginning of the main trial, 12 people from workplaces involved with the feasibility study were invited to become members of a Public Advisory Group. They were given information about the trial and the role of the group and were informed that reimbursement for time and travel expenses would be provided at a rate of £100 per meeting. Three people accepted membership and fully participated in two meetings towards the beginning of the study. This involved scrutinising the data-collection methods, including questionnaires, travel diary and the instructions for participants using the accelerometers and GPS monitors. They also commented on the intervention materials and suggested that some of the information in the draft booklets for employees, Walk to Work promoters and employers was condescending and repetitive. This was particularly valuable advice and the booklets were shortened and improved as a result.

Project timetable and milestones

The study was originally planned to take 33 months (November 2014 to July 2017) and broadly kept to the proposed timetable for recruitment, delivery of the intervention and data collection. However, a 3-month extension was granted for the core Bristol team to give more time for data analyses and dissemination. The study timetable and key milestones are summarised in *Table 1*. Because of the potential for seasonality to influence travel behaviour, the study was structured so that the baseline and the 12-month follow-up data collections took place during spring and early summer.

TABLE 1 Travel to Work project timetable and milestones (1 November 2014 to 31 October 2017)

Milestone	Time point											
	2014	2015				2016				2017		
	November to December	January to March	April to June	July to September	October to December	January to March	April to June	July to September	October to December	January to March	April to June	July to October
Staff recruitment (research assistants at three sites)	✓											
Ethics application	✓											
Finalise questionnaires and booklets	✓											
Preparation for baseline data collection	✓											
Prepare Walk to Work packs	✓											
Workplace recruitment		✓				✓						
Participant recruitment		✓				✓						
Baseline data collection			✓				✓					
Randomise workplaces			✓				✓					
Recruit and train Walk to Work promoters			✓				✓					
Implement Walk to Work intervention			✓	✓			✓	✓				
Preparation for post-intervention data collection				✓				✓				
Post-intervention data collection					✓				✓			

continued

TABLE 1 Travel to Work project timetable and milestones (1 November 2014 to 31 October 2017) (continued)

[illegible]

Chapter 3 Recruitment

Methods

Lessons from the feasibility study

Following the feasibility study,⁴⁹ it was felt that the workplace recruitment process should be simplified so that employers were not required to calculate the number of employees who lived within 2 miles of the workplace before being recruited to the study. This requirement had appeared to be onerous for some workplaces that did not sign up for the study after an initial expression of interest. It was also thought that participant eligibility should be expanded to include people living further away from the workplace who might be willing to incorporate walking as part of a mixed-mode commute. Nevertheless, information about the length of the commute was considered valuable to assess how many participants were within a reasonable walking distance (defined as 2 km for the full-scale trial) and might be encouraged to walk the full distance, and how many might be more suited to a mixed-mode commute. The survey questionnaires, following participant consent, were considered to be the most suitable method of collecting postcodes and enabling study researchers to calculate the distances between home and workplace.

Attrition during the feasibility study (29% at the 12-month follow-up) compared well with other workplace-based physical activity interventions. However, no attempt had been made during the feasibility study to contact employees who left the workplace for other employment between baseline and follow-up. To reduce attrition during the main trial, it was agreed that researchers would ask consenting participants to provide contact details if they left the workplace before the 12-month follow-up. This would enable data-collection packs to be sent to them and returned to the researchers by post.

Eligibility criteria

The following exclusion criteria applied at the workplace level: (1) workplaces with a large proportion of staff on short-term or zero-hours contracts, or workplaces with plans to significantly downsize or relocate during the study period, as follow-up data might not be achievable, and (2) workplaces with fewer than five employees, as there was limited potential to recruit a sufficient number of participating employees into a workplace cluster. All employees within participating workplaces were eligible to take part unless they met any of the following exclusion criteria: (1) they already always walked or cycled to work, (2) they were disabled in relation to walking, (3) they were due to retire before the 12-month follow-up data collection or (4) daily driving was a key part of their role.

Workplace recruitment and consent

The aim was to recruit 84 workplaces of different sizes and industrial classifications. Workplace recruitment took place in two phases during May to July 2015 and March to May 2016. The initial intention was to recruit across three urban areas in south-west England and south Wales: South Gloucestershire, Bath and Swansea (Table 2).

TABLE 2 Target recruitment of workplaces ($n = 84$) and participants ($n = 678$)

Recruitment phase	Bath		Swansea		South Gloucestershire	
	Number of workplaces	Number of participants	Number of workplaces	Number of participants	Number of workplaces	Number of participants
2015	14	113	14	113	14	113
2016	14	113	14	113	14	113
Total	28	226	28	226	28	226

For the 2015 recruitment round, lists of employers were obtained from relevant Chambers of Commerce and local authorities. The BRTC generated a list of random numbers (blinded to workplace addresses and contact details) for half of the workplaces to be invited to express an interest in the study, with the intention of sending information out to the remaining workplaces in 2016. However, recruitment in 2015 was insufficient to reach the required sample size. Following discussions within the co-applicant group, and subsequently with the Trial Steering Committee and the funders (the NIHR PHR programme), it was agreed that four additional areas would be included in the second recruitment round. In 2016, employers in the other half of the lists for South Gloucestershire, Bath and Swansea were sent information about the study, in addition to all workplaces on available lists of employers for Bristol, Swindon, Neath Port Talbot and Newport.

Workplace recruitment packs

Workplaces were sent a letter of invitation together with an information leaflet and a short form to return to the research team to express interest and provide basic information about the workplace (see *Appendix 2*).

Following expressions of interest, eligible workplaces were contacted by telephone or e-mail and a meeting was arranged with one member of the research team at which the trial was explained in more detail and written consent was sought for participation in the study.

Participant recruitment and consent

Employers within participating workplaces were provided with an information leaflet (see *Appendix 3*), describing the study and eligibility criteria, to distribute to all their employees. All eligible employees were invited to participate in the study and given consent forms for their individual participation. This consent was provided before the baseline data collection and subsequent randomisation.

Baseline characteristics

Study participants were asked to complete baseline questionnaires, which included questions about their sociodemographic characteristics, mode of travel to work and occupation.

Results

Workplace recruitment

Approximately 9800 invitation packs were sent out over the two recruitment phases (*Table 3*). Because of time and resource constraints, it was not possible to check whether or not all the workplaces on the lists were still in existence, or whether or not the packs reached an appropriate person with the authority to decide about workplace participation. For example, of 1892 invitations packs sent out in 2015, 114 (6%) were returned undelivered.

Workplaces expressing an interest were checked for eligibility by the research team and those meeting the criteria were contacted and provided with further information about the study. As a result of this process, only 29 workplaces were recruited in the first year (*Table 4*). The number of areas was increased, and a further 58 workplaces were recruited in the second year, making a total of 87 workplaces. This was in line with the target of recruiting 84 workplaces, but there was not an even spread of workplaces across the different areas and the numbers ranged from 35 in Bristol to three in Neath Port Talbot (see *Table 4*).

Reasons for workplace withdrawal following expression of interest

Overall, 271 workplaces expressed an interest in the study. These were checked for eligibility and provided with an opportunity to discuss study participation in more detail. At this stage, 162 workplaces did not continue with the study. Reasons for workplaces not consenting to participation after expressing interest are summarised in *Table 5*: 28% were deemed ineligible by the research team because there were fewer than five employees, 19% reported that their employees already always walk or cycle, 18% felt unable to prioritise the study activities when they were explained in more detail, 12% had consulted their staff and found a lack of interest in participating and 11% indicated that their employees needed to drive as part of their job.

TABLE 3 Recruitment mailout

Research centre and area (recruitment phase)	Number of workplaces
Swansea	
Swansea (2015 and 2016)	1265
Neath Port Talbot (2016)	516
Newport (2016)	1364
Bath	
Bath (2015 and 2016)	1020
Swindon (2016)	2027
Bristol	
South Gloucestershire (2015 and 2016)	2263
Bristol (2016)	1348
Total	9803

TABLE 4 Recruitment of workplaces and participants by year and location

Area	Recruitment status			
	Consented to participate		Withdrawn from study	
	Number of workplaces	Number of participants	Number of workplaces	Number of participants
2015				
South Gloucestershire	10	110	1	12
Swansea	10	64	0	0
Bath	9	49	1	9
Subtotal	29	223	2	21
2016				
South Gloucestershire	2	21	0	0
Bristol	35	266	0	0
Bath	2	7	0	0
Swindon	3	19	0	0
Swansea	7	79	0	0
Newport	6	35	0	0
Neath Port Talbot	3	4	1	1
Subtotal	58	431	1	1
Total	87	654	3	22

TABLE 5 Workplace reasons for not taking part following expressions of interest (*n* = 162)

Reason	Number of workplaces
Workplace too small (fewer than five employees)	46
Employees already walk/cycle	31
Workplace unable to prioritise the study	29
Lack of interest from staff	19
Driving required for job	18
Researcher unable to make further contact	11
Workplace unsuitable (shift work/remote sites/staff turnover)	6
School – lack of time in academic calendar	1
No reason given	1
Total	162

Following workplace consent, a further 22 workplaces withdrew before the baseline data collection (*Table 6*). The main reason for workplaces withdrawing at this stage of the study related to lack of interest among the workforce, despite their employer having an interest in participating.

Workplace characteristics

Workplaces were diverse in relation to their function and included public administration, professional and scientific organisations, retail, services and manufacturing (*Table 7*).⁶⁸ The workplaces varied in size: 10 (11.5%) were micro-sized (< 10 employees), 35 (40.2%) were small (10–49 employees), 22 (25.3%) were medium-sized (50–249 employees) and 20 (23.0%) were large (\geq 250 employees). *Table 7* shows a good balance of workplace characteristics between the two groups following randomisation.

Participant recruitment and characteristics

Across the 87 workplaces, 654 participants were recruited, with a mean cluster size of approximately 8 (as was the case during the feasibility study).⁴⁹ The number of participants in each workplace at baseline ranged from 1 to 28. The average age was 40 years and the majority of participants (455, 65.9%) lived in a household with an income of > £30,000 per year (*Table 8*). There was a slight balance in favour of females (*n* = 371, 56.7%) and being educated to at least degree level (377, 57.7%). A large majority of participants, 557 of 626 who gave this information (89%), lived > 2 km from their workplace, and two-thirds travelled to work by car at baseline. *Table 8* shows a good balance of key participant characteristics in the intervention and the control groups following randomisation.

TABLE 6 Workplace reasons for not taking part following workplace consent (*n* = 22)

Reason	Number of workplaces
Lack of interest from staff	14
Workplace unable to prioritise the study	4
Not suitable for the workplace at the moment	1
School – too late to start intervention in academic calendar	1
No reason given	2
Total	22

TABLE 7 Baseline characteristics of participating workplaces (*N* = 87)

Characteristics	Trial group, <i>n</i> (%)	
	Intervention (<i>N</i> = 44)	Control (<i>N</i> = 43)
Location		
Swansea, Newport and Neath Port Talbot	13 (30)	13 (30)
Bath and Swindon	8 (18)	6 (14)
South Gloucestershire and Bristol	23 (52)	24 (56)
Size of business (number of employees)		
Micro (5–9)	4 (9)	6 (14)
Small (10–49)	21 (48)	14 (33)
Medium (50–249)	9 (20)	13 (30)
Large (≥ 250)	10 (23)	10 (23)
Most often used method of travel to work by employees		
Car or motorised transport	32 (73)	31 (72)
Public transport	1 (2)	1 (2)
Walk or cycle	1 (2)	0 (0)
Unknown	10 (23)	11 (26)
Proportion of employees who walk or cycle all the way to work		
None or hardly any	13 (30)	12 (28)
Fewer than half	23 (52)	21 (49)
Most	1 (2)	0 (0)
All	1 (2)	0 (0)
Unknown	6 (14)	10 (23)
UK-SIC categories 2007 ⁶⁸		
C: manufacturing	4 (9)	2 (5)
D: electricity, gas, steam and air conditioning supply	0 (0)	1 (2)
F: construction	1 (2)	0 (0)
G: wholesale and retail trade; repair of motor vehicles and motorcycles	4 (9)	2 (5)
H: transport and storage	0 (0)	1 (2)
K: financial and insurance activities	2 (5)	2 (5)
M: professional, scientific and technical activities	10 (23)	11 (26)
N: administrative and support service activities	5 (11)	3 (7)
O: public administration and defence; compulsory social security	4 (9)	4 (9)
P: education	5 (11)	6 (14)
Q: human health and social work activities	6 (14)	5 (12)
R: arts, entertainment and recreation	1 (2)	4 (9)
S: other service activities	2 (5)	2 (5)

UK-SIC, *UK Standard Industrial Classification (SIC) Categories 2007*.

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TABLE 8 Baseline characteristics of participants (*N* = 654)

Baseline characteristics	Trial group	
	Intervention	Control
<i>Participant demographic characteristics</i>		
Total number of participants	331	323
Gender: male, <i>n</i> (%)	143 (43) (<i>N</i> = 331)	140 (43) (<i>N</i> = 323)
Age (years), mean (SD)	41.2 (11.4) (<i>N</i> = 321)	42.0 (11.3) (<i>N</i> = 314)
BMI category, <i>n</i> (%)	<i>N</i> = 331	<i>N</i> = 323
Underweight and normal	149 (45)	144 (45)
Overweight	99 (30)	92 (28)
Obese	53 (16)	52 (16)
Missing	30 (9)	35 (11)
Household income, <i>n</i> (%)	<i>N</i> = 313	<i>N</i> = 305
≤ £10,000	1 (< 1)	3 (1)
£10,001–20,000	14 (4)	25 (8)
£20,001–30,000	39 (12)	39 (13)
£30,001–40,000	51 (16)	49 (16)
£40,001–50,000	67 (21)	53 (17)
> £50,000	118 (38)	117 (38)
Does not know	23 (7)	19 (6)
Ethnicity, <i>n</i> (%)	<i>N</i> = 317	<i>N</i> = 310
White British	288 (91)	279 (90)
White other	15 (5)	14 (5)
Mixed ethnic group	4 (1)	3 (1)
Asian or British Asian	3 (1)	6 (2)
Black or black British	7 (2)	5 (2)
Chinese	0 (0)	3 (1)
Education, <i>n</i> (%)	<i>N</i> = 315	<i>N</i> = 309
Higher degree, degree or equivalent	195 (62)	182 (59)
A level or equivalent	74 (23)	79 (26)
GCSE or equivalent	41 (13)	43 (14)
No formal qualifications	5 (2)	5 (2)
<i>Current method of travel to work, n (%)</i>	<i>N</i> = 327	<i>N</i> = 313
Car	217 (66)	205 (65)
Public transport	44 (13)	32 (10)
Walk	32 (10)	42 (13)
Cycle	34 (10)	34 (11)
<i>Distance between workplace and home (km), n (%)</i>	<i>N</i> = 319	<i>N</i> = 307
≤ 2 km	35 (11)	30 (10)
> 2 km	280 (88)	277 (90)

TABLE 8 Baseline characteristics of participants (*N* = 654) (*continued*)

Baseline characteristics	Trial group	
	Intervention	Control
Current occupation, n (%)	N = 315	N = 299
Sedentary	239 (76)	237 (79)
Standing	60 (19)	42 (14)
Manual	15 (5)	20 (7)
Heavy manual work	1 (< 1)	0 (0)

A level, Advanced level; GCSE, General Certificate of Secondary Education.

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Summary

Workplace and participant recruitment proved more difficult than anticipated but increasing the number of urban areas in the study enabled the recruitment of a range of workplaces of different sizes, locations and business classifications. The number of participants was close to, but just under, the recruitment target. The sample of participants was broadly balanced by gender, and the participants tended to be well-qualified and have a higher than average annual household income. A large majority did not live within 'walking distance' of their workplace.

Chapter 4 Baseline characteristics and physical activity

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Methods

Data collection

Study participants were asked to complete travel diaries, to wear accelerometers (ActiGraph GT3X+) for 7 days during waking hours and to carry a personal GPS receiver (Qstarz BT-1000X), set to record positional data at 10-second intervals, during their commute. Participants were provided with instructions about how to use the monitors (see *Appendix 4*) and those who returned the equipment were provided with a £10 gift voucher to acknowledge their contribution to the study.

Objectively measured physical activity and main mode of travel during the commute

Raw accelerometer data were downloaded using ActiLife software (version 6.11.8; ActiGraph, Pensacola, FL, USA) and reintegrated to 10-second epochs for analysis. Reintegrated accelerometer data were processed using KineSoft data reduction software (version 3.3.80; Kinesoft, Loughborough, UK) to generate outcome variables. Continuous periods of ≥ 60 minutes of zero values were considered 'non-wear' time and removed. To be included in the analysis of daily physical activity and sedentary behaviours, participants were required to provide ≥ 3 days of valid accelerometer data of ≥ 600 minutes in duration. In relation to mode and physical activity during the commute, participants were required to provide at least 1 valid day of combined accelerometer and GPS (accGPS) data on a working day. Days on which cycling was identified as the main mode of travel to work were excluded owing to the inability of waist-worn accelerometers to accurately record physical activity during cycling.⁷¹

Accelerometer and GPS data were combined for every 10-second epoch (accGPS) based on the timestamp of the ActiGraph data. The participant's workplace and home were geocoded using the full postcode and imported into a GIS (ArcMap version 10.2.2; Environmental Systems Research Institute, Inc., Redlands, CA, USA). The merged accGPS files were imported into ArcMap and participants' journeys to and from work were visually identified and segmented from other accGPS data using the 'identify' tool. Journeys were identified as a continuous sequence of GPS locations between the participant's home and workplace, and therefore may include trips to other destinations (e.g. shopping).

Mode of travel (walking, cycling, using public transport or driving) for the outward and return journeys over the measurement week was derived from visual analysis using the following variables: counts per 10 seconds (sustained counts per epoch of < 17 were bus, train, car; sustained counts per epoch of > 325 were walking and cycling);⁷² changes to the sum of the signal-to-noise ratio (approximate threshold of a drop to < 250 was employed to indicate movement from an indoor to an outdoor environment);⁷³ maximum speed of the journey (walking – not > 10 km/hour; cycling – not > 40 km/hour; bus – 10 to 50 km/hour; train and car speeds of > 50 km/hour);⁷⁴ and GIS location for each epoch.

For participants who used a mixed mode of travel (e.g. walking and travelling by train), the mode of transport covering the greatest distance was considered the mode for that journey. MVPA accrued from walking during the journey was captured in a separate variable. When an outward/return journey was missing, it was assumed to be the same mode of travel as the outward/return journey on the same day. Any remaining

missing data were replaced with the corresponding travel diary mode when available. The most frequent mode of travel during data collection was used to derive an overall mode of travel for each participant.

Time spent being sedentary and in MVPA were defined using validated thresholds [sedentary, < 100 c.p.m.; MVPA, \geq 1952 c.p.m.].⁷² To examine the proportion of participants who met current physical activity guidelines,¹ we calculated the total MVPA accumulated in bouts of \geq 10 minutes over the data-collection week (by multiplying the mean daily number of bouts of MVPA by 7). In line with another study,⁷⁵ participants were classified as 'active' or 'inactive' during the commute if their mean daily MVPA accrued during the commute was \geq 10 minutes or < 10 minutes, respectively.

Variables

Individual characteristics and interpersonal responsibilities

The following variables were derived from questionnaire data: (1) gender, (2) age group ('below 35 years old' or '35 years or greater'), (3) annual household income ('£30,000 or below' or '> £30,000', representing mean UK household income), (4) level of education ('degree or above' or 'below degree'), (5) occupational activity ('sedentary' or 'non-sedentary'), (6) limited access to a car [absence of a current driving licence and/or household access to car ('yes' or 'no')] and (7) combines commute with school run or caring responsibilities ('yes' or 'no'). Self-reported height and weight were used to compute BMI and were assigned to either 'normal or underweight' (BMI of < 25 kg/m²) or 'overweight or obese' (BMI of \geq 25 kg/m²) categories based on internationally recognised cut-off points.⁷⁶

Workplace characteristics

Commute distance was estimated using an online calculator (www.google.co.uk/maps; accessed 28 February 2019) and the participant's home and work postcodes. Commute distance was categorised as '2 km or below', 'between 2 km and 4 km' and '4 km and above'. Participants were asked about the following policies and facilities at their workplace: (1) free car parking, (2) entitlement to purchase a car parking permit, (3) secure storage for clothing, (4) employer-subsidised cycling schemes, (5) a safe place for bicycles, (6) showers and changing rooms, (7) employer-subsidised public transport schemes and (8) a travel plan or policy. Variables were categorised as 'yes' or 'no'.

Perception of the commuting environment

To describe the commuting environment, participants reported their level of agreement with nine statements using a five-point Likert scale: (1) 'there are suitable pavements for walking', (2) 'the pavements are well-maintained', (3) 'there are not enough safe places to cross roads', (4) 'walking is unsafe because of traffic', (5) 'it is unsafe because of the level of crime or antisocial behaviour', (6) 'the routes for walking are generally well lit at night', (7) 'the area is generally free from litter or graffiti', (8) 'it is a pleasant environment for walking' and (9) 'there is a lot of air pollution'. These statements have been used in other studies,^{74,77,78} and have acceptable test-retest reliability.⁷⁹ Negatively worded items were recoded so that a high score equated to agreement with the statements. A mean substitution approach was used for the seven participants who missed a single item on the scale. As the distribution of scores was positively skewed, a binary variable comprising 'positive perception' (less than the mean score) and negative perception (greater than or equal to the mean score) was created.

Reasons for car use

To provide additional understanding of reasons for car use, participants whose main mode of travel was driving were asked to indicate all reasons that applied to them from the following list: (1) quicker than alternatives, (2) reliability, (3) comfort, (4) have to visit more than one place, (5) cheaper than alternatives, (6) lack of alternative, (7) personal safety, (8) dropping off/collecting children, (9) work unsociable hours, (10) car is essential to perform job, (11) dropping off/collecting partner, (12) carry bulky equipment, (13) health reasons, (14) giving someone else a lift and (15) often on call. They were then asked to choose the single most important reason from the list.

Analysis

Initially, descriptive analyses comprising counts, percentages, medians and interquartile ranges, were conducted. Differences in physical activity variables (overall and during the commute) were analysed by main mode of travel (car users, public transport users and walkers) using analysis of variance (ANOVA) and chi-squared statistics. Data related to participants classified as cyclists are not presented because of the inability of waist-worn accelerometers to accurately record physical activity during cycling.

Associations with objectively measured physical activity during the commute

To explore associations with levels of physical activity during the commute, logistic univariable analyses and likelihood ratio tests were conducted. The following explanatory variables for analysis were selected a priori: gender, age group, annual household income, education, weight status, occupational activity and commute distance. A multivariable logistic regression model was developed using 'inactive during commute' as the reference group. In the order of the strength of association, variables were selected for inclusion and retained in the model if there was an associated improvement in fit ($p < 0.05$). The final model adjusted for weight status, occupational activity and commute distance.

Associations with objectively measured mode of travel

The objective of the next stage of the analysis was to identify associations between different modes of travel to work and individual, interpersonal and workplace variables. Analyses were restricted to participants who were classified as 'walkers' ($n = 74$), 'public transport users' ($n = 76$) or 'car users' ($n = 422$). Participants classified as cyclists ($n = 68$) or whose mode of transport was unknown ($n = 14$) were excluded. Initially, associations were examined using logistic univariable analyses and likelihood ratio tests. Multicollinearity between variables was tested for through correlations. Using the same methodology as described previously, two separate multivariable logistic regression models were developed for 'walkers' and 'public transport users', both using 'car users' as the reference group. Individual, interpersonal and workplace characteristics and perception-of-commute variables were eligible for inclusion if they were associated with an improvement in fit of model ($p < 0.05$). The final 'walkers' model adjusted for limited access to a car, commute distance and availability of workplace car parking. The final 'public transport users' model adjusted for age group, limited access to a car, combines commute with caring responsibilities, availability of workplace car parking and perception of commute environment. Finally, a description of reasons for car use by car users was presented as counts and percentages.

Potential clustering by workplace was adjusted for using a robust standard errors approach allowing for workplace-level random effects in the final model. For each model, results were presented as odds ratios (ORs), adjusted odds ratios (aORs) and corresponding 95% CIs and p -values. Through sensitivity analyses, separate logistic models that were restricted to males only and females only were developed, with no major effect sizes by variables observed. Interactions were not fitted owing to small sample sizes. Analyses were undertaken to explore whether or not associations varied by gender. All analyses were conducted using Stata® version 14 (StataCorp LP, College Station, TX, USA).

Results

Associations with undertaking physical activity during the commute

Valid accGPS data from at least 1 day were provided by 597 participants. After adjustment for weight status, occupational activity and commute distance, there was strong evidence that participants were more physically active during their commute if they had sedentary jobs (aOR 1.96, 95% CI 1.26 to 3.04) or had a commute distance of < 2 km (aOR 2.73, 95% CI 1.69 to 4.41) or between 2 km and 4 km (aOR 2.74, 95% CI 1.58 to 4.73). There was weaker evidence that participants in the underweight or normal weight category (aOR 1.48, 95% CI 1.04 to 2.12) were more physically active during the commute (Table 9).

TABLE 9 A univariable and multivariable model of predictors of incorporating some objectively measured physical activity during the commute

	Participants, <i>n</i> (%)			OR (95% CI); <i>p</i> -value	aOR ^b (95% CI); <i>p</i> -value
Variable	All (<i>N</i> = 654)	Inactive ^a status (<i>N</i> = 349)	Active ^a status (<i>N</i> = 248)		
Gender					
Male	283 (43.3)	160 (63.0)	94 (37.0)	–	NI
Female	371 (56.7)	189 (55.1)	154 (44.9)	1.39 (1.00 to 1.93); 0.05	
Age (years)					
≥ 35	431 (65.9)	241 (60.6)	157 (53.5)	–	NI
< 35	204 (31.2)	100 (39.5)	87 (46.5)	1.34 (0.94 to 1.90); 0.11	
Annual household income					
≤ £30,000	121 (18.5)	65 (59.6)	44 (40.4)	–	NI
> £30,000	455 (69.5)	243 (57.9)	177 (42.1)	1.08 (0.70 to 1.65); 0.74	
Education					
Less than degree level	247 (37.8)	138 (59.7)	93 (40.3)	–	NI
Degree level or higher	377 (57.7)	195 (56.5)	150 (43.5)	1.14 (0.81 to 1.60); 0.44	
Weight status					
Overweight or obese	296 (45.3)	179 (64.2)	100 (35.8)	–	–
Underweight or normal	293 (44.8)	143 (54.0)	122 (46.0)	1.53 (1.08 to 2.15); 0.02	1.48 (1.04 to 2.12); 0.03
Occupational activity					
Non-sedentary	130 (19.9)	87 (69.1)	39 (31.0)	–	–
Sedentary	450 (68.8)	229 (55.5)	184 (44.6)	1.79 (1.17 to 2.74); < 0.01	1.96 (1.26 to 3.04); < 0.01
Commute distance (km)					
> 4	455 (69.6)	276 (64.9)	149 (35.1)	–	–
Between 2 and 4	100 (15.3)	36 (40.9)	52 (59.1)	2.68 (1.67 to 4.28); < 0.001	2.73 (1.69 to 4.41); < 0.001
< 2	71 (10.9)	20 (40.6)	38 (59.4)	2.71 (1.58 to 4.63); < 0.001	2.74 (1.58 to 4.73); < 0.001

NI, not included.

a Inactive: mean daily MVPA during commute of < 10 minutes. Active: mean daily MVPA during commute of ≥ 10 minutes.

b aORs are adjusted for weight status, occupational activity and commute distance.

Of 542 participants (82.4%) who provided 3 days of valid accelerometer data, a minority (*n* = 60, 11.1%) met current UK public health physical activity guidelines.¹ A substantially higher proportion of walkers (*n* = 24, 38.7%) and public transport users (*n* = 10, 16.1%) met public health physical activity guidelines than car users (*n* = 17, 4.7%) (*p* < 0.001). There were marked differences in time spent in MVPA by main mode of travel. Overall, both walkers (mean 71.3 minutes, SD 21.3 minutes) and public transport users (mean 59.5 minutes, SD 26.6 minutes) accumulated more MVPA throughout the day than car users did

(mean 46.3 minutes, SD 20.6 minutes). Walkers (mean 34.3 minutes, SD 18.6 minutes) and public transport users (mean 25.7 minutes, SD 4.0 minutes) were also, on average, more active during the commute than car users (mean 7.3 minutes, SD 7.6 minutes). There was no strong evidence for differences in time spent in sedentary behaviours ($p = 0.12$) or accelerometer wear time ($p = 0.43$) by main mode of travel (Table 10).

Individual characteristics, interpersonal responsibilities and workplace and environmental characteristics associated with mode of travel

After adjustment for having a current driving licence, household access to a car, commute distance to workplace and free work car parking, there was strong evidence that not having a driving licence (aOR 8.74, 95% CI 2.45 to 31.2) and not having access to a car (aOR 23.1, 95% CI 5.0 to 106.5) were positively associated with walking to work. The workplace characteristics 'commute distance of less than 2 km' (aOR 51.4, 95% CI 19.7 to 134.3), 'commute distance between 2 km and 4 km' (aOR 15.2, 95% CI 5.84 to 39.4) and lack of free parking (aOR 2.97, 95% CI 1.38 to 6.39) were also positively associated with walking (Table 11).

After adjustment for age group, having a driving licence, household access to a car, combining the commute with caring responsibilities and free work car parking, there was strong evidence that being < 35 years old (aOR 1.98, 95% CI 1.02 to 3.84), not having a driving licence (aOR 20.2, 95% CI 7.25 to 56.2), not having access to a car (aOR 5.00, 95% CI 1.13 to 22.2), not combining the commute with the school run or caring responsibilities (aOR 4.77, 95% CI 1.13 to 20.2) and the workplace characteristic 'absence of free parking' (aOR 3.32, 95% CI 1.56 to 7.09) were positively associated with using public transport (see Table 11).

Sensitivity analyses indicated no marked differences by gender across all of the models.

TABLE 10 Objectively measured physical activity by main mode of travel to work

Variable	Main mode of travel				p-value ^a
	All	Car	Walking	Public transport	
	N = 540	N = 357	N = 62	N = 62	
Meets public health physical activity guidelines, ^b n (%)	60 (11.1)	17 (4.8)	24 (38.7)	10 (16.1)	< 0.001 ^a
Overall daily physical activity (c.p.m.), mean (SD)	385.3 (193.1)	342.7 (120.1)	507.2 (151.2)	405.5 (150.7)	< 0.001 ^c
Daily time spent in MVPA (minutes), mean (SD)	52.9 (28.7)	46.3 (20.6)	71.3 (21.3)	59.5 (26.6)	< 0.001 ^c
Daily time spent in sedentary behaviours (minutes), mean (SD)	580.6 (72.6)	587.6 (69.5)	568.1 (62.2)	585.8 (65.2)	0.12 ^c
Daily wear time (minutes), mean (SD)	798.2 (75.7)	800.4 (75.0)	788.6 (70.9)	792.7 (72.2)	0.43 ^c
	N = 597	N = 404	N = 71	N = 73	
Daily commute time (minutes), mean (SD)	85.7 (54.2)	86.6 (51.0)	53.8 (29.2)	116.5 (56.2)	< 0.001
Daily time spent in MVPA during commute (minutes), mean (SD)	13.0 (14.3)	7.3 (7.6)	34.3 (18.6)	25.7 (14.0)	< 0.001

^a Derived from a chi-squared test.
^b Recommended physical activity for adults is ≥ 150 minutes accumulated throughout the week in bouts of ≥ 10 minutes.
^c Derived from ANOVA statistics.

TABLE 11 A univariable and multivariable model of predictors associated with walking and public transport as the main modes of travel to work

	Participants, <i>n</i> (%)			OR (95% CI); <i>p</i> -value	aOR (95% CI); <i>p</i> -value	Public transport users (<i>N</i> = 76), <i>n</i> (%)	OR (95% CI); <i>p</i> -value	aOR (95% CI); <i>p</i> -value
Variable	All (<i>N</i> = 654)	Car users (<i>N</i> = 422)	Walkers (<i>N</i> = 74)					
Individual and interpersonal characteristics								
Gender: female	371 (56.7)	241 (57.1)	44 (59.5)	1.10 (0.67 to 1.82); 0.71	NI	50 (65.8)	1.44 (0.87 to 2.41); 0.16	NI
Age: < 35 years	204 (31.2)	115 (27.3)	28 (37.8)	1.69 (1.00 to 2.85); 0.05	NI	38 (50.0)	2.67 (1.62 to 4.41); < 0.001	2.05 (1.05 to 4.02); 0.04
Household income: ≤ £30,000 per annum	121 (18.5)	80 (19.0)	17 (23.0)	1.34 (0.73 to 2.46); 0.34	NI	12 (15.8)	0.84 (0.43 to 1.65); 0.61	NI
Education: lower than degree level	247 (37.8)	169 (40.1)	32 (43.2)	1.15 (0.69 to 1.90); 0.60	NI	29 (38.2)	0.88 (0.53 to 1.46); 0.62	NI
Weight status: underweight or normal	293 (44.8)	178 (42.2)	44 (59.5)	2.31 (1.34 to 3.97); < 0.01	NI	28 (36.8)	0.99 (0.58 to 1.70); 0.99	NI
Occupational activity: sedentary	130 (19.9)	288 (68.3)	50 (67.6)	1.39 (0.71 to 2.72); 0.34	NI	61 (80.3)	2.54 (1.17 to 5.50); 0.02	NI
Limited access to car: no	62 (9.5)	9 (2.1)	21 (28.4)	20.4 (8.78 to 47.2); < 0.001	20.5 (6.01 to 69.8); < 0.001	27 (35.5)	26.8 (11.8 to 60.7); < 0.001	29.2 (10.4 to 81.6); < 0.001
Combines commute with caring responsibilities: no	485 (74.2)	308 (73.0)	59 (79.7)	2.52 (1.05 to 6.05); 0.04	NI	64 (84.2)	5.47 (1.67 to 17.9); < 0.01	4.88 (1.17 to 20.3); 0.03
Workplace characteristics								
Commute distance (km)								
> 4 ^a	–	–	–	–	–	–	–	–
Between 2 and 4	100 (15.3)	48 (11.4)	21 (28.4)	11.3 (5.30 to 24.0); < 0.001	15.0 (5.55 to 40.6); < 0.001	8 (10.5)	0.87 (0.39 to 1.93); 0.74	NI
< 2	71 (10.9)	26 (6.2)	35 (47.3)	34.7 (16.4 to 73.5); < 0.001	63.6 (21.5 to 187.9); < 0.001	1 (1.3)	0.21 (0.03 to 1.60); 0.13	NI
No free work car parking	253 (38.7)	147 (34.8)	38 (51.4)	3.02 (1.69 to 5.40); < 0.001	3.19 (1.38 to 7.39); < 0.01	38 (50.0)	2.88 (1.63 to 5.10); < 0.001	3.81 (1.75 to 8.27); < 0.01

Variable	Participants, <i>n</i> (%)			OR (95% CI); <i>p</i> -value	aOR (95% CI); <i>p</i> -value	Public transport users (<i>N</i> = 76), <i>n</i> (%)	OR (95% CI); <i>p</i> -value	aOR (95% CI); <i>p</i> -value
	All (<i>N</i> = 654)	Car users (<i>N</i> = 422)	Walkers (<i>N</i> = 74)					
No entitlement to purchase a parking permit	444 (67.9)	299 (70.9)	49 (66.2)	1.62 (0.70 to 3.72); 0.26	NI	46 (60.5)	1.33 (0.60 to 2.94); 0.49	NI
Secure storage for personal belongings	218 (52.0)	217 (58.3)	39 (65.0)	1.33 (0.75 to 2.34); 0.33	NI	37 (59.7)	1.06 (0.61 to 1.82); 0.84	NI
Employer-subsidised cycling schemes	214 (32.7)	142 (33.7)	25 (33.8)	1.24 (0.68 to 2.28); 0.47	NI	20 (46.5)	1.04 (0.55 to 1.97); 0.90	NI
Safe place to leave bicycles	95 (14.5)	71 (19.6)	12 (16.2)	1.03 (0.52 to 2.04); 0.94	NI	9 (15.0)	1.38 (0.65 to 2.93); 0.41	NI
No showers/changing rooms	195 (29.8)	131 (31.0)	25 (33.8)	1.22 (0.71 to 2.11); 0.48	NI	24 (39.3)	1.20 (0.69 to 2.10); 0.51	NI
No employer-subsidised public transport schemes	406 (11.2)	268 (62.1)	42 (56.8)	2.15 (0.74 to 6.26); 0.16	NI	48 (63.2)	1.23 (0.55 to 2.75); 0.61	NI
No travel plan or policy	233 (35.6)	151 (35.8)	25 (33.8)	1.77 (0.79 to 3.94); 0.17	NI	35 (46.1)	1.71 (0.86 to 3.40); 0.13	NI
Environmental characteristics								
Positive perception of environment	290 (44.3)	161 (38.2)	46 (62.2)	3.44 (1.95 to 6.10); < 0.001	NI	19 (25.0)	2.71 (1.24 to 3.98); 0.01	2.71 (1.24 to 5.92); 0.01
NI, not included. a > 4 was the reference category. Note Comparator group: car users. Walkers' aORs are adjusted for workplace, limited access to car, distance to workplace and absence of free work car parking. Public transport aORs are adjusted for workplace, age group, limited access to car, combines commute with caring responsibilities and absence of free work car parking.								

Reasons for car use

The reasons that were frequently provided for car use (Table 12) included that it was quicker than alternative modes of travel ($n = 329$, 78.0%), reliability ($n = 275$, 65.2%), comfort ($n = 275$, 65.2%), having to visit more than one place ($n = 179$, 42.4%), that it was cheaper than alternative modes of travel ($n = 179$, 42.2%) and lack of alternatives ($n = 174$, 41.2%). This order changed slightly when participants were asked to choose their single most important reason (see Table 5). Being quicker than alternatives ($n = 100$, 28.7%), lack of alternatives ($n = 51$, 14.7%) and reliability ($n = 39$, 11.2%) continued as main reasons, but dropping off and collecting children ($n = 34$, 9.8%) and a car being essential for their job ($n = 29$, 8.3%) appeared to take priority over comfort, cost or having to visit more than one place.

Summary

Compared with car users, walkers and public transport users accrued substantially higher levels of daily MVPA during the commute and throughout the day. Participants in non-sedentary occupations were less physically active during their commute. Factors associated with walking to work included shorter commuting distances, limited access to a car and lack of free car parking. Factors associated with public transport use included being aged < 35 years, having limited access to a car, lack of free car parking, not combining the commute with the school run or caring responsibilities and having more-positive perceptions of the commute environment.

TABLE 12 Reasons for mode of travel by car users

Order			
By all reasons ($N = 383$)		By most important reason ($N = 348$)	
Reasons	n (%)	Reasons	n (%)
Quicker than alternatives	329 (78.0)	Quicker than alternatives	100 (28.7)
Reliability	275 (65.2)	Lack of alternatives	51 (14.7)
Comfort	275 (65.2)	Reliability	39 (11.2)
Have to visit more than one place	179 (42.4)	Dropping off/collecting children	34 (9.8)
Cheaper than alternatives	178 (42.2)	Car is essential to perform job	29 (8.3)
Lack of alternative	174 (41.2)	Have to visit more than one place	16 (4.6)
Personal safety	115 (27.3)	Cheaper than alternatives	15 (4.3)
Dropping off/collecting children	103 (24.4)	Dropping off/collecting partner	14 (4.0)
Works unsociable hours	99 (23.5)	Comfort	13 (3.7)
Car is essential to perform job	91 (21.6)	Works unsociable hours	10 (2.9)
Dropping off/collecting partner	38 (9.0)	Carries bulky equipment and/or cash	9 (2.6)
Carries bulky equipment and/or cash	80 (19.0)	Health reasons	6 (1.7)
Health reasons	23 (5.5)	Personal safety	5 (1.4)
Giving someone else a lift	55 (13.0)	Giving someone else a lift	4 (1.2)
Often on call	28 (6.6)	Often on call	3 (0.9)

Chapter 5 The Walk to Work intervention

Developing the intervention

The intervention aimed to increase the physical activity of participants, and reduce private car use, by focusing on walking as active travel during the commute. Walking and cycling are frequently combined under the term 'active travel', but they are discrete behaviours appealing to different population groups and requiring different strategies to increase their use as modes of travel.⁸⁰ A number of high-profile active travel initiatives focus on cycling (www.cyclescheme.co.uk; accessed 6 June 2018). However, for shorter journeys, or as part of longer journeys, walking may be perceived as a cheaper and safer option than cycling: it requires no special equipment and is less likely to involve direct competition with motorised traffic for road space.

There were three main stages of the intervention: (1) identification and training of workplace Walk to Work promoters, (2) initial contact between the Walk to Work promoters and participating employees, including the distribution and discussion of intervention materials, and (3) three additional contacts during the following 10 weeks to provide encouragement for participating employees and Walk to Work promoters. Ten weeks is considered a suitable length of time to enable a change of behaviour to become a habit.⁸¹

Lessons from the feasibility study: behaviour change techniques

During the Walk to Work feasibility study, the intervention focused on nine BCTs to guide participants to consider a more active travel mode through to maintaining the new behaviour: intention formation, instruction, barrier identification, goal-setting, general encouragement, self-monitoring, social support, review of goals and relapse prevention. Evidence from the process evaluation suggested that different participants found different BCTs more useful than others.⁸² This was supported by other research: for example, 'intention formation' was identified by Bird *et al.*⁴⁷ as a key BCT for use in walking and cycling interventions, but not by Malik *et al.*²⁸ in their review of workplace physical activity. A qualitative evidence synthesis of workplace smoking interventions concluded that workplace interventions should employ a range of different elements because different employees have different requirements.⁸³ Overall, the nine BCTs that formed the basis of the Walk to Work intervention during the feasibility study appeared acceptable to participants and were retained for the main trial. However, the term 'relapse prevention' had been challenged by some participants as being inappropriate for an intervention that promotes walking. This is supported by Michie *et al.*,⁴⁴ who argue that different BCTs from those used to stop negative behaviour, such as smoking, should be used to support positive behaviours, such as physical activity and healthy eating. Therefore, for the main trial, the techniques used to avoid 'relapse' from increased walking back to less active modes of travel were couched in terms of ongoing support and encouragement for walking.

Lessons from the feasibility study: Walk to Work promoter training and support

During the feasibility study, it was originally proposed that the Walk to Work promoters from different workplaces would be invited to an external training event organised by the researchers. However, not all workplaces were able to release an employee for the time and date proposed, and so two smaller external training sessions were organised and some individual workplace-based training was provided. Having received their training and booklets to guide them through their role, the Walk to Work promoters were not provided with any additional support or guidance during the 10-week intervention. However, during post-intervention interviews, the Walk to Work promoters indicated that they would have welcomed additional prompts and encouragement during the intervention period.⁸² In the light of these findings, for the main trial an individual training package for Walk to Work promoters was developed for delivery in the workplace and ongoing support for Walk to Work promoters was incorporated into the 10-week intervention.

Lessons from the feasibility study: workplace support for the intervention

Advocates of the socioecological model argue that public health interventions need to consider influences at the policy, community, organisational, interpersonal and intrapersonal levels.⁸⁴ During the feasibility study, the importance of support at the workplace (organisational) level was acknowledged. However, the majority of employers who took part in the feasibility study were unclear about how to give practical support for employees who walk to work.⁸⁵ Additional materials were, therefore, developed for the main trial to give employers information and ideas about how to support the Walk to Work intervention.

The Walk to Work intervention: methods and resources

The intervention components, linked to BCTs, are summarised in *Table 13*.

TABLE 13 Summary of BCTs used during the Walk to Work intervention

Contact	BCT	Walk to Work intervention
Week 1 (getting started)	<ul style="list-style-type: none"> • Intention formation • Barrier identification • Specific goal-setting • Provide instruction • Provide general encouragement • Self-monitoring of behaviour 	<ul style="list-style-type: none"> • Employee decides to participate in the Walk to Work intervention and to try to increase walking during the journey to and from work • Promoter works with the participant to examine any barriers to walking to work and some proposed solutions. Participant's booklet contains some examples of barriers and possible solutions • Promoter and participant agree short-term (weeks 1–3), intermediate-term (in 1 month) and longer-term (in 3 months) goals. Worked examples are provided in the employee booklet • Promoter gives the participant the booklet containing practical information, websites and a 10-week diary • Promoter and work colleagues give encouragement and affirmation • Employer booklet gives ideas of how to give additional support (e.g. posters and changes to the workplace) • Participant is encouraged to keep a record of their walking behaviour in a diary. Promoter provides an optional pedometer to monitor steps walked per day and encourages the use of smartphone apps to self-monitor as appropriate
Week 3	<ul style="list-style-type: none"> • BCTs from week 1 as appropriate • Plan social support 	<ul style="list-style-type: none"> • Participants encourage and support each other in changing their behaviour. Promoter offers assistance, encouragement, guidance and motivation to the employee. Participants are encouraged to seek support from people outside the workplace, such as family and friends • Newsletter 1: health benefits of walking in daily routine; ideas about how to increase social support
Week 5	<ul style="list-style-type: none"> • BCTs from weeks 1 and 3 as appropriate • Review of behavioural goals 	<ul style="list-style-type: none"> • Promoter and employee review intentions and short-, intermediate- and long-term goals to better suit the employee as necessary • Newsletter 2: news stories relating to goal-setting; additional resources and websites; free pedometer apps to download for smartphones
Week 7 onwards	<ul style="list-style-type: none"> • BCTs from weeks 1, 3 and 5 as appropriate • Relapse prevention 	<ul style="list-style-type: none"> • Promoter and employee discuss situations likely to result in the participants not maintaining walking and ways to avoid or manage them, recognising it may take several attempts before walking to work becomes a habit • Newsletter 3: news stories about habit formation; additional resources and websites

app, application.

Each stage of the intervention is described in the following sections. A logic model (see *Figure 2*) summarising the intervention theory, inputs, activities, outputs and anticipated outcomes was developed for the process evaluation.

Walk to Work promoter recruitment

Following randomisation, workplaces in the intervention group were asked to identify a Walk to Work promoter. This could be a volunteer with an interest in the study, someone nominated by their employer as being suitable for the role (e.g. an employee already tasked with developing and implementing a travel plan) or an employer willing to take on the role themselves. Potential Walk to Work promoters were provided with an information leaflet explaining the role (see *Appendix 5*) and a consent form. Written consent was provided before potential Walk to Work promoters received the training and undertook the role.

Walk to Work promoter training and resources

The research team delivered a training session, lasting for approximately 1 hour, to the Walk to Work promoters at their workplace and at a time and place to suit their needs. The training was summarised in a DVD (digital versatile disc), developed by the research team, which promoters retained after the session. The training included information about the health, social, economic and environmental benefits of walking; using BCTs to promote increased walking, either the whole route or as part of a mixed-mode journey; providing support and encouragement to participating employees; and accessing relevant websites and resources for additional information and resources. Walk to Work promoters were given booklets, also developed by the research team, to assist them in the role. The content of these booklets (see *Appendix 6*) was discussed in detail as part of the training session.

Walk to Work promoters were given the names of participating employees in their workplace and were asked to provide the employees with Walk to Work booklets and an optional pedometer, highlight the benefits of increased walking, discuss barriers and solutions to walking during the commute, help participants to identify routes and methods of incorporating walking in their journeys and provide ongoing support through four contacts over the following 10 weeks. These contacts could be face to face, via e-mail or via telephone, in groups or on an individual basis, depending on the preferences of the workplace and participants. The Walk to Work promoter's booklet contained guidance about providing support and encouragement to participating employees over the 10-week intervention period and optional diary pages to record their activities.

Walk to Work promoters were prompted and encouraged in their role through three short newsletters from the research team over the 10-week intervention period (see *Appendix 7*). These were supplemented by newsletters to pass on to participants (see *Appendix 8*) focusing on specific BCTs and providing additional information about the benefits of walking. The newsletters were provided by e-mail and/or in paper form to suit the workplace.

Participant booklets

The Walk to Work promoters were given the names of all employees in their workplaces who were participating in the study and were asked to provide each of them with a participant booklet. These booklets provided information and guidance relating to the BCTs that comprised the behavioural intervention (see *Appendix 9*). To encourage intention formation, the booklets began by considering the benefits of increasing walking during the commute. The focus then moved to identifying personal benefits, barriers and solutions, and goal-setting. Self-monitoring was encouraged through the use of diary pages at the back of the participant's booklet or the use of optional pedometers, which had been provided free of charge to the study by the charity Living Streets (www.livingstreets.org.uk; accessed 6 June 2018), to record daily steps. Participants were prompted to seek encouragement and social support during their attempts to increase walking during the commute.

Participant newsletters

Three newsletters were sent to the Walk to Work promoters for circulation to participating employees during the following 10 weeks (see *Appendix 8*). These provided additional information, to stimulate continued interest in the benefits of walking, as well as continuing the focus on key BCTs: highlighting social support at around week 3, reviewing goals at week 5 and following up participants to support the maintenance of behavioural change (relapse prevention) at around week 7.

Information and ideas for employers

An employer pack was provided to all workplaces in the intervention group of the study (see *Appendix 10*). This comprised a letter outlining the intervention, the booklets being used by the Walk to Work promoters and participants, additional booklets specifically designed for employers and free Walk4Life poster templates for display in the workplace (www.walk4life.info; accessed 6 June 2018). The employer's booklet contained ideas for promoting walking to work, including providing information about walking distances to train and bus stops, providing lockers or improved cloakroom facilities, giving financial assistance for public transport season tickets or for walking clothes/shoes, offering free incentive items for those who switch to walking (e.g. umbrellas, rucksacks or breakfast vouchers) and supporting competitions and challenges for those who enjoy taking part in such activities. Employers were encouraged to record any support they had provided for the intervention, together with associated costs, in a section at the back of their booklet.

Adverse events

Details of the procedure for reporting adverse events are provided in *Chapter 2*. No accidents or adverse events relating to the intervention were reported during the study.

Summary

The Walk to Work intervention was based on nine key BCTs and involved three stages: (1) identification and training of workplace Walk to Work promoters, (2) initial contact between the Walk to Work promoters and participating employees, and the distribution and discussion of intervention materials, and (3) additional support and encouragement during the following 10 weeks. Walk to Work promoters, participants and employers were provided with a co-ordinated suite of booklets and resources to support implementation of the 10-week intervention to encourage increased walking during the commute to and from work.

Chapter 6 Process evaluation

Methods

The process evaluation methods were informed by the Medical Research Council guidance on process evaluation of complex public health interventions.⁸⁶

Logic model

A logic model was developed, indicating the theoretical underpinning of the Walk to Work intervention, inputs, activities, outputs and outcomes as well as contextual factors likely to have an impact on the implementation of, and response to, the intervention (*Figure 2*).

Data collection

The planned process evaluation methods are summarised in *Table 14*.

Data relating to the context, delivery and response to the intervention were collected from employers, Walk to Work promoters and employees through survey questionnaires at baseline, post intervention and at the 12-month follow-up, and through interviews with a purposive sample of employers, Walk to Work promoters and employees immediately post intervention. Observations and notes were also recorded during contacts with workplaces.

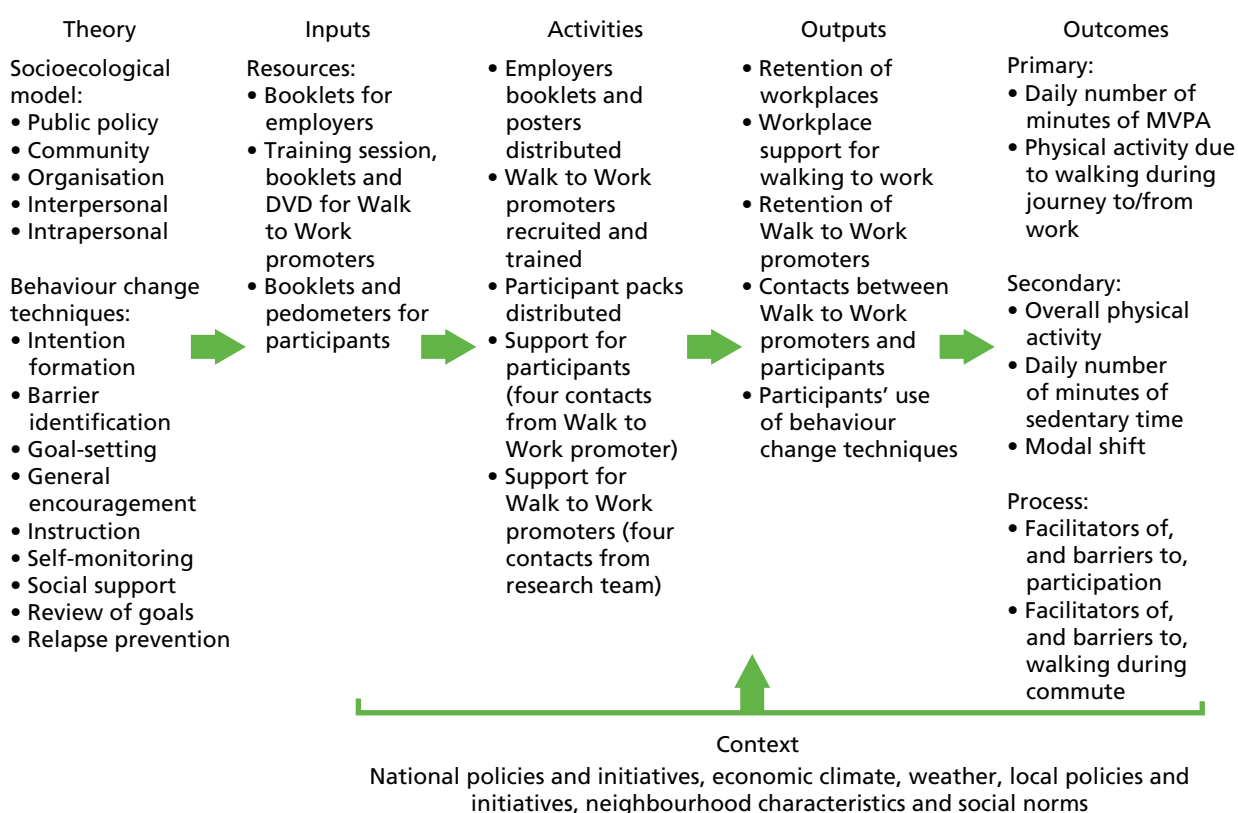


FIGURE 2 Walk to Work intervention logic model.

TABLE 14 Outline of the process evaluation

Stage	Method	Issues to be examined
Recruitment and retention of workplaces	<ul style="list-style-type: none"> E-mail/letter to all workplaces Short questionnaire to all workplaces expressing interest 	<ul style="list-style-type: none"> Response rates Reasons for expressing/not expressing interest Ability to 'match' pairs of participating workplaces by size, location and type of business/activity
Recruitment and retention of employees	<ul style="list-style-type: none"> Descriptive statistics Post-intervention interviews Accelerometers and GPS compliance Questionnaires (basic personal data) 	<ul style="list-style-type: none"> Response rates Reasons for participating Compliance rates Social patterning in uptake of walking to work, particularly in relation to socioeconomic status, age and gender
Baseline	Questionnaires administered to all participating employees	<ul style="list-style-type: none"> Basic personal data, job title, mode of transport to work, before- and after-work 'routines' (e.g. school run), duration of employment at the workplace, typical commuting costs, car ownership, commute-related adverse events, health service use and views about walking Current physical activity Facilitators of, and barriers to, walking to work
Randomisation	Within 'matched' pairs, randomly generated number	Response to randomisation (retention)
Training Walk to Work promoters	<ul style="list-style-type: none"> Fieldnotes Post-intervention interviews 	<ul style="list-style-type: none"> Context Participants' views of training
Contact/support for walkers	Diary completed by Walk to Work promoters	Used as prompt in post-intervention interviews
Immediately post intervention	<ul style="list-style-type: none"> Questionnaires with all participating employees (intervention and control arms) Interviews with purposive sample of employees in workplaces that received the intervention who have increased walking to work ($n \approx 18$) and employees who have not ($n \approx 18$) Interviews with purposive sample of employers/managers in participating workplaces (intervention group) ($n \approx 18$) Interviews with purposive sample of Walk to Work promoters ($n \approx 18$) 	<ul style="list-style-type: none"> As per baseline questionnaires Additional questions for employees in workplaces that received the intervention about the context, delivery and receipt of the intervention Rationale/method used for choice of Walk to Work promoter(s) Views about the context, design, delivery and receipt of the intervention Support offered to walkers, including type and content of contact Issues raised by walkers Workplace-related issues (e.g. time taken) Facilitators of, and barriers to, walking to work
12-month follow-up	Questionnaires with all participating employees (intervention and control arms)	<ul style="list-style-type: none"> As per the baseline questionnaires Additional questions for employees in workplaces in the intervention group about any memories/views of the intervention

Questionnaires

For the process evaluation, the post-intervention questionnaires included questions about whether or not participants were aware of efforts within their workplace to increase or support walking during the commute and whether or not the research activities (particularly wearing activity monitors) had influenced their physical activity levels. All questionnaire data were entered into a secure database. Descriptive statistics are displayed as counts and percentages. Some questions allowed participants to add short free-text responses. These were entered in full into the database and grouped in accordance with the issues raised, including identifying similarities and differences in relation to those issues. The quotations included in this chapter were chosen to illustrate the key points that were made.

Interviews

Semistructured interviews were conducted with a purposive sample of employers, Walk to Work promoters and employees in the intervention group. The aim was to include views and experiences from a wide range of workplaces, Walk to Work promoters and employees who self-reported that they had, or had not, increased walking during the commute to work. A gender balance was also sought. Interviews were conducted in the workplace at a time to suit the interviewee. The topic guides were tailored to suit the participant's role (employer, Walk to Work promoter or employee) and whether they were in the intervention or the control group of the trial (see *Appendix 11*). Potential interviewees were sent a letter of invitation and written consent was obtained prior to the interview. Interviewees were given a £10 gift voucher to thank them for their contribution to the study.

All interviews were digitally recorded, fully transcribed and anonymised. For this report, preliminary analyses focused on a key outcome for the process evaluation: barriers to, and facilitators of, walking during the commute to and from work. Thematic analysis was undertaken using the Framework method of data management.⁸⁷ The Framework method entails examining the transcripts and creating charts of sections of text relevant to key research questions. Streamlined versions of the charts are produced as the process of coding and analysing the data progresses: key terms and phrases are retained, repetition and extraneous text are removed and similarities and differences are examined within emerging themes.

Workplace descriptors

The classification of workplace activities is based on the *UK Standard Industrial Classification (SIC) Categories 2007*.⁶⁸ 'Micro' usually refers to workplaces with between one and nine employees,⁸⁸ but for this study at least five employees were needed to meet the eligibility criteria and so micro refers to workplaces employing between five and nine people. Small workplaces are defined as employing 10–49 people, medium-sized workplaces are defined as employing 50–249 people and large workplaces are defined as employing ≥ 250 people.⁸⁸

Participant identification numbers

All participants in the study were given a unique identification number: the first three digits refer to the workplace and the last two digits refer to the participant. IDs (identifiers) preceded by '9' indicate that these participants, either Walk to Work promoters or Walk to Work employers, contributed to the study but did not take part in the outcome data-collection activities.

Results

Workplace and participant recruitment

The process of recruiting workplaces and participants is considered in detail in *Chapter 3*. Following baseline data collection, 44 workplaces were randomised to receive the intervention. However, two workplaces withdrew from the intervention group: one because of unanticipated relocation to another country and one because the key contact felt that the study activities were too onerous.

Walk to Work promoter recruitment

In the remaining intervention workplaces, the employers were asked to identify a Walk to Work promoter to implement the 10-week intervention. In 19 workplaces, the employer took on this role themselves: of these, six were micro-sized, seven were small, five were medium-sized and one was large (*Table 15*). One large workplace had two Walk to Work promoters, but in the majority of workplaces one person was identified to undertake the role. Fourteen of the Walk to Work promoters were male and 24 were female.

During the first year of recruitment, five workplaces in the intervention group were unable to identify someone to take on the role of Walk to Work promoter. Rather than lose these workplaces from the study altogether, it was decided that the relevant researcher would take on the role of ensuring that the intervention materials were distributed to participating employees. However, it was not felt appropriate

TABLE 15 Recruitment of Walk to Work promoters

Promoter				Workplace	
Gender	Age (years)	Role	ID	Classification	Size
Male	55	Employer/promoter	101-01	Wholesale and retail; vehicle repairs	Small
Male	63	Employer/promoter	102-01	Professional, scientific and technical	Small
Female	52	Employer/promoter	127-05	Other service activities	Micro
Female	52	Employer/promoter	127-05	Other service activities	Micro
Male	43	Employer/promoter	165-01	Financial and insurance	Small
Male	43	Employer/promoter	165-01	Financial and insurance	Small
Female	55	Employer/promoter	166-01	Human health and social work	Micro
Female	55	Employer/promoter	166-01	Human health and social work	Micro
Female	38	Employer/promoter	223-01	Professional, scientific and technical	Medium
Female	52	Employer/promoter	228-01	Human health and social work	Medium
Female	52	Employer/promoter	228-01	Human health and social work	Medium
Male	43	Employer/promoter	302-03	Arts, entertainment and recreation	Small
Male	33	Employer/promoter	325-01	Wholesale and retail; vehicle repairs	Small
Male	33	Employer/promoter	325-01	Wholesale and retail; vehicle repairs	Small
Female	48	Employer/promoter	334-01	Administrative and support services	Micro
Female	48	Employer/promoter	334-01	Administrative and support service	Micro
Male	–	Employer/promoter	9-122-07	Manufacturing	Large
Male	–	Employer/promoter	9-319-01	Professional, scientific and technical	Medium
Male	–	Employer/promoter	9-319-01	Professional, scientific and technical	Medium
–	–	No promoter	207	Human health and social work	Small
–	–	No promoter	209	Membership organisation	Small
–	–	No promoter	303	Wholesale and retail; vehicle repairs	Medium
–	–	No promoter	307	Administrative and support services	Large
–	–	No promoter	310	Public administration and defence	Medium
Female	33	Promoter	111-02	Professional, scientific and technical	Large
Female	31	Promoter	141-03	Human health and social work	Medium
Female	31	Promoter	141-03	Human health and social work	Medium
Female	58	Promoter	161-02	Professional, scientific and technical	Small
Female	58	Promoter	161-02	Professional, scientific and technical	Small
Female	58	Promoter	305-01	Manufacturing	Medium
Female	27	Promoter	317-03	Professional, scientific and technical	Small
Female	27	Promoter	317-03	Professional, scientific and technical	Small
Male	–	Promoter	9-122-07	Manufacturing	Large
Female	–	Promoter	9-226-18	Public administration and defence	Large
Female	–	Promoter	9-226-18	Public administration and defence	Large
Female	–	Promoter	9-232-12	Manufacturing	Small
Female	–	Promoter	9-232-12	Manufacturing	Small

TABLE 15 Recruitment of Walk to Work promoters (*continued*)

Promoter				Workplace	
Gender	Age (years)	Role	ID	Classification	Size
Female	–	Promoter	9-330-36	Education	Large
Female	–	Promoter	9-330-36	Education	Large
Male	–	Promoter	9-335-15	Administrative and support service	Large
Male	–	Promoter	9-335-15	Administrative and support service	Large
Male	61	Promoters (paired)	106-13	Public administration and defence	Large
Female	–		9-106-29		

for the researcher to go into the workplace to give face-to-face support for employees to encourage them to change their travel behaviour. These workplaces were therefore considered to have received a 'light-touch' intervention. In the second year of recruitment, researchers stressed the importance of being able to identify someone in the workplace who might be suitable to be a Walk to Work promoter should the workplace be randomised to the intervention group, and no further workplaces were recorded as not recruiting a Walk to Work promoter.

Walk to Work promoter training and intervention materials

The methods and resources used for the Walk to Work intervention are described in detail in *Chapter 5*. The training session, DVD and booklets offering guidance about their role were delivered to all designated Walk to Work promoters at the start of the intervention. Three newsletters offering additional information and encouragement were also sent to all Walk to Work promoters during the 10-week intervention. All Walk to Work promoters were provided with booklets and optional pedometers to distribute to participating employees in their workplaces, plus three newsletters to distribute to participants during the 10-week intervention period. The pedometers, which were provided free of charge for participants who wished to use them, were not of high quality. Participants who wanted to self-monitor preferred to use their own wrist-worn monitoring devices or an app (application) on their smartphone, details of which were supplied in newsletter 2 of the intervention.

All employers were provided with the employer pack containing a letter reminding them of the aims of the intervention and the role of Walk to Work promoter, booklets with ideas about how to support the intervention and templates for posters to display as appropriate in their workplaces.

Activities of the Walk to Work promoters

In relation to fidelity (the extent to which the intervention was delivered as planned), we were able to examine the recruitment, training and ongoing support of the Walk to Work promoters but it was not possible to directly observe their activities in their respective workplaces. However, the post-intervention questionnaires included questions to shed light on the Walk to Work promoters' activities. Questionnaires were administered to all study participants, including those in the control group. Descriptive statistics show that participants in the intervention group were more likely to indicate that someone had tried to encourage them to change their travel behaviour in the last 2–3 months (the intervention period): 19.9% ($n = 66$) in the intervention group compared with 10.8% ($n = 35$) in the control group (*Table 16*).

The non-response rate for this question was noticeably higher in the intervention group (40.5%) than in the control group (18.6%), and there were noticeably higher non-response rates in the intervention group for other questions relating to intervention activities. It is not clear why this was the case; it may relate to the additional participant burden in the intervention group, as participants had just come to the end of a 10-week intervention, or there may have been some reluctance among participants in the intervention group to confirm that they, or the Walk to Work promoter, had not engaged with the intervention.

TABLE 16 Post-intervention questionnaire: intervention delivery – in the last 2–3 months, has anyone in your workplace tried to encourage you to change the way you travel to or from work?

Trial group participants	Response, n (%)		No response, n (%)
	Yes	No	
Intervention	66 (19.9)	131 (39.6)	134 (40.5)
Control	35 (10.8)	228 (70.6)	60 (18.6)

In the intervention group, 64 participants from 28 of the 42 intervention workplaces made use of the free-text box to give some additional information about the encouragement they were given. In some cases, the Walk to Work promoter or the Travel to Work study were specifically mentioned; in others, it was less clear if the participant was referring to other active travel initiatives. Half ($n = 32$) of comments in the intervention group suggested that sustainable transport, active travel and cycling were promoted, rather than specifically focusing on walking. For example:

E-mails about cycling to work, conversations about parking further away from office, e-mails about bike pods.

Employee, ID 106-05

Work colleagues supported my decision to start biking, but also tried suggesting alternatives but unfortunately nothing that would work for me.

Employee, ID 224-08

I have had a workplace induction and the health and safety talk included protecting the environment. They mentioned the benefits (personal and environmental) that can be achieved by alternative travel.

Employee, ID 330-13

The remainder of the comments in the intervention group focused more clearly on encouragement given for walking:

Colleague involved in project gave me a pedometer and suggested I park in the industrial estate and walk the rest of the way to work. Articles on benefits of walking also sent round.

Employee, ID 106-21

Walk to Work champion discussed some strategies to increase number of days I walk.

Employee, ID 141-02

There were posters around the office. Some people who took part in the study live close by so we walked together and encouraged each other to walk. In the past we were sharing car lifts more.

Employee, ID 155-04

Although there was evidence of some interest and enthusiasm, other study participants offered explanations as to why they could not increase walking during the commute:

Talked to [name of Walk to Work promoter] in work, the liaison for Travel to Work. But with weather changes + nights getting darker. I didn't feel happy to walk more.

Employee, ID 303-02

Tried to get me to park further away, but due to the hours I work, it's safer for me to park closer to work.

Employee, ID 307-08

I cannot walk to work as I live 6 miles away. I walk most lunchtimes – 1.75 miles but this programme hasn't adjusted that behaviour.

Employee, ID 335-03

In the control group, there were fewer comments from study participants ($n = 35$ from 18 of the 43 workplaces). About half ($n = 17$) who said that they had been encouraged to change their travel behaviour focused on cycling:

Travel to work schemes advertised, car sharing – cycling – new cycle centre opened – discussed with boss whether to cycle to work and he suggested borrowing the electric loan bike to try out for the 10 miles.

Employee, ID 162-14

Posters at work showing examples of employees cycling to work, their routes, how long it takes and the benefits.

Employee, ID 112-12

We have some very good advocates for cycling to work here.

Employee, ID 126-10

Others mentioned more general sustainable transport initiatives:

Conversation with the sustainability leader. Consideration how to try and expand the carshare from my home town.

Employee, ID 104-06

We took part in [name of city] commuter challenge which encourages employees to travel more sustainably/actively for 1 month.

Employee, ID 1151-01

Six respondents indicated that they had been encouraged to walk:

Colleague who lives near me persuaded me to walk home with her one evening rather than get the bus – it was a good experience.

Employee, ID 125-29

Manager encourages us to walk more.

Employee, ID 150-05

The Civil Service walking challenge – an annual campaign to raise money for the Civil Service Benevolent Fund and get us to walk at least 10,000 steps each of 50 days in the summer.

Employee, ID 153-02

Other related activities and campaigns

Descriptive statistics suggest that very few participants were aware of, or taking part in, activities outside the workplace that aimed to change the way they travelled to work (Table 17).

The free-text box to provide more information about other schemes was completed by 28 participants, of whom five appeared to have misunderstood the question and referred to the Travel to Work study. Ten participants mentioned cycling schemes, for example 'Cycling UK "cycle-to-work" day' (Employee, ID 128-09), 'bike to work campaign' (Employee, ID 136-05) and 'cycling schemes to buy bikes' (Employee, ID 224-07). Only three participants mentioned walking, although not specifically walking to work: 'I went on a 3-month holiday – trekking' (Employee, ID 125-07), 'Living Streets' (Employee ID 150-04) and 'I chatted

TABLE 17 Post-intervention questionnaire: in the last 2–3 months, have you heard of, or taken part in, any projects or campaigns outside your workplace that try to encourage you to change the way you travel to or from work?

Trial group participants	Response, n (%)		No response, n (%)
	Yes	No	
Intervention	11 (3.3)	188 (56.8)	132 (39.9)
Control	18 (5.6)	244 (75.5)	61 (18.9)

with colleagues about it and walked more after work on a regular basis. I took walks between 6–8 p.m. for around 10–30 mins + took part in an exercise diary' (Employee, ID 131-01). Other participants referred to more general sustainable transport initiatives: 'commuter challenge' (Employee, ID 121-09), 'Local campaign about car sharing/using the car less' (Employee, ID 121-10) and 'Travel Smart in my organisation. Big commuting challenge. Green Impact Award' (Employee, ID 162-16).

Hawthorne effects

Data from the post-intervention questionnaires provide some evidence of a potential Hawthorne effect in relation to the research activities. *Table 18* indicates that around 18–28% of all participants 'often' or 'sometimes' changed their behaviour (either walking more on journeys to/from work or being more active in general) while wearing the monitors. However, this affect was reported in both the intervention and the control arms and therefore is unlikely to have changed the results of the study.

Free-text comments suggest that taking part in the research study, rather than receiving the intervention, appeared to have influenced some participants:

The Travel to Work survey got me to cycle a few days a week in the summer when my wife, a teacher, was on school holiday.

Employee, ID 112-05

This one [Travel to Work questionnaire] made me think. When I was first approached I was tied as I had to pick mum up – although if she could of [sic] walked, she would have – she was known for walking and was on no medication when she died, so I have decided to do more.

Employee, ID 112-21

TABLE 18 Post-intervention questionnaire: influence of wearing accelerometers and GPS monitors

	Response, n (%)			
While you were wearing the monitors, did you:	Often (at least half of the time)	Sometimes (less than half of the time)	Never or hardly ever	No response, n (%)
Walk more than usual on journeys to and/or from work?				
All participants	44 (6.7)	83 (12.7)	306 (46.8)	221 (33.8)
Intervention group participants	26 (7.9)	42 (12.7)	116 (35.1)	147 (44.4)
Control group participants	18 (5.6)	41 (12.7)	190 (58.8)	74 (22.9)
Become more active in general?				
All participants	61 (9.3)	124 (19.0)	247 (37.8)	222 (33.9)
Intervention group participants	39 (11.8)	55 (16.6)	90 (27.2)	147 (44.4)
Control group participants	22 (6.8)	69 (21.4)	157 (48.6)	75 (23.2)

This study enabled me to think about my activity levels. If I could travel to work by bicycle that would be great, but it is impracticable, and unsafe, too time consuming.

Employee, ID 137-02

Discussed ideas in staff room with other people taking part in Travel to Work survey.

Employee, ID 160-08

To encourage participants to wear the monitors, the research team printed and distributed personal graphs of activity levels and maps showing the routes that were taken. Just over 60% of participants recalled receiving the graphs or maps (Table 19).

Of those who recalled receiving a graph or map, around 18–28% indicated that they ‘often’ or ‘sometimes’ changed their behaviour (either walking more on journeys to/from work or being more active in general) after seeing the graph or map of their activity (Table 20). This influence appeared to be balanced between the intervention and the control arms in relation to walking to work, but was somewhat higher in the control group in relation to undertaking more activity in general.

Workplace support for the Walk to Work intervention

Questions were included in the post-intervention questionnaires to explore the extent to which employees were aware of support for the intervention in the workplace. Again, rates of ‘no response’ were noticeably higher in the intervention group than in the control group. Overall, around 10% of respondents were aware of an increase in their workplace of information about walking. Table 21 suggests that those in the intervention group were more aware than those in the control group of posters (13.6% vs. 7.1%) and information about walking or walking routes (14.0% vs. 4.0%).

TABLE 19 Post-intervention questionnaire: did you receive a personal graph or map of activity levels?

Participants	Response, <i>n</i> (%)		No response, <i>n</i> (%)
	Yes	No	
All	411 (62.8)	29 (4.4)	214 (32.7)
Intervention group	173 (52.3)	14 (4.2)	144 (43.5)
Control group	238 (73.7)	15 (4.6)	70 (21.7)

TABLE 20 Post-intervention questionnaire: influence of receiving a personal graph or map of activity levels

	Response, <i>n</i> (%)			No response, <i>n</i> (%)
After seeing the graph or map of your activity, did you:	Often (at least half of the time)	Sometimes (less than half of the time)	Never or hardly ever	
<i>Walk more than usual on journeys to and/or from work?</i>				
All participants	39 (6.0)	81 (12.4)	286 (43.7)	248 (37.9)
Intervention group participants	21 (6.3)	40 (12.1)	109 (32.9)	161 (48.6)
Control group participants	18 (5.6)	41 (12.7)	177 (54.8)	87 (26.9)
<i>Become more active in general?</i>				
All participants	56 (8.6)	125 (19.1)	227 (34.7)	246 (37.6)
Intervention group participants	28 (8.5)	54 (16.3)	88 (26.6)	161 (48.6)
Control group participants	28 (8.7)	71 (22.0)	139 (43.0)	85 (26.3)

TABLE 21 Post-intervention questionnaire: in the past 2–3 months, have you noticed an increase in the following information or activities in your workplace?

Information and activities	Participants, <i>n</i> (%)							
	Overall		Intervention group			Control group		
	Response		Response		No response	Response		No response
	Yes	No	Yes	No		Yes	No	
Posters about walking	68 (10.4)	389 (59.5)	45 (13.6)	153 (46.2)	133 (40.2)	23 (7.1)	236 (73.1)	64 (19.8)
Information about walking or walking routes	60 (9.2)	398 (60.9)	47 (14.2)	153 (46.2)	131 (39.6)	13 (4.0)	245 (75.9)	65 (20.1)
Information about public transport	76 (11.6)	382 (58.4)	33 (10.0)	167 (50.5)	131 (39.6)	43 (13.1)	215 (66.6)	65 (20.1)
Walking competitions or events	72 (11.0)	386 (59.0)	36 (10.9)	165 (49.9)	130 (39.3)	36 (11.2)	221 (68.4)	66 (20.4)
Other information or activities related to walking or transport	54 (8.3)	365 (55.8)	29 (8.8)	153 (46.2)	149 (45.0)	25 (7.7)	212 (65.6)	86 (26.6)

Changes requiring more input from employers (such as improved facilities, changes to parking arrangements, incentives to walk during the commute or subsidised sustainable transport initiatives) were less evident (*Tables 22 and 23*).

TABLE 22 Post-intervention questionnaire: in the past 2–3 months, have you noticed any of the following changes in workplace facilities?

Changes in workplace facilities	Participants, <i>n</i> (%)							
	Overall		Intervention group			Control group		
	Response		Response		No response	Response		No response
	Yes	No	Yes	No		Yes	No	
Improvements to storage, lockers or hanging space	31 (4.7)	429 (65.6)	11 (3.3)	189 (57.1)	131 (39.6)	20 (6.2)	240 (74.3)	63 (19.5)
Improvements to washing facilities	24 (3.7)	438 (67.0)	11 (3.3)	190 (57.4)	130 (39.3)	13 (4.0)	247 (76.8)	62 (19.2)
Reduction in the number of workplace parking spaces	51 (7.8)	409 (62.5)	28 (8.5)	172 (52.0)	131 (39.6)	23 (7.1)	237 (73.4)	63 (19.5)
Increase in the cost of workplace parking	20 (3.1)	439 (67.1)	15 (4.5)	196 (56.2)	130 (39.3)	5 (1.6)	253 (78.3)	65 (20.1)
Other facilities related to walking or transport	7 (1.1)	413 (63.2)	3 (0.9)	181 (54.7)	147 (44.4)	4 (1.2)	232 (71.8)	87 (26.9)

TABLE 23 Post-intervention questionnaire: in the past 2–3 months, have any of the following incentives been offered by your workplace?

Incentives	Participants, <i>n</i> (%)							
	Overall		Intervention group			Control group		
	Response		Response			Response		
	Yes	No	Yes	No	No response	Yes	No	No response
Subsidies for public transport use	32 (4.9)	429 (65.6)	18 (5.4)	182 (55.0)	131 (39.6)	14 (4.3)	247 (76.5)	62 (19.2)
Subsidies for wet-weather clothing or walking shoes	0 (0.0)	462 (69.4)	0 (0.0)	201 (60.7)	130 (39.3)	0 (0.0)	261 (80.8)	62 (19.2)
Discounts for local outdoor shops	9 (1.4)	450 (68.8)	5 (1.5)	195 (58.9)	131 (39.6)	4 (1.2)	255 (79.0)	64 (19.8)
Walking mileage allowance	2 (0.3)	460 (70.3)	2 (0.6)	199 (60.1)	130 (39.3)	0 (0.0)	261 (80.8)	62 (19.2)
Free umbrellas, rucksacks or similar freebies	10 (1.5)	450 (68.8)	8 (2.4)	192 (58.0)	131 (39.6)	2 (0.6)	258 (79.9)	63 (19.5)

Interviews were conducted with 70 participants: 11 employers (*Table 24*), and a further 12 employers who also took on the role of Walk to Work promoters (*Table 25*); 11 Walk to Work promoters (*Table 26*); and 36 employees, of whom 19 self-reported no increase in walking to work (*Table 27*) and 17 self-reported an increase (*Table 28*). The age range of interviewees was 24–63 years and there were 33 men and 37 women.

TABLE 24 Characteristics of interviewed employers (*n* = 11)

Employer				Workplace		
ID	Gender	Age (years)	Annual household income	Classification	Urban area	Size
9-106-30	Male	–	–	Public administration and defence	South Gloucestershire	Large
9-128-20	Male	–	–	Professional, scientific and technical	Bristol	Large
9-226-19	Female	–	–	Public administration and defence	Swindon	Large
9-232-15	Female	–	–	Manufacturing	Bath	Small
9-305-10	Female	–	–	Manufacturing	Swansea	Medium
9-336-01	Male	–	–	Wholesale and retail trade; repair of motor vehicles	Neath Port Talbot	Small
317-01	Male	43	> £50,000	Professional, scientific and technical	Swansea	Small
120-08	Male	45	> £50,001	Professional, scientific and technical	Bristol	Medium
207-03	Male	53	> £50,001	Other service activities	Bath	Small
303-06	Female	53	> £50,001	Wholesale and retail	Swansea	Medium
9-335-16	Male	–	–	Administrative and support services	Swansea	Large

TABLE 25 Characteristics of interviewed employer promoters (*n* = 12)

Employer/promoter				Workplace		
ID	Gender	Age (years)	Annual household income	Classification	Urban area	Size
9-122-07	Male	–	–	Manufacturing	South Gloucestershire	Large
9-319-01	Male	–	–	Professional, scientific and technical	Neath Port Talbot	Medium
325-01	Male	33	£30,001–40,000	Wholesale and retail trade; repair of motor vehicles	Newport	Small
223-01	Female	38	£40,001–50,000	Professional, scientific and technical	Bath	Medium
165-01	Male	43	> £50,001	Financial and insurance	Bristol	Small
302-03	Male	43	£40,001–50,000	Arts, entertainment and recreation	Swansea	Small
334-01	Female	48	> £50,001	Administrative and support service activities	Newport	Micro
127-05	Female	52	–	Other service activities	Bristol	Micro
228-01	Female	52	> £50,001	Human health and social work	Swindon	Medium
101-01	Male	55	> £50,001	Wholesale and retail trade; repair of motor vehicles	South Gloucestershire	Small
166-01	Female	55	£40,001–50,000	Human health and social work	Bristol	Micro
102-01	Male	63	> £50,001	Professional, scientific and technical	South Gloucestershire	Small

TABLE 26 Characteristics of interviewed Walk to Work promoters (*n* = 11)

Walk to Work promoter				Workplace		
ID	Gender	Age (years)	Annual household income	Classification	Urban area	Size
9-226-18	Female	–	–	Public administration and defence	Swindon	Large
9-232-12	Female	–	–	Manufacturing	Bath	Small
9-330-36	Female	–	–	Education	Swansea	Large
9-335-15	Male	–	–	Administrative and support service	Swansea	Large
317-03	Female	27	£20,001–30,000	Professional, scientific and technical	Swansea	Small
141-03	Female	31	£20,001–30,000	Human health and social work	Bristol	Medium
111-02	Female	33	£40,001–50,000	Professional, scientific and technical	South Gloucestershire	Large
161-02	Female	58	> £50,001	Professional, scientific and technical	Bristol	Small
305-01	Female	58	£20,001–30,000	Manufacturing	Swansea	Medium
106-13	Male	61	£40,001–50,000	Public administration and defence	South Gloucestershire	Large
9-106-29	Female	–	–			

TABLE 27 Characteristics of interviewed employees: self-reported no increase in walking (*n* = 19)

Employee				Workplace		
ID	Gender	Age (years)	Annual household income	Classification	Urban area	Size
101-05	Male	25	–	Wholesale and retail trade; repair of motor vehicles	South Gloucestershire	Large
106-05	Female	32	£30,001–40,000	Public administration and defence	South Gloucestershire	Large
122-03	Male	52	> £50,001	Manufacturing	South Gloucestershire	Large
128-18	Female	28	> £50,001	Professional, scientific and technical	Bristol	Large
136-05	Female	32	> £50,001	Administrative and support service	Bristol	Small
158-03	Female	45	> £50,001	Professional, scientific and technical	Bristol	Small
161-03	Male	60	> £50,001	Professional, scientific and technical	Bristol	Small
223-02	Female	52	> £50,001	Professional, scientific and technical	Bath	Medium
223-10	Male	41	–	Professional, scientific and technical	Bath	Medium
226-03	Male	48	£40,001–50,000	Public administration and defence	Swindon	Large
226-08	Female	55	£30,001–40,000	Public administration and defence	Swindon	Large
228-03	Male	30	£40,001–50,000	Human health and social work	Swindon	Large
302-04	Male	39	£10,001–20,000	Arts, entertainment and recreation	Swansea	Small
305-08	Female	49	£30,001–40,000	Manufacturing	Swansea	Medium
307-09	Male	37	£40,001–50,000	Administrative and support service	Swansea	Large
317-02	Female	33	–	Professional, scientific and technical	Swansea	Small
330-29	Female	37	£20,001–30,000	Education	Swansea	Large
337-02	Female	37	> £50,001	Human health and social work	Newport	Large
337-05	Male	33	£40,001–50,000	Human health and social work	Newport	Large

TABLE 28 Characteristics of interviewed employees: self-reported increase in walking (*n* = 17)

Employee				Workplace		
ID	Gender	Age (years)	Annual household income	Classification	Urban area	Size
101-06	Female	51	£30,001–40,000	Wholesale and retail trade; repair of motor vehicles	South Gloucestershire	Small
102-06	Female	34	£10,001–20,000	Professional, scientific and technical	South Gloucestershire	Small
106-12	Female	49	> £50,001	Public administration and defence	South Gloucestershire	Large
106-23	Male	41	> £50,001	Public administration and defence	South Gloucestershire	Large
122-05	Male	59	> £50,001	Manufacturing	South Gloucestershire	Large
128-08	Male	30	£40,001–50,000	Professional, scientific and technical	Bristol	Large

continued

TABLE 28 Characteristics of interviewed employees: self-reported increase in walking ($n = 17$) (*continued*)

Employee				Workplace		
ID	Gender	Age (years)	Annual household income	Classification	Urban area	Size
155-02	Female	63	£40,001–50,000	Financial and insurance	Bristol	Small
207-01	Female	34	£40,001–50,000	Other service activities	Bath	Small
223-08	Male	60	> £50,001	Professional, scientific and technical	Bath	Medium
226-07	Female	52	> £50,001	Public administration and defence	Swindon	Large
228-04	Male	41	£40,001–50,000	Human health and social work	Swindon	Large
232-14	Female	24	£40,001–50,000	Manufacturing	Bath	Small
305-05	Male	47	£40,001–50,000	Manufacturing	Swansea	Medium
310-02	Male	55	£40,001–50,000	Administrative and support service	Swansea	Medium
330-11	Female	38	> £50,001	Education	Swansea	Large
335-06	Female	32	> £50,001	Administrative and support service	Swansea	Large
337-07	Male	46	£40,001–50,000	Human health and social work	Newport	Large

For the process evaluation, a key outcome of interest was the identification of barriers to, and facilitators of, walking during the daily commute. Preliminary analyses are presented here, examining key issues from the perspectives of employers, Walk to Work promoters and employees. Several key issues were identified: distance, alternatives to car use (public transport and park and walk facilities), caring responsibilities and the stress of the commute.

Distance

The distance between home and work was frequently highlighted as an important factor in whether or not walking was a feasible mode of travel to work:

I suppose the most important is distance the person lives away from their workplace and that's how, and I think is the main consideration of how they decide how they're going to get to work.

Employer promoter, ID 302-03

Distance was expressed in terms of both mileage and time:

1 to 2 miles, I think, you know, most people would walk, which they do, um, there are a lot of people who just live within probably yeah, probably three or four live in a mile, or mile and a half, radius so they walk to work.

Employee, ID 161-03

For staff that live more than a mile or so away it's not a convenient route to be able to walk into work.

Employer promoter, ID 228-01

I live literally 15 minutes approximately from here. I always have tried to walk to work with most of my jobs, um, it's only once I had to commute 'cos I worked at a hospital which was a bit too far away. So I always try to walk as much as possible, um, anywhere really, but yeah I think living close to my workplace is what gives me the motivation to do it really.

Promoter, ID 141-03

I walk to work, but only because of the distance, like it's only a 20-minute walk.

Employer, ID 9-232-15

Interviewees also linked distance with location:

I would walk to work if I worked in town, like in the centre, I would walk to work definitely but it's just too far here.

Employee, ID 102-06

Distance is a big one I mean where we live, um, we're in [name of city] but I know a lot of people here especially at work live quite rurally, live a long way away from [name of city], um so distance is a big factor.

Employee, ID 335-06

If you are in a business park, it's, it's too long a hike for most people.

Employer, ID 9-128-20

Some workplaces suggested that the majority of employees taking part in the study lived too far away from the workplace to walk the entire commute:

There was something about this project that attracted people from a long way away. I'm not quite sure what there was in our pre-marketing recruitment and I don't know whether that's been the same with other workplaces, but we've had people from [English city] and [English town] and [English city] and all over that um commute hours each way . . . I think yeah they would have had that barrier from the beginning.

Promoter, ID 9-226-18

Everybody was like 'Look, we just live too far, too far away to get here' so whether that was because of the group make-up, um, if it was a larger group maybe we would have had people that were closer.

Promoter, ID 9-335-15

The location of workplaces was also linked to perceptions of available walking routes:

We don't park on site, we park a little further away and then it takes about sort of ten minutes to walk from the car park to the door and it's, it sounds really daft it's probably not that much quicker than walking from my house but it's safer. Where I live I have to walk along to the dual carriageway, down a lane which is incredibly creepy, um and sort of through another car park in order to get here um and especially with the light, with the nights being darker. In summer months it wouldn't be so much of an issue but where it's later, it's darker, it's really creepy so where, where we park now is lovely and light, lovely bright um and just generally feels a little less like somethings going to jump out in the bushes . . . there's probably nothing to be concerned about um I don't think this area's got a particularly high crime rate but it's um, it's more of a comfort thing.

Promoter, ID 111-02

It's some distance for me but the routes, I wouldn't even know the safest route, and the route that I drive in, half of that has no pavements that you could walk anyway. So I wouldn't even know which route to take um to get to work, safely and on my own, I mean especially in the nights or in the um in the mornings when it's dark.

Employee, ID 317-02

At one workplace, concerns about the safety of a walking route had led to calls for improvements:

Since they've build the new houses up by um junction – up by the [Welsh village] roundabout . . . They've actually now put in the new footpath for those houses on that side of the road, so they can get, so that the children can go from that site straight into the primary school. Um and one of the girls who works in [workplace], she lives there and she's saying it takes her 20 minutes to get by car from there to here, so she's been looking at walking but of course the other pavement that we need to come in, which is the opposite side of the road, is the one where there's no lighting and you have to cross the dual carriageway, so it's the safety aspect of that and it's the same with me if I parked um on [Welsh village] and walked back that way, it's crossing that dual carriageway is the problem. Now further up they've put, now put the um traffic lights with the pelican crossing facilities on it, and we were just wondering whether they would have considered doing it further down so that we can use, so people can actually walk across there.

Promoter, ID 305-01

At the time of the interview, as a result of this concern, the local authority had set up monitoring devices to check vehicle speeds at the site of a requested new crossing.

Analyses of baseline characteristics (see *Table 8*) confirmed that a large majority of participants lived > 2 km from their workplace. This meant that increased walking was more likely to be part of a mixed-mode journey involving the use of public transport or combining a car journey with walking.

Public transport

There were some positive comments about the availability of public transport:

We're very lucky we've got a train station you know not even a 3-minute walk up the road so um you know location to public transport helps um I'm not familiar with the bus but I've used the train a few times so I know that, I know the train station's very close.

Employee, ID 106-23

Access to this workplace is good because we're in the centre of [name of city] so you've got buses, the trains, a bit of a walk, it's a 15-minute walk, some people are OK with that, some people are not OK with that.

Employer promoter, ID 165-01

There is good public transport links so I don't think that will be a major problem for people to change from using a car to public transport really.

Employer promoter, ID 302-03

However, the majority of interviewees expressed dissatisfaction with public transport as a means of travelling to and from work. Although the study had focused on workplaces in urban areas, this did not mean that their employees lived in urban areas served by regular bus or train services:

It is either 'Do I get in the car?' or 'Do I get the bus?'. You know it is that simple for me. That may not be the case for somebody who lives a little bit closer who could walk all the way, but the four of us that participated, none of us are in that category. In fact, the other three, I don't know how they'd get to work with public transport. They would be hours if they had to do that. Because one lives down at [English village] I think it is, and the other at [English village] so they are miles outside of [English city] so I think they're limited to what changes they could make really.

Promoter, ID 161-02

Because we're quite rural the public transport isn't great, um you couldn't get a train from where I live to here, you couldn't get one bus from, from, where I live to here, you'd have to catch several.

Employee, ID 335-06

There were also concerns about whether or not public transport would enable employees to get to work on time:

A bus from my house [laughs] would actually get me to [name of town] town centre about 15 minutes after I was supposed to start work so, you know, that, the timing of the bus probably, you know, is probably the biggest influence.

Employee, ID 226-08

I have to be in work for 7 o'clock in the morning, there's no buses, there's no trains, I am forced to use a car. If there were public transport I would use it, so that's a big factor.

Employee, ID 310-02

Because of concerns about getting to work on time, the idea of getting off the bus a few stops early to include additional walking in the journey could be problematic:

It's whether you are running late or not, and that can be down to the public transport being late. You know, you might, you might intend to get off the bus earlier and then the bus might not turn up till 10 minutes later so that cuts your getting to work time . . . you might go out thinking 'Right, I am going to get off the bus two stops earlier' but then the bus might be 10 minutes late and you think 'Actually I can't because I am not going to get into work on time'.

Promoter, ID 161-02

In some areas, using public transport might result in quite complex journeys compared with a single-mode car journey:

I live in the [name of place] which is about 30 miles away from here where I work, um, it's quite a remote village, um, there's very little public transport, unless it's a Tuesday or a Thursday [laugh] so travel by public transport would mean a cab to a rail station and then three changes of train, or a cab to a local town (name of place) and then two buses at least, so the only practical way to travel to work is really by car.

Employee, ID 122-05

More-complex journeys may also be perceived as extending the working day:

The bus station is only a very short walk from the office so anyone travelling in by bus wouldn't have a problem, the same as the train station that's not far away. Whether or not there would be a direct bus or a direct train, I suspect a direct train is more likely, um but if they were to come in by train they may have to get a bus to the train station and vice versa. I think for a lot of people one of the deterrents there would be the fact that it makes the working day that much longer.

Employer promoter, ID 9-319-01

In some areas, public transport was also perceived as being expensive:

Financially it would be far more expensive. I can't, I can't remember how much it is something like £4.50 one way to get on the bus to come to work, and I think I can probably drive that for a lot less.

Employee, ID 226-08

I think public transport is relatively expensive in this area, on a few occasions I've used it um I've been surprised how expensive it is, I'm sure if someone was using it on a regular basis and they're buying season tickets that type of thing it's probably cheaper, but I think um sort of on an ad hoc basis given that the price of public transport would probably put people off as well.

Employer promoter, ID 9-319-01

Park and walk

Where public transport was not perceived to be a viable alternative to car use, increased walking might be achieved by parking further away from the workplace and walking the remainder of the journey:

What I do now is I park 10 minutes away from the office, so I drive, it's probably, yeah it's probably just 2 and a bit miles and so I park 10 minutes away and then I have that 10-minute walk into the office, and I do that most of the time . . . I've done it in the rain and I've done it when I've not been feeling great, and I've done it when I've had a lot to carry, so all those things that previously I would have said 'I can't do it today' because I've, because I think that was one of your questions in one of your booklets wasn't it . . . I guess that made me think about it and I thought well it's, you know, it's not really a valid excuse because you, I can carry that or I might feel better – feeling a bit grotty I might feel a bit better after a walk and sure enough you were right [laugh] and I did.

Employee, ID 106-12

Other interviewees encountered difficulties in finding a suitable place to park their car:

I haven't found a way of making the walk part of the commute and making the journey times the same for me. The, the, my main route to work there isn't actually anywhere I can leave the car to walk that last bit, so for me to, to park further away I am actually increasing the journey in terms of the driving part of it as well as the walking part.

Promoter, ID 106-13

One of the options was to park in a local park and then walk um and then they changed the parking restrictions so you can only park there for 2 hours before you move on, rather than all day . . . I guess having somewhere to park for free which then allows me a short walk to work would be useful but the, yeah, with the parking restrictions going crazy all over the place that's becoming less and less feasible.

Employee, ID 207-01

There isn't anywhere around here where you could actually park your car to be able to walk in, sort of thing. I think it's more down to the council and the government then, who are actually stopping anybody from doing it because there aren't facilities around here to do be able to leave your car off the premises where you can walk that distance then into work.

Employee, ID 305-08

One participant decided to pay for the park-and-ride facility but then walk to work rather than take the bus. This led to some confusion when an attendant at the park-and-ride said it was not permitted and attempted to issue a fine:

There's been quite a few changes at the park and ride, one of which was introducing civilian um security guards who seem to be of the opinion they could issue fines for people that left their car and walked, um that was misdirection it now appears, um but it did cause 2 weeks where um we couldn't walk at all because of the threat of being fined . . . through various emails and correspondence we managed to clarify the position and find out that it wasn't the case you couldn't walk – it was a misunderstanding and they were happy for you to walk.

Employee, ID 310-02

Where workplaces provided free or relatively stress-free parking, this could undermine attempts to encourage study participants to park and walk:

The only thing that could seriously affect it [current park-and-walk journey] is if I reached the holy grail and get a parking space in the basement car park . . . it's not only financial but obviously the ease. I can come straight in to work and literally jump in the lift and I'm at work so it's a big time saving as

well. I mean with the best will in the world I spend at least half an hour getting to and from work where if I could park in work I could drive straight in and drive straight out again.

Employee, ID 310-02

If there's somewhere I know I can park, and I can walk in, like a 25- to 30-minute walk, and I used to do that quite a lot, but then we had more parking at work so, I actually feel bad [laugh], so they can buy you more parking and so it's so much easier now to come and drive in and park whereas before it wasn't and so I had to use this park and walk thing um but now we've got more parking.

Employee, ID 223-02

They often live a fair distance out, there's convenient parking at the place of work, so if somebody was to try and drive part-way and park somewhere it would actually make life a lot more difficult for them. Um most of the streets around the office are either residents' parking or you've got to pay to park and people aren't going to do that if they can just drive straight to the office and make life easier for themselves.

Employer promoter, ID 9-319-01

One possible solution would be for workplaces to provide parking facilities away from the workplace itself to encourage employees to park and walk:

I suppose one thing that might help if there was spaces that the company, I just don't think it's really viable so I wouldn't even, I don't [laugh], but if there were spaces that were a 10-minute walk way. If the company kind of had, were going to buy more parking spaces, it almost would be a good thing in a way but to be a 10-minute walk.

Employer promoter, ID 223-01

They're putting a charge on it [parking] so it's £20 a month if you park in one of the car parks close by but if you then park on site it's £40 a month . . . for £20 a month you can't really beat that so um it's about £1 a day so um yeah the car park's probably about half a mile away so then I'd walk about half a mile . . . if I park in the car parks which are a little bit, little bit further away then just walking that half mile in is now probable.

Employee, ID 226-03

Car drivers appeared to discount the cost of purchasing and maintaining their vehicle, and focused on the immediate costs of running and parking their vehicles. This resulted in perceptions that car driving was cheaper and more convenient than other modes of transport, especially where workplaces provided free or subsidised parking:

One person said she used to get the bus and walk the rest of the way but um, it didn't save any money and the weather's always rubbish so she couldn't really be bothered with that. Um, most of the employees feel it's too far to walk and as the building has free parking, and we're in the city centre there's nowhere really to park further away um, without paying or getting parking tickets.

Promoter, ID 317-03

We get free parking at work but if you park further away there's a lot of residential parking zones so there aren't many areas where you can actually park [laugh] and leave your car all day without paying . . . I think this project has prompted people higher up than myself such as [name] to um thinking about actually our policy on car parking isn't an incentive at all to make people walk or cycle to work so, and we knew that anyway, and we did have a try a few years ago to bring in car park charging, but it got thrown out. But now perhaps is the time in the days of austerity to try again [laugh] . . . there's lack of incentives really, in terms of just providing people free and ample parking, to try and change behaviour.

Promoter, ID 9-226-18

If people had to pay for parking and we didn't have um, parking here, then I think it would change how people would travel to work. It would definitely be more of an encouragement for them to, to look at alternatives, possibly to walk.

Employer, ID 317-01

Caring responsibilities

Interviewees with caring responsibilities, especially for young children, appeared to feel that they had no alternative but to combine the journey to work with transporting their children to school or child-care facilities:

My children go to school near here and I bring them here to work and then they walk to school from here. Um, they could all, we could all walk but actually, you know, they have, during their spring and summer terms they have cricket bags. They are at different ages so the days that they bring their stuff to school is different and, you know, yes they could walk with their cricket bags and their school bags and their sports bags but actually it's a lot!

Employee, ID 158-03

My personal family life is definitely one of the barriers. I have a young son who is at a childminder and my wife works part-time hours so it's a combination of making sure we were picking him up at the childminder and my wife also works evenings and making sure I was back in time for that.

Employee, ID 228-04

My journeys include dropping the kids off to childminders/school and then coming in to work and finishing early to get back for the school run and so on, so I'm restricted with times.

Employee, ID 317-02

Concerns about timing the journey were particularly evident in relation to public transport:

I have to drive for my daughter because there's no other option um well there is a bus, but it doesn't, the timing isn't really, doesn't work for everyone taking their daughters to school so that's, so that's not an option.

Employer promoter, ID 223-01

I've for example got two children and I often have to drop them off and pick them up at the same time to, as I go to and from work, so um that makes public transport impossible for me.

Employee, ID 337-02

One participant who was keen to change his travel arrangements was able to negotiate a solution with his employer:

Getting the children, well picking them up for me from school um was something to consider so, how much walking or public transport could I do, you know, with that in mind um and actually some things I would change, I have changed my hours since I filled in the questionnaire and I should mention that, so it makes it easier for me to catch the train um three times a week to [Welsh city] and then I get home in time to pick my daughter up then from the childminder . . . I always find the train times don't quite correlate, so I tend to have about a half an hour wait in the station. Um so I think obviously more regular transport would help but I have found work have been a bit more flexible I think, with thinking about how people do get to and from work now and they have been flexible by giving me 15 minutes at the end of 4 days a week to catch the train.

Employee, ID 337-05

The stress of the commute

For some participants, it was clear that the journey to and from work was a stressful part of the day. Some interviewees felt that changing their mode of travel would be complicated, less convenient and would increase the level of stress:

For maybe half of the team they possibly could get a bus, but then they would have to walk from the bus stop, but a lot of that, they would probably choose not to do it because of the reliability of the bus. Um, that being the biggest factor, it would be the reliability. They would probably end up having to leave a lot earlier to get to work, but yeah, I would say that probably, definitely, half of them are on a bus route that comes this direction. I wouldn't say it's necessarily round the corner but it's this direction. They'd have to then maybe do a walk. 'Cos even myself, I could get a bus to the top of [name of road] and I could walk down and have done that, but then it would take me, I would have to get, make sure that that bus is 100 per cent guaranteed to leave at that time, so, cos I'd be panicking.

Employer promoter, ID 127-05

If I had the time, I'd have quite a good walk in to work and back. I would definitely prefer to do it. Um but yeah just, just the last few months has been mental . . . I just have to get kids to school, get to work, not you know as quickly as I possibly can. Um I don't have time to walk, um I don't have time for lunch breaks. I work on reduced, I'd be working, I have a break because I have to have a break but I have the shortest break that I, you know, because I just have, I have to leave the office early to get my daughter so to work my hours I don't have, I can't have, an hour lunch break um and so really I supposed I felt like why, why set myself targets that I can't, you know, I haven't, I just thought, I haven't got the space in my life right now to set myself goals . . . it would just go down the source of stress.

Employer promoter, ID 223-01

I thought I would try to increase my levels of activity across the board um by walking a little bit on my way in to work, etc., and then the things such as the park closing and then having to take a detour or um having to get on to the main road from my parking space and it adding another 15 minutes to my day, these – what would consider to be relatively minor incidents in the grand scheme of things, just to have such a negative knock-on effect on my, onto my, the most stressful part of my day which is getting to work and getting, with the kids, and getting home from work with the kids, um that it left me very little wiggle room and I just found it stressful and unhelpful so I stopped doing it.

Employee, ID 337-02

Others felt able to adjust their journey and found some enjoyment in doing so:

When we started doing it, it became quite enjoyable and we got the maps back and we saw [laugh] where we had walked. We're all there then going 'How much did you do?'. It's all about like gamification you almost want to be 'Oh I've done the most steps' or 'I've walked the furthest' that's, creates a bit of team building really'.

Employer promoter, ID 165-01

I have walked more, um, my commute's about 4 miles but over the summer I was trying to do it once a week and I'll, I'm a little bit embarrassed to admit that it was Pokémon GO that started me doing that. So I found that the commute was a great time to catch Pokémon on the way to work.

Promoter, ID 9-226-18

I've found a really pretty route. I've also started listening to serialised podcasts on my walk to and from the bus, so like it's time that I can spend on my own listening to something . . . I go from working with loads of people to being with my partner all the time so having like half an hour or so on my own listening to something and chilling out is really nice.

Employee, ID 335-06

When you first contacted me I was working 20 miles, or 18 miles away, um, and I looked into the train, couldn't use the train, um, because of times to get to work and certainly when I'm on call at the weekends, nights and so on it just doesn't happen so I didn't have any option other than to drive . . . now it's completely different because it's 12 minutes' walk for me so I'm not going to drive . . . now I live and work in the same town, I do not drive, and even though I know the parking is going to be OK I elect not to drive.

Employee, ID 337-07

Summary

Descriptive statistics from the process evaluation suggest that a majority of participants in the intervention group of the study were aware of the Walk to Work promoters in their workplaces, and attempts were made to encourage increased walking during the commute. Workplace support for the intervention tended to focus on the provision of information rather than improvements to facilities or incentives with cost implications. Key factors influencing whether or not participants increased walking during the commute were identified through the behavioural questionnaires and qualitative interviews, and included commuting distance and workplace location, availability and cost of alternatives to private car use, caring responsibilities and stress during the commute.

Chapter 7 Outcome evaluation

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Methods

Data collection

The physical activity outcomes, data-collection methods and timings are summarised in *Table 29*.

Outcome measures

Physical activity was objectively measured using accelerometers (ActiGraph GT3X+). Validated accelerometer thresholds were used to compute daily time spent in MVPA (all 10-second epochs with ≥ 1952 c.p.m.) and being sedentary (all 10-second epochs with < 100 c.p.m.);⁷² these are listed in *Table 30*. The primary outcome was the daily number of minutes of MVPA. To be included in the analyses, participants were required to provide at least 3 valid days of accelerometer data: any 3 days were permissible, as our primary aim was to see if increasing walking during the commute led to an increase in overall physical activity, rather than on work days only. The secondary outcomes were overall levels of physical activity (c.p.m.), daily number of minutes of sedentary time, daily number of minutes of MVPA during the commute and modal shift (number of journeys, over the previous 5 working days, when walking was the major commuting mode). Primary and secondary outcomes were measured at baseline and at the 12-month follow-up.

To identify physical activity during the commute, participants wore a GPS receiver (QStarz BT-1000X) during their journeys, set to record positional data every 10 seconds; GPS settings are listed in *Table 31*. As described in *Chapter 4*, participants' workplaces and homes were geocoded using the full postcode and imported into a GIS (ArcMap v10.2.2). The merged accGPS files were imported into ArcMap and participants' journeys to and from work were visually identified and segmented from other accGPS data using the 'identify' tool to provide a measure of duration of the journey and associated MVPA.

TABLE 29 Physical activity outcomes, data collection methods and timings

Outcome	Method	Timing
Primary outcome		
1. Daily number of minutes of MVPA	Accelerometers	Baseline and 12-month follow-up
Secondary outcomes		
2. Overall level of physical activity (c.p.m.)	Accelerometers	Baseline and 12-month follow-up
3. Daily number of minutes of sedentary time	Accelerometers	Baseline and 12-month follow-up
4. Daily number of minutes of moderate to vigorous activity during the commute (mean MVPA over the number of valid working follow-up days completed)	Accelerometers, GPS and travel diaries	Baseline and 12-month follow-up
5. Modal shift (number of journeys, when walking was the main mode of travel to/from work)	Accelerometers, GPS and travel diaries	Baseline and 12-month follow-up

TABLE 30 Accelerometry procedures and settings

Procedure	Settings
Initialising	Accelerometers were initialised to start recording on the day after distribution and to store data for 7 days including a weekend
Protocol	Single ActiGraph GT3X+ monitor, worn around the waist over the same hip during waking hours (except when swimming/bathing/showering)
Wear time	Waking hours (usually 06.00 to midnight but this was modified, e.g. for shift workers)
Valid length of day	≥ 10 hours (600 minutes)
Days required	Any 3 days ⁶⁹
Epoch length	10 seconds
Zero counts	Bouts of 60 minutes of continuous/consecutive zero counts excluded
Spurious data	> 15,000 c.p.m.
Missing data	No alternative source of information
Activity cut-off points	Sedentary, < 100 c.p.m.; MVPA, ≥ 1952 c.p.m. ⁷²

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TABLE 31 The GPS procedures and settings

Procedure	Settings
Initialising	GPS records when switched on
Protocol	Switch on to 'log' before leaving for work. Switch to 'off' when finishing the commute
Wear time	Commute and working hours
Days required	1 valid working day
Valid data	One journey on given day required
Spurious data	Aberrant speed: all GPS points recorded as travelling at > 100 km/hour Outliers for each participant: removal of GPS points that are > 500 m from any other GPS points
Missing data	Use mode of travel from self-reported travel diary

Randomisation procedures

Randomisation took place at the workplace level after consent to participate was secured and baseline data were collected, thus ensuring allocation concealment. Employers in participating workplaces completed a short questionnaire to optimise matching pairs (or triples) of workplaces with similar characteristics, including size (micro-sized, 5–9 employees; small, 10–49 employees; medium-sized, 50–249 employees; large, ≥ 250 employees), location (south Wales, Bath, Swindon, Bristol and South Gloucestershire) and type of business [using *UK Standard Industrial Classification (SIC) Categories*].⁶⁸ The assignment of workplaces was carried out at the BRTC by a statistician not involved in workplace recruitment. Allocation was based on random numbers generated by Stata version 14, such that one workplace from a matched set was randomised to the control group and one (or two in a triple) to the intervention group. Given the nature of the intervention, it was not possible to blind participants following randomisation.

Statistical methods

The primary statistical analysis was prespecified in a statistical and health economics analysis plan, which was made publicly available prior to release of outcome data to the statistical team.⁹⁰ Individuals providing a measurement of the primary outcome were included in the primary analysis, which compared workplaces allocated to the intervention and workplaces allocated to usual practice. The treatment effect was estimated as the mean difference between the intervention and the control groups using multivariable linear regression (adjusted for baseline MVPA), accelerometer wear time at follow-up, workplace size, location and type of business as covariates. A normally distributed random effect accommodated any variation between workplaces in the mean outcome of their employees. This model was adapted for the continuous secondary outcome measures (overall levels of physical activity, daily number of minutes of sedentary time and daily number of minutes of MVPA during the commute). A zero-inflated negative binomial regression model, with robust standard errors, estimated the treatment effect on the modal shift measure (number of journeys when walking was the major mode of travel). This model was adjusted for baseline modal shift, workplace size and location, with variation across participants in the total number of journeys recorded being accommodated (as an offset). In this model, variation between workplaces in the average outcome of their employees was accommodated by the robust standard errors.⁹¹

Sensitivity analyses on the primary outcome only were pre-planned to assess the impact on the primary analysis of any imbalance in baseline covariates, any non-normality in the distribution of the primary outcome missing data (through the use of multiple imputation) and different quality-assurance thresholds for accelerometer data. This last analysis included a greater number of participants in the primary analysis and so explored the influence of missing values. Prespecified subgroup analyses of the primary outcome measure explored whether or not age at baseline (above/below the median), gender (male/female) or household income (above/below £30,000) modified the intervention effect; these analyses proceeded by adding interaction terms to the regression models used in the primary analysis. The statistician was blinded while the code for analysis was developed and unblinded to run the final analysis.

Results

Recruitment and retention

Recruitment is discussed in detail in *Chapter 3*. Recruitment took place in two phases: May to July 2015 and March to May 2016. The initial intention was to recruit across three urban areas in south-west England and south Wales. However, because fewer workplaces were recruited during the first year, we included four additional urban areas in the same regions during the second year. We received 271 expressions of interest and, after screening for eligibility and giving further information about the study, we recruited 87 workplaces (*Figure 3*): 10 micro-sized, 35 small, 22 medium-sized and 20 large.

Following baseline data collection, 44 workplaces (331 participants) were randomised to receive the intervention and 43 workplaces (323 participants) were randomised to the control group (see *Figure 3*). Two workplaces (21 participants) withdrew during the 10-week intervention period: one relocated overseas, and in the other workplace the main contact indicated that they were too busy to continue with the study. A further intervention workplace (with only one participant) withdrew at the follow-up data-collection point because of a lack of interest among staff. At the 12-month follow-up, 84 workplaces (41 intervention and 43 control) and 477 employees (73% of those originally recruited to the study) took part in data-collection activities. Response rates in the control group were higher than those in the intervention group (*Tables 32 and 33*; see *Figure 3*).

Outcomes and estimation

At baseline, study participants were achieving, on average, > 50 minutes of MVPA per day (*Table 34*). At the 12-month assessment point, no increase in MVPA was observed in either the intervention group or the control group, and hence there was no evidence of an effect of the Walk to Work intervention on the

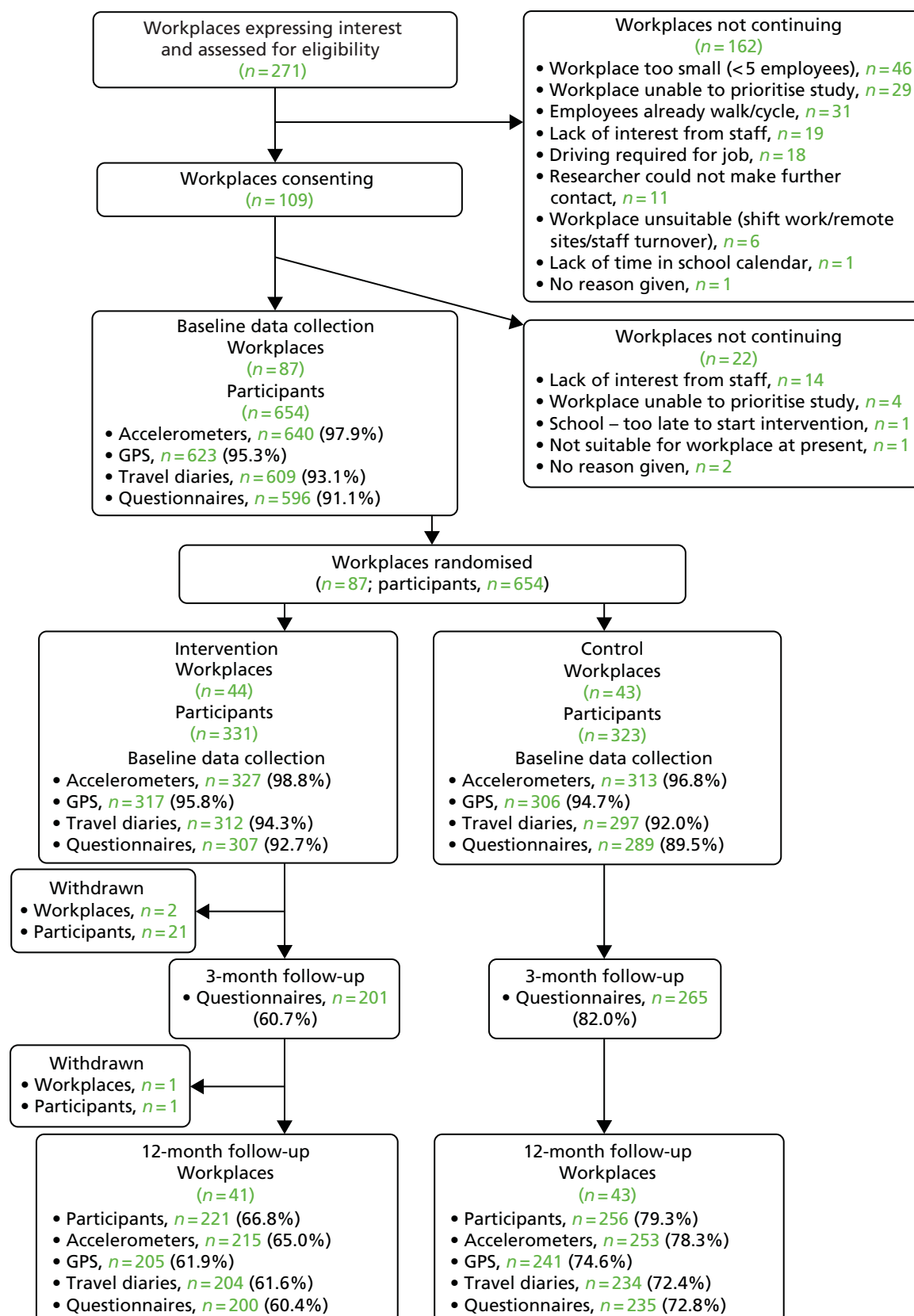


FIGURE 3 Flow of workplaces and participants through the study. This figure is reproduced from Audrey *et al.*,⁶⁹ published by BMC Public Health journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The figure includes minor additions and formatting changes to the original.

TABLE 32 Baseline characteristics of participants with complete/incomplete outcome data (*N* = 654)

Characteristics	Trial group, outcome data			
	Intervention (<i>N</i> = 331)		Control (<i>N</i> = 323)	
	Complete (<i>N</i> = 160)	Incomplete (<i>N</i> = 171)	Complete (<i>N</i> = 192)	Incomplete (<i>N</i> = 131)
Participant demographics				
Gender: male, <i>n</i> (%)	64 (40) (<i>N</i> = 160)	79 (46) (<i>N</i> = 171)	75 (39) (<i>N</i> = 192)	65 (50) (<i>N</i> = 131)
Age (years), mean (SD)	42.7 (10.1) (<i>N</i> = 160)	39.8 (12.3) (<i>N</i> = 161)	43.3 (10.9) (<i>N</i> = 191)	40.0 (11.7) (<i>N</i> = 123)
BMI category, <i>n</i> (%)				
Underweight and normal	71 (44) (<i>N</i> = 160)	78 (46) (<i>N</i> = 171)	99 (52) (<i>N</i> = 192)	45 (34) (<i>N</i> = 131)
Overweight	56 (35) (<i>N</i> = 160)	43 (25) (<i>N</i> = 171)	52 (27) (<i>N</i> = 192)	40 (31) (<i>N</i> = 131)
Obese	26 (16) (<i>N</i> = 160)	27 (16) (<i>N</i> = 171)	33 (17) (<i>N</i> = 192)	19 (15) (<i>N</i> = 131)
Missing	7 (4) (<i>N</i> = 160)	23 (13) (<i>N</i> = 171)	8 (4) (<i>N</i> = 192)	27 (21) (<i>N</i> = 131)
Household income, <i>n</i> (%)				
≤ £10,000	0 (0) (<i>N</i> = 159)	1 (1) (<i>N</i> = 154)	3 (2) (<i>N</i> = 188)	0 (0) (<i>N</i> = 117)
£10,001–20,000	8 (5) (<i>N</i> = 159)	6 (4) (<i>N</i> = 154)	10 (5) (<i>N</i> = 188)	15 (13) (<i>N</i> = 117)
£20,001–30,000	17 (11) (<i>N</i> = 159)	22 (14) (<i>N</i> = 154)	21 (11) (<i>N</i> = 188)	18 (15) (<i>N</i> = 117)
£30,001–40,000	26 (16) (<i>N</i> = 159)	25 (16) (<i>N</i> = 154)	30 (16) (<i>N</i> = 188)	19 (16) (<i>N</i> = 117)
£40,001–50,000	39 (25) (<i>N</i> = 159)	28 (18) (<i>N</i> = 154)	33 (18) (<i>N</i> = 188)	20 (17) (<i>N</i> = 117)
> £50,000	58 (36) (<i>N</i> = 159)	60 (39) (<i>N</i> = 154)	79 (42) (<i>N</i> = 188)	38 (32) (<i>N</i> = 117)
Not known	11 (7) (<i>N</i> = 159)	12 (8) (<i>N</i> = 154)	12 (6) (<i>N</i> = 188)	7 (6) (<i>N</i> = 117)
Ethnicity, <i>n</i> (%)				
White British	146 (92) (<i>N</i> = 159)	142 (90) (<i>N</i> = 158)	171 (90) (<i>N</i> = 190)	108 (90) (<i>N</i> = 120)
White other	8 (5) (<i>N</i> = 159)	7 (4) (<i>N</i> = 158)	9 (5) (<i>N</i> = 190)	5 (4) (<i>N</i> = 120)
Mixed ethnic group	1 (1) (<i>N</i> = 159)	3 (2) (<i>N</i> = 158)	0 (0) (<i>N</i> = 190)	3 (3) (<i>N</i> = 120)
Asian or British Asian	0 (0) (<i>N</i> = 159)	3 (2) (<i>N</i> = 158)	5 (3) (<i>N</i> = 190)	1 (1) (<i>N</i> = 120)
Black or black British	4 (3) (<i>N</i> = 159)	3 (2) (<i>N</i> = 158)	2 (1) (<i>N</i> = 190)	3 (3) (<i>N</i> = 120)
Chinese	0 (0) (<i>N</i> = 159)	0 (0) (<i>N</i> = 158)	3 (2) (<i>N</i> = 190)	0 (0) (<i>N</i> = 120)
Education, <i>n</i> (%)				
Higher degree, degree or equivalent	103 (65) (<i>N</i> = 158)	92 (59) (<i>N</i> = 157)	117 (62) (<i>N</i> = 190)	65 (55) (<i>N</i> = 119)
A level or equivalent	38 (24) (<i>N</i> = 158)	36 (23) (<i>N</i> = 157)	45 (24) (<i>N</i> = 190)	34 (29) (<i>N</i> = 119)
GCSE or equivalent	16 (10) (<i>N</i> = 158)	25 (16) (<i>N</i> = 157)	24 (13) (<i>N</i> = 190)	19 (16) (<i>N</i> = 119)
No formal qualifications	1 (1) (<i>N</i> = 158)	4 (3) (<i>N</i> = 157)	4 (2) (<i>N</i> = 190)	1 (1) (<i>N</i> = 119)
Current method of travel to work (by journeys), <i>n</i> (%)				
Car	106 (66) (<i>N</i> = 160)	111 (66) (<i>N</i> = 167)	124 (65) (<i>N</i> = 190)	81 (66) (<i>N</i> = 123)
Public transport	17 (11) (<i>N</i> = 160)	27 (16) (<i>N</i> = 167)	16 (8) (<i>N</i> = 190)	16 (13) (<i>N</i> = 123)
Walking	18 (11) (<i>N</i> = 160)	14 (8) (<i>N</i> = 167)	26 (14) (<i>N</i> = 190)	16 (13) (<i>N</i> = 123)
Cycling	19 (12) (<i>N</i> = 160)	15 (9) (<i>N</i> = 167)	24 (13) (<i>N</i> = 190)	10 (8) (<i>N</i> = 123)
Distance between workplace and home (km), <i>n</i> (%)				
≤ 2	22 (14) (<i>N</i> = 159)	17 (11) (<i>N</i> = 160)	14 (7) (<i>N</i> = 187)	18 (15) (<i>N</i> = 120)
> 2	137 (86) (<i>N</i> = 159)	143 (89) (<i>N</i> = 160)	173 (93) (<i>N</i> = 187)	102 (85) (<i>N</i> = 120)

continued

TABLE 32 Baseline characteristics of participants with complete/incomplete outcome data (*N* = 654) (*continued*)

Characteristics	Trial group, outcome data			
	Intervention (<i>N</i> = 331)		Control (<i>N</i> = 323)	
	Complete (<i>N</i> = 160)	Incomplete (<i>N</i> = 171)	Complete (<i>N</i> = 192)	Incomplete (<i>N</i> = 131)
Current occupation, <i>n</i> (%)				
Sedentary	122 (76) (<i>N</i> = 160)	117 (75) (<i>N</i> = 155)	150 (80) (<i>N</i> = 187)	87 (78) (<i>N</i> = 112)
Standing	31 (19) (<i>N</i> = 160)	29 (19) (<i>N</i> = 155)	26 (14) (<i>N</i> = 187)	16 (14) (<i>N</i> = 112)
Manual	7 (4) (<i>N</i> = 160)	8 (5) (<i>N</i> = 155)	11 (6) (<i>N</i> = 187)	9 (8) (<i>N</i> = 112)
Heavy manual work	0 (0) (<i>N</i> = 160)	1 (1) (<i>N</i> = 155)	0 (0) (<i>N</i> = 187)	0 (0) (<i>N</i> = 112)

A level, Advanced level; GCSE, General Certificate of Secondary Education.

Note

The *N* values in each cell are the total numbers of participants who responded to this question (those with missing values are excluded).

TABLE 33 Baseline physical activity levels and travel modes of participants with complete/incomplete outcome data (*N* = 654)

Characteristics	Trial group, outcome data			
	Intervention (<i>N</i> = 331)		Control (<i>N</i> = 323)	
	Complete	Incomplete	Complete	Incomplete
Primary outcome: daily number of minutes of MVPA, mean (SD)	55.0 (24.9) (<i>N</i> = 142)	48.2 (22.3) (<i>N</i> = 136)	57.7 (37.0) (<i>N</i> = 180)	46.1 (20.5) (<i>N</i> = 82)
Secondary outcomes, mean (SD)				
Overall physical activity (c.p.m.)	390.5 (144.2) (<i>N</i> = 142)	361.0 (140.9) (<i>N</i> = 136)	417.1 (267.4) (<i>N</i> = 180)	346.7 (126.5) (<i>N</i> = 82)
Sedentary time (minutes per day)	585.8 (63.2) (<i>N</i> = 142)	581.6 (72.0) (<i>N</i> = 135)	581.8 (79.9) (<i>N</i> = 179)	567.2 (71.8) (<i>N</i> = 82)
Daily number of minutes of MVPA during the commute	13.3 (14.6) (<i>N</i> = 142)	13.1 (13.6) (<i>N</i> = 156)	13.7 (15.1) (<i>N</i> = 174)	11.5 (13.9) (<i>N</i> = 120)
Number of journeys when walking was the major mode of travel to and from work, <i>n</i> (%)				
0	130 (81) (<i>N</i> = 160)	136 (81) (<i>N</i> = 167)	152 (80) (<i>N</i> = 190)	99 (80) (<i>N</i> = 123)
1	8 (5) (<i>N</i> = 160)	7 (4) (<i>N</i> = 167)	5 (3) (<i>N</i> = 190)	4 (3) (<i>N</i> = 123)
2	2 (1) (<i>N</i> = 160)	8 (5) (<i>N</i> = 167)	4 (2) (<i>N</i> = 190)	4 (3) (<i>N</i> = 123)
3	3 (2) (<i>N</i> = 160)	0 (0) (<i>N</i> = 167)	3 (2) (<i>N</i> = 190)	2 (2) (<i>N</i> = 123)
4	0 (0) (<i>N</i> = 160)	3 (2) (<i>N</i> = 167)	3 (2) (<i>N</i> = 190)	1 (1) (<i>N</i> = 123)
5	2 (1) (<i>N</i> = 160)	2 (1) (<i>N</i> = 167)	2 (1) (<i>N</i> = 190)	2 (2) (<i>N</i> = 123)
6	5 (3) (<i>N</i> = 160)	2 (1) (<i>N</i> = 167)	3 (2) (<i>N</i> = 190)	1 (1) (<i>N</i> = 123)
7	0 (0) (<i>N</i> = 160)	1 (1) (<i>N</i> = 167)	1 (1) (<i>N</i> = 190)	0 (0) (<i>N</i> = 123)
8	3 (2) (<i>N</i> = 160)	5 (3) (<i>N</i> = 167)	6 (3) (<i>N</i> = 190)	6 (5) (<i>N</i> = 123)
9	0 (0) (<i>N</i> = 160)	1 (1) (<i>N</i> = 167)	2 (1) (<i>N</i> = 190)	1 (1) (<i>N</i> = 123)
10	5 (3) (<i>N</i> = 160)	2 (1) (<i>N</i> = 167)	9 (5) (<i>N</i> = 190)	1 (1) (<i>N</i> = 123)
11	2 (1) (<i>N</i> = 160)	0 (0) (<i>N</i> = 167)	0 (0) (<i>N</i> = 190)	0 (0) (<i>N</i> = 123)
12	0 (0) (<i>N</i> = 160)	0 (0) (<i>N</i> = 167)	0 (0) (<i>N</i> = 190)	2 (2) (<i>N</i> = 123)

The *N* values in each cell are the total numbers of participants who responded to this question (those with missing values are excluded).

TABLE 34 Summary statistics and intervention effect estimates (intervention minus control) for primary and secondary measures of physical activity

Outcome	Trial group, mean (SD)				Adjusted difference in means ^a (95% CI)	p-value ^a
	Intervention		Control			
	Baseline	Follow-up	Baseline	Follow-up		
Primary						
1. Daily number of minutes of MVPA	55.0 (24.9) (n = 142)	53.3 (23.7) (n = 142)	57.7 (37.0) (n = 180)	53.9 (27.6) (n = 180)	0.3 (−5.3 to 5.9)	0.917
Secondary						
2. Overall physical activity (c.p.m.)	390.5 (144.2) (n = 142)	387.6 (148.5) (n = 142)	417.1 (267.4) (n = 180)	392.7 (168.8) (n = 180)	3.5 (−30.3 to 37.4)	0.838
3. Sedentary time (minutes per day)	585.5 (63.3) (n = 141)	580.0 (97.0) (n = 141)	581.9 (80.1) (n = 178)	585.4 (108.6) (n = 178)	1.0 (−11.7 to 13.6)	0.882
4. Daily number of minutes of MVPA during commute	13.9 (14.1) (n = 183)	13.8 (14.0) (n = 183)	13.3 (15.1) (n = 213)	16.2 (19.0) (n = 213)	−3.1 (−6.0 to −0.2)	0.036

^a Multilevel mixed-effect linear regression model adjusted for size, location and type of business, baseline outcome, accelerometer wear time at follow-up (for outcomes 1 and 3) and workplace as a random effect.

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primary outcome measure ($p = 0.92$) (see *Table 34*). The ICC for the primary outcome was estimated at 0.020 (95% CI 0.001 to 0.292).

Including participants with at least 1 day of valid accelerometer data, at least 2 weekdays and 1 weekend day, using data from either working days or non-working days only, or log-transforming the primary outcome data (at baseline and follow-up, to model the non-normality), in sensitivity analyses supported the same conclusion (*Table 35*). We did not carry out the multiple imputation of the primary outcome as specified in the statistical and health economics analysis plan⁸⁸ as it was clear that using at least 1 day of valid data did not change our conclusions and, therefore, it was agreed with the Trial Steering Committee that this was acceptable. We also did not further adjust our primary outcome analysis by any baseline characteristics, as there was no imbalance in these between the intervention and the control groups at baseline.

The unadjusted means of the primary outcome of daily number of minutes of MVPA and the secondary outcome of overall physical activity decreased in both the intervention group and the control group over the 12-month follow-up (see *Table 35*). There was no evidence of an effect of the intervention on these measures for any of the adjusted analyses. The unadjusted means of sedentary time increased over the 12-month follow-up in the control group but reduced in the intervention group, again with no evidence of an intervention effect. However, daily number of minutes of MVPA during the commute increased in the control group but reduced in the intervention group, with evidence of a differential effect after adjustment for covariates ($p = 0.036$). For both the intervention group and the control group, at all assessment points, the median number of journeys walked to work was 0 (interquartile range 0–0), with no evidence of an effect of the intervention on this measure ($p = 0.395$).

There was no evidence that the effect of the intervention differed between different age groups, men and women or participants with different household incomes (*Table 36*).

TABLE 35 Sensitivity analyses of the primary outcome: daily number of minutes of MVPA

Outcome	Trial group, mean (SD)				Adjusted difference in means ^a (95% CI)	p-value ^a
	Intervention		Control			
	Baseline	Follow-up	Baseline	Follow-up		
At least 1 day of valid data	52.6 (25.0) (n = 189)	51.1 (23.7) (n = 189)	55.5 (35.1) (n = 217)	52.6 (28.1) (n = 217)	−0.4 (−5.3 to 4.5)	0.876
At least 2 weekdays and 1 weekend day	53.9 (20.3) (n = 86)	54.3 (22.3) (n = 86)	59.8 (40.3) (n = 121)	56.6 (29.0) (n = 121)	1.6 (−6.5 to 9.7)	0.691
Data from working days only	55.7 (26.2) (n = 131)	51.2 (23.0) (n = 131)	54.7 (27.8) (n = 163)	51.9 (26.1) (n = 163)	−2.4 (−7.2 to 2.5)	0.339
Data from non-working days only	52.1 (28.2) (n = 87)	53.9 (29.2) (n = 87)	60.8 (46.3) (n = 121)	56.7 (40.2) (n = 121)	4.9 (−5.7 to 15.5)	0.364
Log-mean (SD)					Adjusted ratio of geometric means ^a (95% CI)	p-value ^a
Log-transformed daily number of minutes of MVPA	3.9 (0.5) (n = 142)	3.9 (0.5) (n = 142)	3.9 (0.5) (n = 179)	3.9 (0.6) (n = 179)	1.0 (0.9 to 1.1)	0.898

^a Multilevel mixed-effect linear regression model adjusted for size, location and type of business, baseline outcome, accelerometer wear time at follow-up and workplace as a random effect.

TABLE 36 Subgroup analyses of the primary outcome: daily number of minutes of MVPA

Outcome	Trial group, mean (SD)				Adjusted difference in means between control and intervention within the subgroup ^a (95% CI)	Interaction test <i>p</i> -value ^a
	Intervention		Control			
	Baseline	Follow-up	Baseline	Follow-up		
Age						
Less than the median	55.2 (23.2) (<i>n</i> = 61)	56.3 (24.7) (<i>n</i> = 61)	63.2 (46.7) (<i>n</i> = 77)	60.6 (26.8) (<i>n</i> = 77)	−1.9 (−9.8 to 6.0)	0.496
More than or equal to the median	54.9 (26.3) (<i>n</i> = 81)	51.0 (22.8) (<i>n</i> = 81)	53.6 (27.2) (<i>n</i> = 103)	48.9 (27.2) (<i>n</i> = 103)	1.6 (−5.5 to 8.6)	
Gender						
Male	58.1 (24.8) (<i>n</i> = 57)	56.4 (23.7) (<i>n</i> = 57)	61.8 (50.1) (<i>n</i> = 71)	56.0 (31.3) (<i>n</i> = 71)	1.5 (−6.8 to 9.9)	0.664
Female	53.0 (24.9) (<i>n</i> = 85)	51.1 (23.6) (<i>n</i> = 85)	55.0 (24.9) (<i>n</i> = 109)	52.6 (25.0) (<i>n</i> = 109)	−0.8 (−7.7 to 6.2)	
Household income						
≤ £30,000 or missing	52.4 (24.2) (<i>n</i> = 32)	54.4 (23.2) (<i>n</i> = 32)	54.6 (25.5) (<i>n</i> = 41)	53.8 (24.6) (<i>n</i> = 41)	2.6 (−8.3 to 13.5)	0.628
> £30,000	55.8 (25.2) (<i>n</i> = 110)	52.9 (24.0) (<i>n</i> = 110)	58.6 (39.8) (<i>n</i> = 139)	54.0 (28.5) (<i>n</i> = 139)	−0.4 (−6.6 to 5.8)	

TABLE 36 Subgroup analyses of the primary outcome: daily number of minutes of MVPA (*continued*)

Outcome	Trial group, mean (SD)				Adjusted difference in means between control and intervention within the subgroup ^a (95% CI)	Interaction test <i>p</i> -value ^a
	Intervention		Control			
	Baseline	Follow-up	Baseline	Follow-up		
Distance from work						
≤ 2 km	58.7 (26.3) (<i>n</i> = 20)	57.2 (25.4) (<i>n</i> = 20)	59.9 (22.7) (<i>n</i> = 12)	64.5 (34.0) (<i>n</i> = 12)	−6.8 (−23.2 to 9.7)	0.419
> 2 km	54.7 (24.7) (<i>n</i> = 121)	52.9 (23.4) (<i>n</i> = 121)	57.3 (38.0) (<i>n</i> = 164)	53.1 (27.1) (<i>n</i> = 164)	0.4 (−5.5 to 6.3)	

a Multilevel mixed-effect linear regression model adjusted for size, location and type of business, baseline outcome, accelerometer wear time at follow-up and workplace as a random effect.

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Summary

We conducted a robust outcome evaluation of the Walk to Work intervention in line with a prespecified statistical analysis plan. The results presented here show that the intervention was not effective in increasing participants' MVPA or in changing travel mode.

Chapter 8 Economic evaluation

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Methods

The economic evaluation is presented as a cost–consequences analysis whereby costs and consequences have been estimated but no attempt has been made to combine the results (e.g. in an incremental cost-effectiveness ratio). A broad perspective was taken, including employer, employee and health-care costs and individual well-being over the 1-year follow-up period. Given the follow-up period, discounting was not carried out.

Assessment of costs

Promoter training was conducted in the workplace. Trainer and promoter time and trainer travel costs were recorded on time sheets during the 10-week intervention period. Trainer time was costed using University of Bristol pay scales and included basic salary, National Insurance and superannuation (*Table 37*). Trainer travel costs were self-reported. If trainers travelled by car, they reported the number of miles travelled and the cost was estimated using a cost per mile of 59.9 pence.⁹² The numbers of promoters and employers and the numbers of individuals participating in the intervention at each workplace were recorded. The unit cost of promoter time was calculated by dividing the upper quartile weekly earnings by the median number of hours worked per week, as reported in the annual survey of hours and earnings.⁹³ The upper quartile was applied as some promoters were also the employer and it was believed that promoters were likely to be on a higher wage than the average worker.

The intervention resources required at each workplace included employee, employer and promoter booklets and folders, employer letters, newsletters, incident forms, poster sets, postage, optional pedometers and DVDs. Materials were printed by the University of Bristol print services, with 60% of the costs covered by Living Streets (www.livingstreets.org.uk; accessed 6 June 2018), a UK charity that promotes everyday walking. Pedometers were donated by Living Streets but were costed at £3.00 per unit in the analysis to reflect the true cost if the intervention was to be rolled out.

Health service use in the previous 4 weeks was self-reported by study participants at baseline and at the 12-month follow-up. Unit costs that were used to value health service use are presented in *Table 38*.

Primary care, including general practitioner (GP) visits, nurse visits, GP calls and nurse calls, was costed using national unit cost estimates.^{94,95} Hospital-based care was costed using *NHS Reference Costs 2015–16*.⁹⁶

TABLE 37 Staff unit costs of promoter training

Staff role	Unit cost per hour (£)
Research associate	28.16
Senior research associate	31.77
Senior research fellow	44.59
Senior lecturer	44.59
Promoter	18.39

TABLE 38 Health service unit costs

Health-care resource	Unit cost per resource (£)
Face-to-face appointment with a doctor at the GP surgery	36.00
Face-to-face appointment with a nurse at the GP surgery	14.47
Telephone consultation with a doctor at the GP surgery	27.72
Telephone consultation with a nurse at the GP surgery	11.14
Hospital accident and emergency department	137.74
Hospital outpatient appointment	116.92
Hospital admission	1243.86
Telephone call to NHS Direct/NHS 111	12.89
Out-of-hours visit	69.83
Chiropractor appointment	55.00
Osteopath appointment	42.50
Other non-hospital-based appointments	Varies by item ^{94,95}
Other hospital-based appointments	Varies by item ⁹⁶
Prescribed medication	Varies by item ⁹⁷
GP, general practitioner.	

Osteopathic and chiropractic care were costed using the NHS Choices website.^{98,99} Out-of-hours care and NHS 111/NHS Direct use were costed using published estimates.^{100,101} Admitted care and all other care reported by participants, including use of NHS 111/NHS Direct, out-of-hours care, osteopathic care and chiropractic care were grouped together under 'other care' for the analysis. All health service use was valued for the year 2016; when 2016 unit costs were not available, costs were inflated to 2016 prices using the Hospital and Community Health Services Index.⁹⁴ For five appointments in which participants were asked to provide details of other care they received, some participants reported only the type of care and not the number of appointments; for these, we assumed that the participant had one appointment. Routine dental and optician appointments and pharmacist contacts were excluded from the analysis and a few health-care items were excluded because of a lack of information on what service the participant had received. Medications were costed using the *Prescription Cost Analysis – England*.⁹⁷ When medications could not be costed because of missing information on the number of days taken, it was assumed that medications for chronic conditions and contraception were taken daily. For medications with missing information on the number of doses per day, an assumption of one dose was made. Any medications that could not be costed owing to a lack of sufficient information were excluded.

Self-assessed productivity was measured on a 10-point scale based on the extent to which health problems had affected productivity in the previous 7 days at baseline and in the previous 3 months at the post-intervention and the 12-month follow-ups: 1 indicated that health problems had no effect on an individual's work and 10 indicated that health problems had completely prevented work.¹⁰² Self-assessed lost productivity was valued using median weekly earnings,⁹³ assuming that a 1-point decrement on the scale equated to a 10% loss in productivity. Absence from work was also self-reported, whereby participants were asked to report the number of hours of work they had missed because of health problems in the previous 7 days at baseline and the number of days they had missed because of health problems in the previous 3 months at the post-intervention and the 12-month follow-ups. Lost productivity due to hours and days of missed work was also valued using median weekly earnings.⁹³

Workplaces were contacted after the 12-month follow-up and asked to report the total number of sickness absence days and the number of full-time-equivalent employees between baseline and the 12-month follow-up. The overall workplace absentee rates were estimated assuming that full-time employees have 28 days of paid annual leave per year.

Information regarding the commute was recorded for 1 week at baseline and the 12-month follow-up in a travel diary. Time spent commuting by mode of transport, daily expenses (such as bus fares) associated with the commute and occasional commuting expenses (including bus and train passes and parking permits) were all recorded. When reported commute modes and times were found to be inaccurate when compared with GPS data, diary data were replaced with GPS data. For some participants, it was observed that their commute time included time spent doing other activities (such as shopping); for these journeys, when possible, the commute time was replaced with the participant's average commute time for the given mode of transport. A cost per mile of 59.9 pence⁹² and an average speed of 23.43 miles per hour¹⁹ were used to calculate a cost per minute of driving; this was multiplied by the number of minutes of driving in order to estimate the cost of commuting by car. Costs and durations of parking permits, bus passes and train passes were used to estimate daily parking permit, bus and train costs. Car sharing was incorporated into the costs of car travel by deducting the contribution from passengers from the cost of commuting by car.

Quality of life

Scores on the ICECAP-A, a measure of well-being, were collected at baseline, post intervention and at the 12-month follow-up to capture participant well-being.⁵² ICECAP-A is a five-attribute questionnaire, with each attribute containing four levels, which range from no capability to full capability. The ICECAP-A tariff was applied to questionnaire scores to estimate participant quality of life.¹⁰³ ICECAP-A scores are anchored on 0 indicating no capability and 1 indicating full capability.

Results

Costs of intervention materials

The costs of intervention materials to deliver the intervention are provided in *Table 39*.

Cost per employer and participating employee

The costs of the intervention per workplace and employee, by workplace size, are presented in *Table 40*. Costs varied because of different numbers of promoters in each workplace and depending on the number of employees participating in the intervention at each workplace. The number of trainers delivering the promoter training and travel distance and cost also affected the overall cost. The costs per workplace and per participating employee by workplace size demonstrate that there is no clear association between employer size and cost per participating employee; this may be in part because the number of participants recruited was not consistently larger in larger workplaces.

Health service use

Table 41 provides the mean number of units and the mean cost of each service per participant, by group and by time point. There was a total of 331 participants in the intervention group and 323 participants in the control group. At baseline, the response rate varied between 88% and 91% in the intervention group and between 81% and 88% in the control group, depending on the question asked. At the 12-month follow-up, response rates, including only participants who also recorded their baseline health-care use, varied between 52% and 56% in the intervention group and between 63% and 67% in the control group. On average, the response rate was 36% lower than baseline in the intervention group and 21% lower than baseline in the control group at follow-up.

At baseline, the mean total cost of health services, including medications, in the intervention group was lower than that in the control group, at £50.43 (SD £174.64) compared with £60.61 (SD £236.81).

TABLE 39 Costs of intervention materials

Item	Number of units	Cost (£)	
		Unit	Total
Employer booklet	73	0.35	25.55
Employer folder	26	5.00	130.00
Employer letter	43	0.05	2.15
Promoter/employer folder	15	5.00	75.00
Promoter booklet	73	0.40	29.20
Promoter folder	32	5.00	160.00
Employee booklet	357	0.45	160.65
Newsletters 1, 2 and 3	993	0.05	49.65
Promoter newsletters 1, 2 and 3	144	0.05	7.20
Incident form 1	150	0.05	7.50
Incident form 2	181	0.06	10.86
Poster sets	73	2.40	175.20
Postage	482	0.54	260.28
Pedometers	331	3.00	993.00
DVDs	48	1.50	72.00
Average cost per workplace			50.19
Average cost per participating employee			6.52

TABLE 40 Promoter training costs per workplace and participating employee, by workplace size

	Costs (£)				Total per workplace	Per participating employee
	Intervention materials ^b	Promoter training				
Workplace size ^a			Training delivery ^c	Promoter ^d		
Micro	31.58	130.50	20.69	182.77	43.01	
Small	42.78	97.86	19.05	159.68	25.60	
Medium	44.55	134.19	29.12	207.86	34.01	
Large	81.40	118.98	27.59	227.96	16.03	
All	50.19	112.92	23.09	186.20	24.19	

a Size: micro, 5–9 employees; small, 10–49 employees; medium, 50–249 employees; large, ≥ 250 employees.

b The costs of intervention materials are reported by item in *Table 38*.

c Trainer costs include trainer time and travel.

d Promoter costs include promoter time spent at training.

Note

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TABLE 41 Health service use in the last 4 weeks, measured at baseline and the 12-month follow-up

Health service use	Trial group						
	Intervention			Control			Incremental difference (£) (95% CI)
	<i>n</i>	Mean number of units	Cost (£), mean (SD)	<i>n</i>	Mean number of units	Cost (£), mean (SD)	
Baseline							
GP appointment	300	0.18	6.48 (17.20)	284	0.18	6.46 (15.11)	0.02 (−2.62 to 2.65)
Nurse appointment	299	0.08	1.21 (4.18)	282	0.07	1.03 (3.72)	0.18 (−0.46 to 0.83)
GP telephone call	300	0.04	1.20 (6.09)	284	0.10	2.73 (11.56)	−1.53 (−3.02 to −0.04)
Nurse telephone call	298	0.01	0.07 (0.91)	283	0.01	0.16 (1.62)	−0.08 (−0.30 to 0.13)
A&E visit	300	0.02	2.30 (20.95)	284	0.02	2.91 (25.73)	−0.61 (−4.42 to 3.19)
Hospital outpatient visit	299	0.11	12.90 (50.39)	285	0.09	10.67 (43.67)	2.24 (−5.44 to 9.92)
Other care	298	0.16	20.18 (126.75)	279	0.12	10.04 (81.76)	10.15 (−7.42 to 27.72)
Medication	291		7.86 (57.38)	263		27.48 (198.73)	−19.62 (−43.54 to 4.29)
Total	284		50.43 (174.64)	254		60.61 (236.81)	−10.18 (−45.19 to 24.82)
12-month follow-up							
GP appointment	183 ^a	0.46	16.52 (31.28)	216 ^a	0.62	22.17 (36.84)	−5.45 (−12.17 to 1.27) ^b
Nurse appointment	181 ^a	0.33	4.80 (10.68)	215 ^a	0.27	3.84 (8.84)	0.79 (−1.10 to 2.68) ^b
GP telephone call	183 ^a	0.11	3.18 (11.37)	216 ^a	0.24	6.55 (17.43)	−3.06 (−5.94 to −0.18) ^b
Nurse telephone call	181 ^a	0.03	0.37 (2.00)	216 ^a	0.04	0.41 (2.37)	−0.04 (−0.48 to 0.39) ^b
A&E visit	184 ^a	0.06	8.23 (35.77)	215 ^a	0.07	8.97 (41.14)	0.16 (−7.35 to 7.67) ^b
Hospital outpatient visit	180 ^a	0.36	41.57 (136.85)	215 ^a	0.46	53.84 (191.71)	−11.67 (−45.13 to 21.80) ^b
Other care	178 ^a	0.43	68.47 (264.84)	212 ^a	0.35	34.64 (151.26)	33.93 (−8.25 to 76.10) ^b
Medication	173 ^a		13.20 (99.08)	202 ^a		18.83 (123.55)	2.20 (−17.64 to 22.04) ^b
Total ^c	158 ^a		139.75 (372.56)	191 ^a		140.51 (339.55)	23.19 (−56.09 to 102.47) ^b
A&E, accident and emergency.							
a Including only participants who have complete variables for adjustment.							
b Adjusted for baseline value.							
c Adjusted for baseline value, workplace size, workplace location, workplace type and workplace as a random effect.							

At the 12-month follow-up, the mean cost of health service use was similar in both arms, at £139.75 (SD £372.56) in the intervention group and £140.51 (SD £339.55) in the control group. The adjusted incremental difference of £23.19 (95% CI −£56.09 to £102.47) at the 12-month follow-up was not statistically significantly different from zero.

Commute

A summary of the commute data is presented in *Table 42*. At baseline, 90% of the intervention participants and 90% of the control participants provided information on their weekly commute to and from work. This information was provided at both baseline and the 12-month follow-up for 56% of the intervention participants and 65% of the control participants.

TABLE 42 Average daily commute by mode of transport

Mode of Transport	Trial group, mean (SD) daily number of minutes		
	Intervention (N = 299)	Control (N = 290)	Incremental difference (95% CI)
Baseline	n = 187^a	n = 211^a	
Walking	11.69 (16.90)	10.46 (17.28)	1.23 (–1.54 to 4.00)
Cycling	6.75 (20.84)	6.39 (15.22)	0.35 (–2.61 to 3.31)
Bus	5.32 (15.06)	5.74 (16.25)	–0.42 (–2.96 to 2.11)
Train	6.24 (21.61)	4.97 (17.46)	1.27 (–1.91 to 4.46)
Car	39.55 (36.84)	41.31 (35.08)	–1.75 (–7.58 to 4.07)
Other	1.27 (6.87)	1.05 (5.12)	0.21 (–0.77 to 1.20)
Inactive travel ^b	52.38 (45.35)	53.07 (39.66)	–0.69 (–7.59 to 6.21)
Total	70.82 (50.50)	69.93 (42.69)	0.89 (–6.69 to 8.47)
Follow-up	n = 187^a	n = 211^a	
Walking	11.49 (19.63)	12.92 (21.62)	–2.15 (–5.46 to 1.15) ^c
Cycling	6.37 (18.03)	7.37 (17.53)	–0.69 (–3.67 to 2.29) ^c
Bus	3.13 (10.04)	4.87 (13.77)	–1.45 (–3.48 to 0.58) ^c
Train	4.72 (18.98)	7.14 (23.83)	–1.44 (–4.95 to 2.07) ^c
Car	34.56 (31.06)	39.70 (35.84)	–2.09 (–6.63 to 2.45) ^c
Other	0.62 (3.12)	1.56 (7.48)	–0.94 (–2.10 to 0.22) ^c
Inactive travel ^b	43.03 (35.46)	53.27 (47.75)	–6.03 (–12.98 to 0.93) ^c
Total	60.90 (41.48)	73.56 (57.40)	–9.17 (–18.05 to –0.28) ^c
a Including only participants for whom we have complete variables for adjustment.			
b Inactive travel includes bus, train, car and other travel.			
c Adjusted for baseline value.			

At baseline, the average daily time of commuting to work was similar between groups, at approximately 71 and 70 minutes for the intervention and the control groups, respectively. At the 12-month follow-up, there was a trend for a lower total daily mean commute time in the intervention group [60.90 minutes (SD 41.48 minutes)] than in the control group [73.56 minutes (SD 57.40 minutes)], with an adjusted incremental difference of –9.17 minutes (95% CI –18.05 to –0.28 minutes).

The percentage of participants with complete information available for costing was 78% of the intervention group and 72% of the control group at baseline. This number dropped at the 12-month follow-up, with 42% of the intervention participants and 41% of the control participants with complete information available for costing. As shown in *Table 43*, at baseline the mean daily commuting cost was £11.03 (SD £9.74) in the intervention group and £11.37 (SD £10.21) in the control group. At the 12-month follow-up, the mean daily commuting cost was £9.32 (SD £7.67) in the intervention group and £10.99 (SD £12.19) in the control group. The adjusted incremental difference at follow-up was £1.15 (95% CI –£3.10 to £0.79).

Productivity

Response rates to the questions on self-rated productivity and absenteeism declined over the study period (*Table 44*). At baseline, approximately 89% of participants in the intervention group and 88% of participants in the control group answered these questions. At the 12-month follow-up, response rates had fallen to approximately 59% in the intervention group and 72% in the control group.

TABLE 43 Average total daily commuting cost at baseline and the 12-month follow-up

	Trial group, mean (SD) daily cost				
Costs	Intervention		Control		Incremental difference (95% CI)
Baseline	n = 259		n = 233		
Daily commuting cost	£11.03	(£9.74)	£11.37	(£10.21)	–£0.34 (–£2.11 to £1.43)
12-month follow-up	n = 140^a		n = 131^a		
Daily commuting cost	£9.32	(£7.67)	£10.99	(£12.19)	–£1.15 (–£3.10 to £0.79) ^b

^a Including only participants for whom we have complete variables for adjustment.

^b Based on a repeated-measures analysis that was adjusted for time point as a categorical variable, baseline commuting cost, workplace size, workplace location, workplace type and workplace as a random effect.

TABLE 44 Productivity results

Productivity	Trial group						Incremental difference in wages lost (£) (95% CI)
	Intervention (N = 331)			Control (N = 323)			
	n	Mean number of units	Value of wages lost (£), mean (SD) ^a	n	Mean number of units	Value of wages lost (£), mean (SD) ^a	
Self-assessed productivity							
Post intervention	200	2.23	701.32 (1067.41)	263	2.56	891.04 (1238.79)	–189.72 (–405.04 to 25.60)
Follow-up	195	2.26	719.30 (1041.80)	231	2.85	1056.44 (1397.15)	–337.13 (–575.53 to –98.73)
Average of post-intervention and follow-up differences ^b							–231.35 (–424.77 to –37.92)
Self-reported number of days of work missed							
Post intervention	199	1.01	88.16 (245.15)	262	1.44	126.39 (449.57)	–38.23 (–107.58 to 31.12)
Follow-up	194	2.01	176.57 (536.05)	232	1.71	149.92 (401.70)	26.65 (–62.78 to 116.08)
Average of post-intervention and follow-up differences ^b							–12.50 (–84.34 to 59.33)

a Mean value of wages lost in the previous week at baseline and in the previous 3 months post intervention and at follow-up, based on median weekly earnings of £438.60.

b Based on a repeated-measures analysis that was adjusted for time point as a categorical variable, baseline value, workplace size, workplace location, workplace type and workplace as a random effect.

At baseline, the mean productivity score in both the intervention group and the control group was low [1.77 (SD 1.47) and 2.02 (SD 1.83), respectively], suggesting a low self-perceived impact of health on productivity. Productivity scores were slightly lower (better) in the intervention group than in the control group at the 12-month follow-up [2.26 (SD 1.83) and 2.85 (SD 2.45), respectively]. When converted to lost wages, on average, the control participants lost more wages than the intervention participants did [£1056.44 (SD £1397.15) and £719.30 (SD £1041.80), respectively], with a difference in wages of –£231 (95% CI –£424.77 to –£37.92) based on a repeated-measures analysis.

The average number of hours missed from work because of health problems was slightly higher in the control group at baseline, at 0.60 hours (SD 3.48 hours) compared with 0.45 hours (SD 2.36 hours) in the intervention group. Immediately post intervention, the mean number of days missed was higher in the control group, at 1.44 days (SD 5.13 days) than 1.01 days (SD 2.79 days) in the intervention group. At the 12-month follow-up, the mean number of days was higher in the intervention group [2.01 days (SD 6.11 days)] than in the control group [1.71 days (SD 4.58 days)]. Conversion into wages suggested that the intervention participants lost, on average, more wages than the control participants (£176.57 (SD £536.05) and £149.92 (SD £401.70), respectively); however, this result was not statistically significant (mean -£12.50, 95% CI -£84.34 to £59.33).

Data required to estimate overall workplace absentee rates were reported by 15 intervention and 13 control workplaces. The average overall workplace absentee rate between baseline and the 12-month follow-up was 1.68% in intervention workplaces and 2.91% in control workplaces.

Quality of life

At baseline, 90% of the intervention participants and 88% of the control participants completed the ICECAP-A questions. For both trial arms, the percentage reduced over the follow-up period; however, the reduction was larger in the intervention group, with 59% of the intervention participants and 82% of the control participants answering the ICECAP-A questions at the 12-month follow-up.

The ICECAP-A scores, presented in *Table 45*, were similar between trial arms at baseline, with the mean intervention score being 0.839 (SD 0.133) and the mean control score being 0.831 (SD 0.136). A repeated-measures analysis suggests that the mean ICECAP-A score in the intervention group was higher than that in the control group over the follow-up period (mean 0.018, 95% CI 0.000 to 0.036; scores anchored at 0 indicated 'no capability' and scores anchored at 1 indicated 'full capability').

Summary

On average, the Walk to Work intervention cost £186.20 per workplace and £24.19 per participating employee, representing a relatively inexpensive and 'light-touch' intervention for employers to adopt. Participants in the intervention group had better self-rated productivity and well-being scores over the 12-month follow-up period; however, the small differences and higher loss to follow-up in the intervention group caution against overinterpreting these findings.

TABLE 45 Quality of life as measured by ICECAP-A, by intervention group

Time point	Trial group				Incremental difference (95% CI)
	Intervention (N = 331)		Control (N = 323)		
	n	Score, mean (SD)	n	Score, mean (SD)	
Baseline	298	0.839 (0.133)	284	0.831 (0.136)	0.008 (−0.014 to 0.030)
Post intervention	197	0.852 (0.136)	264	0.825 (0.143)	0.027 (0.001 to 0.053)
Follow-up	196	0.840 (0.134)	228	0.823 (0.152)	0.017 (−0.010 to 0.045)
Average of post-intervention and follow-up differences ^a					0.018 (0.000 to 0.036)
^a Based on a repeated-measures analysis that was adjusted for time point as a categorical variable, baseline value, workplace size, workplace location, workplace type and workplace as a random effect.					

Chapter 9 Discussion

Main findings

Recruitment and retention

Recruitment took place in two phases, during May to July 2015 and March to May 2016, across seven urban areas in south-west England and south Wales. Information sheets with invitations for expressions of interest were sent to approximately 9800 workplace addresses. We received 271 expressions of interest and 87 workplaces were recruited (10 micro-sized, 35 small, 22 medium-sized and 20 large workplaces) involving 654 participants. Following baseline data collection, 44 workplaces were randomised to receive the intervention and 43 workplaces were randomised to the control group. At the 12-month follow-up, 84 workplaces (41 intervention and 43 control) and 477 employees (73% of those originally recruited to the study) took part in data-collection activities. Response rates in the control group were higher than those in the intervention group at the 12-month follow-up.

Baseline characteristics and physical activity

In line with other studies reporting objective measures of physical activity,^{104–106} a low proportion of participants in our study ($\approx 11\%$) met current physical activity recommendations of ≥ 150 minutes of MVPA per week in bouts of ≥ 10 minutes.¹ Compared with car users, walkers and public transport users accrued substantially higher levels of daily MVPA during the commute. The absence of free workplace car parking was independently related to walking to work and using public transport. Shorter commuting distances were also related to walking to work, and public transport users were less likely to combine their commute with caring responsibilities.

Intervention delivery

Of the 44 workplaces that were randomised to receive the intervention, two workplaces withdrew during the intervention. A total of 37 workplaces identified a Walk to Work promoter who received training and materials to undertake the role; however, five workplaces were unable to identify a Walk to Work promoter and the local researcher took on the role of distributing intervention materials to participating employees. All employers in the intervention group were provided with booklets and posters encouraging them to support the intervention.

Process evaluation

Descriptive statistics from the process evaluation suggested that a majority of participants in the intervention group were aware of the Walk to Work promoters in their workplace. Employers' support for the intervention tended to focus on the provision of information rather than initiatives with a higher cost or requiring organisational change, such as improved washing and changing facilities, changes to parking arrangements, incentives to walk during the commute or subsidised sustainable transport initiatives. Key factors influencing whether or not participants increased walking during the commute were identified through the behavioural questionnaires and qualitative interviews, and included commuting distance and workplace location; the availability, reliability and cost of alternatives to private car use; and caring responsibilities, especially child care.

Outcome evaluation

At the 12-month follow-up, we found no effect on the participants' MVPA levels, overall physical activity or travel mode. There was no evidence that the effect of the intervention differed between different age groups, males and females or participants with different household incomes.

Economic evaluation

On average, the Walk to Work intervention cost £186.20 per workplace and £24.19 per participating employee, representing a relatively inexpensive intervention for employers to adopt. There was weak

evidence that self-rated productivity and well-being scores were better in the intervention group than in the control group over the 12-month follow-up period. However, the small differences, the lack of improvement in MVPA and active commuting and the higher loss to follow-up in the intervention group caution against overinterpreting these findings.

Limitations and strengths

Recruitment

Although the target for workplace recruitment was achieved, this was after a large mailout to workplaces across seven urban areas. It was not possible to check if all workplaces on the lists were extant, if addresses and contact details were accurate and if the information reached someone with the authority to make a decision on study participation. However, with only 271 responses from > 9000 letters, we can conclude that the study, which was clearly related to workplace travel behaviour with an emphasis on changing travel mode to increase walking, was not of interest to the majority of employers. Furthermore, there was a relatively low cluster size, even within larger workplaces.

Baseline characteristics and physical activity

There are some notable strengths of this study. To our knowledge, this is the largest study that has combined robust, objectively measured data derived from accelerometer and GPS devices to identify characteristics associated with physical activity and walking as the main mode of travel to work. Data were collected over a relatively short period of time (May to July 2015 and March to May 2016) to minimise the effect of seasonality on physical activity and travel behaviours. In this study, 65% and 11% of the study participants were categorised as car users and walkers, respectively. Similarly, findings from the *National Travel Survey: England 2016* showed that 64% and 11% of commute journeys were made by car and walking, respectively.¹⁹ This suggests that the findings we report are similar to national patterns of commuting behaviour and could be more widely generalisable. However, as analyses were undertaken on cross-sectional data, we are unable to establish causal relationships between the variables of interest. We used perceptions of the commute environment, rather than objectively quantified characteristics of the environment through a GIS. Participants of the study were relatively young, predominantly well-educated and employed in sedentary occupations. Therefore, the findings may not be applicable to a population with different characteristics.

Process evaluation

The promoters all received the Walk to Work training session and DVD, booklets and resources relevant to their role and four newsletters during the intervention period. However, they were encouraged to deliver the intervention to colleagues in a way that suited their workplace routines. This model was relatively cheap to deliver, as shown by the economic evaluation, but leaves room for variation and uncertainty about fidelity and reach. On the other hand, the results may be more relevant to a 'real-world' situation than an intervention that is highly monitored throughout and is therefore more likely to accrue Hawthorne effects.

The post-intervention questionnaires sent to all study participants, which included questions about interventions relating to travel to work, had noticeably higher non-response rates in the intervention group than in the control group. It is not clear why this is the case; it may relate to the additional participant burden in the intervention group, as these participants had just come to the end of a 10-week intervention, or it may be that there was a reluctance among participants in the intervention group to confirm that they, or the Walk to Work promoter, had not engaged with the intervention in their workplace. A strength of the process evaluation is the number of interviews ($n = 70$) with employers, Walk to Work promoters and employees. This has provided a substantial data set that has provided additional understanding of some of the statistical findings and will be subject to detailed future analyses.

Outcome evaluation

The use of objective measures, and a 12-month follow-up period, contribute valuable evidence for those who have called for greater rigour in assessing the effectiveness of physical activity interventions,^{26,28} and interventions aiming to change the travel mode of commuters.²⁵ It would have been interesting to collect these objective measures immediately post intervention to assess whether or not there was an immediate impact of the intervention on physical activity and commuting behaviour, and the response rate may have been higher. However, this would have increased the burden on research participants and would not have addressed the important concern that long-term follow-up has been identified as a weakness in other studies.

The study included workplaces in geographically distinct areas and of different sizes and industrial classifications, which might add to its generalisability. However, it should be noted that participants were predominantly educated to degree level and with a household income above the national average. It might be thought that study participants were fairly active with a baseline mean daily number of minutes of MVPA of > 50 minutes; however, this was largely not achieved in the recommended bouts of ≥ 10 minutes. Furthermore, there are concerns that feedback from activity monitors is not easily reconciled with current physical activity recommendations because the guidelines refer to the amount of activity required on top of normal activities.¹⁰⁷

Missing data

Three workplaces, all randomised to the intervention group, did not continue with the study. The loss of these workplaces contributed to a higher response rate in the control group at the 12-month follow-up than in the intervention group, but does not completely explain the difference observed. In the intervention group, 142 out of 331 participants (43%) provided a measure of the primary outcome; in the control group, 180 out of 323 participants (56%) provided that measure. The number of missing data is disappointing, and the reasons are unclear. It may be that the interest in the research, and especially the novelty of wearing the monitors, decreased over the 12-month period. At the follow-up data collection point, 477 participants (73%) were still involved with the study and returned some data (questionnaire, travel diary, accelerometer or GPS data). However, it may be that those who had not changed their travel behaviour were less inclined to have this confirmed by wearing the monitors. Moreover, the waist-worn accelerometer involves a research burden for the participants: it is usually worn on an elastic belt (as was the case with our study) and requires a degree of commitment to remember to put it on at the beginning of the day and to wear it for ≥ 10 hours, especially if a change of clothes is required when arriving home.

Although this low response rate is clearly a limitation to the strength of conclusions that can be drawn, we do not believe that the missing measurements cause the study results to be misleading. If the lower completion rate in the intervention group was due to some individuals who did not benefit from the intervention not wanting to have their physical activity assessed, had these participants provided outcome data it would have been in line with the same conclusion of no intervention effect. Furthermore, measuring the primary outcome for all participants who provided 1 day or more of accelerometer data (rather than 3 days or more) provided an outcome measure for 189 out of 331 participants (57%) in the intervention group and 217 out of 323 participants (67%) in the control group; repeating the analysis with these data led to the same conclusion of no effect of the intervention.

Measuring physical activity

The primary outcome of the Travel to Work study was compromised by missing data at the 12-month follow-up and this may have related to the burden of wearing waist-worn accelerometers in free-living conditions. Wrist-worn monitors are easier to wear and may increase compliance.¹⁰⁸ At the outset of this study, wrist-worn accelerometry was evolving and we wished to use an established technology so that we could relate the findings to other studies. Research suggests that the results from wrist-worn accelerometers differ from waist-worn accelerometers, with the wrist attachment producing a higher average step count than the waist attachment in free-living conditions.¹⁰⁹ A study comparing the wrist-worn Fitbit Flex (Fitbit, San Francisco, CA, USA) and waist-worn ActiGraph wGT3X-BT (ActiGraph, Pensacola, FL, USA) in free-living

adults found that the Fitbit Flex and ActiGraph respectively classified 51.5% and 37.5% of the days as active.¹¹⁰ Clearly, caution is needed in the choice of instrument used to measure physical activity in free-living conditions. The potential of wrist-worn devices to collect more data over a longer period of time and in larger samples is obviously attractive to researchers and health professionals. However, more work needs to be done to examine the accuracy of wrist-worn devices in measuring walking-related physical activity.

Economic evaluation

There was a high percentage of missing health economic data, in particular for commuting costs: at the 12-month follow-up, costs could only be estimated for 42% of the intervention participants and 41% of the control participants. To estimate daily commuting costs, participants were required to record complete times and costs for each work day at baseline and follow-up. It was evident that some participants reported details of bus and train costs in multiple places in the travel diary; when possible, this information was included only once. When possible, fuel and parking permit costs were excluded from daily costs as these costs were also recorded elsewhere in the diaries. Some participants reported that they were reimbursed for travel costs by their employer, but these costs were still included in the analyses. Some missing information was observed in the medication section of the questionnaire; as a result, some medications could not be costed and were not included. Consequently, the medication cost for these participants is an underestimate. Although we could have used multiple imputation to impute missing data and obtain estimates for all participants, given that no evidence of an intervention effect was observed, imputation was not conducted as it would not have altered the conclusion.

Conclusions

Recruitment

Overall, it can be concluded that a large proportion of workplaces that were sent information about the study were unwilling or unable to participate. This would suggest that active travel interventions may need to be carefully targeted at workplaces. Issues such as the location of the workplace, the type of business activities, working hours and the availability and reliability of public transport are important factors to be taken into consideration.

Two decisions taken by the research team may have restricted workplace recruitment and employee participation in the intervention. The first relates to the size of workplaces. The research team decided that workplaces with fewer than five employees would be ineligible. This was because of the increased cost of delivering the intervention to only one or two people. However, in the UK in 2014, micro-sized businesses (0–9 employees) accounted for 96% of all businesses and 33% of all employees,⁸⁷ and so a large pool of workplaces were ineligible for the intervention.

The second issue relates to the distance between where the study participants lived and their workplaces. The original feasibility study,⁴⁹ which was not powered to provide evidence of effectiveness, had nevertheless shown some promise that the intervention might have an effect. However, the feasibility study had initially focused on recruiting employees who lived within 2 miles of their workplace. After discussion within the team, it was felt that this might have been an unnecessary restriction, making recruitment difficult and failing to reach people who might be willing to increase walking as part of a mixed-mode journey. For the current study, the baseline statistical analyses and qualitative analyses of interview transcripts suggest that commuting distance is a critical factor in whether or not people walk during the commute. Focusing on those who live within walking distance of their workplace but who do not currently walk to work may narrow the field of participants but may increase the likelihood of success in changing travel mode.

Changing travel mode

Our findings suggest that workplace-based interventions focusing on travel mode are more likely to be of interest to 'motivated subgroups', as Ogilvie *et al.*²⁴ also suggest, rather than a broad spectrum of workplaces and employees. It is worth noting that 89% of participants in our study lived > 2 km from their place of work

and, to increase walking during the commute, mixed-mode travel would be more feasible than walking the whole route. Our findings indicate that such a change is likely to be influenced by the availability, cost, convenience and reliability of public transport. The analyses of the baseline data in *Chapter 4* indicate that other contextual factors, such as the location of the workplace and the availability of car parking, influence travel mode.^{76,111} In addition, interventions may be more effective when they coincide with naturally occurring disruption in travel habits,¹¹² such as moving house, changing employment or reductions in workplace parking, suggesting that tailoring the timing or target group of travel mode interventions in accordance with the wider context could also be an important factor in their impact.

Implications for policy and practice

We have shown that walking to work, either the whole route or combined with public transport, is an important contributor to objectively measured physical activity levels in a large sample of adult employees recruited from diverse workplaces and settings in the UK. We believe that the picture is sufficiently clear to assert that supporting walking during the daily commute (either as the main mode or as part of a mixed-mode journey) should be a priority for both transport and public health disciplines. However, interventions to increase walking to work should take into account the wider determinants of commuting behaviour. Our research suggests that, at organisational and policy levels, consideration needs to focus on commuting distances, availability of car parking and the availability of convenient and reliable public transport. Our findings support the argument that attention should be directed towards a systems approach that focuses on interactions between the correlates of physical inactivity, rather than BCTs focusing on individuals.¹¹³

Previous qualitative research has suggested that child-care commitments may restrict choice of travel mode for the commute.^{114,115} Within our sample of employees, we found that child-care commitments were perceived as an important reason why participants were unable to change travel mode from private car use. This was particularly evident in relation to the reliability, frequency and timing of public transport, suggesting that employees with caring responsibilities may require greater flexibility in their working hours if they are to be encouraged to use public transport.

We found that walking and public transport use were both positively associated with a lack of free car parking at work. The removal of this 'perk' is unlikely to be popular with employees who value driving to work. Previous qualitative research has suggested that, where removing parking might be perceived as punitive, employers would prefer this to be imposed from outside the workplace.⁴⁹ This might, for example, be a directive from a more distant 'head office' or because of policies imposed by the local or national government.

In other UK-based studies, a short distance to the workplace^{75,76,116} and a lack of on-site car parking^{84,112,117} have been shown to act as facilitators of walking travel modes. In the current study, the majority of participants had a commute distance of > 2 km ($n = 555$, 84.8%). Therefore, switching to walking as the main mode of travel to work may not have been feasible for many of our study population. However, a mixed-mode commute, combining walking with public transport, may be possible. A case study of 20 UK workplaces showed that limiting parking, by either introducing parking charges or reducing the number of spaces available, and providing payments for public transport users were critical factors contributing to decreased car use.¹¹⁸ The implementation of workplace policies to limit or charge for workplace car parking, while offering subsidies for public transport, may make modes of travel other than a car more appealing. Providing, or subsidising, car parking away from city-centre workplaces, to enable and encourage employees to park and walk, may be a more palatable option for employees than the removal of parking 'perks' altogether, and may be attractive to employers if it proves to be cheaper than the provision of city-centre parking.

In our study, although univariable analyses suggested that walkers and public transport users had more positive perceptions of their commute environment than car users, there was no evidence of a difference after adjustment for other variables. As we did not objectively quantify characteristics of the environment through GIS-based measures, we cannot eliminate physical differences in participants' commute

environments. Our qualitative data suggest that concerns about the walking environment may be a deterrent to walking. However, Guell *et al.*¹¹⁹ suggest that some participants will walk despite adverse environmental conditions, having overcome the issue through experience or weighing up the perceived benefits and costs. In the UK, nationwide construction of walking and cycling routes has been shown to be associated with increased physical activity levels and walking and cycling as modes of travel.^{120,121} However, distance to the infrastructure was identified as a mediating factor, suggesting that fragmented improvements to infrastructure may not be sufficient to bring about behaviour changes.¹²²

Recommendations for future research

We believe that there is sufficient reliable evidence to show that walking to work, or incorporating walking into a mixed-mode commute, can enable working adults to build physical activity into their daily routine and meet the physical activity recommendations. We would also argue that there is sufficient evidence to suggest that focusing on individual behaviour change has limited capacity to change travel mode at the population level.

We would recommend that future research considers targeted interventions for particular subgroups (e.g. employees with good public transport links between their workplace and home and employees wanting to increase physical activity for health reasons), interventions that address specific barriers that have been identified in this and other research (e.g. employees with caring responsibilities) and interventions that operate at organisational, environmental and policy levels (e.g. reductions in car parking and improvements to pedestrian routes). Some of the environmental and policy research may be more suited to evaluation as high-quality natural experiments rather than in RCTs.

Some areas for future research to encourage active travel include the acceptability, impact and cost-effectiveness of interventions relating to the reduction or relocation of workplace parking, examining the links between the school run and the commute to work, the effectiveness and cost-effectiveness of targeting travel-to-work interventions at micro-sized workplaces and the impact of infrastructure changes to the walking environment on travel mode.

Future work

The current study has a comprehensive dissemination plan, including publications and presentations to academics, practitioners and policy-makers. This focuses on analysing both the statistical and the qualitative data to (1) further interpret and explain the results relating to physical activity and travel mode, (2) examine contextual issues and (3) explore the wider determinants of workplace travel behaviour.

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Contributions of authors

Dr Suzanne Audrey (Senior Research Fellow in Public Health) was principal investigator and lead qualitative researcher, and drafted *Chapters 1, 3–5* and *9*.

Dr Harriet Fisher (Senior Research Associate in Mixed Methods) was the lead researcher on physical activity measurement, drafted *Chapter 4* and contributed analyses for *Chapter 6*.

Professor Ashley Cooper (Physical Activity and Public Health) led the physical activity measurement and contributed to the analyses for *Chapters 4* and *7*.

Ms Daisy Gaunt (Senior Research Associate in Medical Statistics) conducted the statistical analyses of the outcome data, contributed to *Chapter 2* and drafted *Chapter 7*.

Professor Chris Metcalfe (Medical Statistics) led the outcome evaluation and contributed to *Chapters 2* and *7*.

Ms Kirsty Garfield (Research Associate in Health Economics) analysed the health economic data and drafted *Chapter 8*.

Professor William Hollingworth (Health Economics) led the economic evaluation and contributed to *Chapters 2* and *8*.

Dr Sunita Procter (Trial Manager) co-ordinated the study activities and contributed to *Chapters 1* and *5*.

Dr Marie Gabe-Walters (Research Fellow) was the lead researcher in Swansea.

Dr Sarah Rodgers (Associate Professor) led the study at the Swansea University.

Dr Fiona Gillison (Senior Lecturer in Exercise and Health Psychology) led the study at the University of Bath.

Dr Adrian Davis (Visiting Professor and Independent Consultant in Health and Transport) contributed expertise in transport and health.

Mr Philip Insall (Lead Consultant at Insall & Coe) contributed lay expertise in active and sustainable transport.

All authors contributed to the design and conduct of the study.

Publications

Travel to Work: randomised controlled trial

Audrey S, Cooper A, Hollingworth W, Metcalfe C, Procter S, Davis A, *et al.* Study protocol: the effectiveness and cost effectiveness of an employer-led intervention to increase walking during the daily commute: the Travel to Work randomised controlled trial. *BMC Public Health* 2015;**15**:154.

Batista Ferrer H, Cooper A, Audrey S. Associations of mode of travel to work with physical activity, and individual, interpersonal, organisational, and environmental characteristics. *J Transp Health* 2018;**9**:45–55.

Audrey S, Fisher H, Cooper A, Gaunt D, Garfield K, Metcalfe C, *et al.* Evaluation of an intervention to promote walking during the commute to work: a cluster randomised controlled trial. *BMC Public Health* 2019;**19**:427.

Walk to Work: feasibility study

Audrey S, Procter S, Cooper AR. The contribution of walking to work to adult physical activity levels: a cross sectional study. *Int J Behav Nutr Phys Act* 2014;**11**:37.

Procter S, Mutrie N, Davis A, Audrey S. Participants' views of using behaviour change techniques to encourage walking to work: a qualitative study. *BMC Public Health* 2014;**14**:868.

Audrey S, Procter S, Cooper A, Mutrie N, Hollingworth W, Davis A, *et al.* Employer schemes to encourage walking to work: feasibility study incorporating an exploratory randomised controlled trial. *Public Health Res* 2015;**3**(4).

Audrey S, Procter S. Employers' views of promoting walking to work: a qualitative study. *Int J Behav Nutr Phys Act* 2015;**12**:12.

Data-sharing statement

All data requests should be submitted to the corresponding author for consideration. Access to available anonymised data may be granted following review.

References

1. Department of Health and Social Care. *Start Active, Stay Active. A Report on Physical Activity for Health From the Four Home Countries*. London: Chief Medical Officer; 2011. URL: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/216370/dh_128210.pdf (accessed 6 June 2018).
2. Lee IM, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT, Lancet Physical Activity Series Working Group. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet* 2012;**380**:219–29. [https://doi.org/10.1016/S0140-6736\(12\)61031-9](https://doi.org/10.1016/S0140-6736(12)61031-9)
3. Department of Health and Social Care. *UK Physical Activity Guidelines*. London: Chief Medical Office; 2011.
4. World Health Organization (WHO). *Global Recommendations on Physical Activity for Health*. Geneva: WHO; 2010.
5. Public Health England. *6 Million Adults do not do a Monthly Brisk 10 Minute Walk*. GOV.UK; 2017. URL: www.gov.uk/government/news/6-million-adults-do-not-do-a-monthly-brisk-10-minute-walk (accessed 6 June 2018).
6. Hallal PC, Andersen LB, Bull FC, Guthold R, Haskell W, Ekelund U, Lancet Physical Activity Series Working Group. Global physical activity levels: surveillance progress, pitfalls, and prospects. *Lancet* 2012;**380**:247–57. [https://doi.org/10.1016/S0140-6736\(12\)60646-1](https://doi.org/10.1016/S0140-6736(12)60646-1)
7. Department of Health and Social Care (DHSC). *Be Active, Be Healthy: A Plan for Getting the Nation Moving*. London: DHSC; 2009.
8. Wilmut EG, Edwardson CL, Achana FA, Davies MJ, Gorely T, Gray LJ, *et al*. Sedentary time in adults and the association with diabetes, cardiovascular disease and death: systematic review and meta-analysis. *Diabetologia* 2012;**55**:2895–905. <https://doi.org/10.1007/s00125-012-2677-z>
9. Jeon CY, Lokken RP, Hu FB, van Dam RM. Physical activity of moderate intensity and risk of type 2 diabetes: a systematic review. *Diabetes Care* 2007;**30**:744–52. <https://doi.org/10.2337/dc06-1842>
10. Kelly P, Kahlmeier S, Götschi T, Orsini N, Richards J, Roberts N, *et al*. Systematic review and meta-analysis of reduction in all-cause mortality from walking and cycling and shape of dose response relationship. *Int J Behav Nutr Phys Act* 2014;**11**:132. <https://doi.org/10.1186/s12966-014-0132-x>
11. Saunders LE, Green JM, Petticrew MP, Steinbach R, Roberts H. What are the health benefits of active travel? A systematic review of trials and cohort studies. *PLOS ONE* 2013;**8**:e69912. <https://doi.org/10.1371/journal.pone.0069912>
12. Rissel C, Curac N, Greenaway M, Bauman A. Physical activity associated with public transport use – a review and modelling of potential benefits. *Int J Environ Res Public Health* 2012;**9**:2454–78. <https://doi.org/10.3390/ijerph9072454>
13. Morris JN, Hardman AE. Walking to health. *Sports Med* 1997;**23**:306–32.
14. Ainsworth BE, Haskell WL, Whitt MC, Irwin ML, Swartz AM, Strath SJ, *et al*. Compendium of physical activities: an update of activity codes and MET intensities. *Med Sci Sports Exerc* 2000;**32**(Suppl. 9):498–504. <https://doi.org/10.1097/00005768-200009001-00009>
15. Scottish Executive. *A Walking Strategy for Scotland: Consultation Document*. Edinburgh: Scottish Executive Development Department; 2003.

16. Department for Transport. *Walking and Cycling: An Action Plan*. London: Department for Transport; 2004.
17. Welsh Assembly Government. *A Walking and Cycling Action Plan for Wales*. Cardiff: Welsh Assembly Government; 2008.
18. Coote A. What health services could do about climate change. *BMJ* 2006;**332**:1343–4. <https://doi.org/10.1136/bmj.332.7554.1343>
19. Department for Transport. *National Travel Survey: England 2016*. London: Department for Transport; 2017. URL: www.gov.uk/government/uploads/system/uploads/attachment_data/file/633077/national-travel-survey-2016.pdf (accessed 6 June 2018).
20. World Health Organization (WHO). *Economic Assessment of Transport Infrastructure and Policies: Methodological Guidance on the Economic Appraisal of Health Effects Related to Walking and Cycling*. Copenhagen: WHO; 2007.
21. Hillsdon M, Foster C, Cavill N, Crombie H, Naidoo B. *The Effectiveness of Public Health Interventions for Increasing Physical Activity Among Adults: A Review of Reviews*. London: Health Development Agency; 2005.
22. Kahn EB, Ramsey LT, Brownson RC, Heath GW, Howze EH, Powell KE, et al. The effectiveness of interventions to increase physical activity. A systematic review. *Am J Prev Med* 2002;**22**(Suppl. 4):73–107. [https://doi.org/10.1016/S0749-3797\(02\)00434-8](https://doi.org/10.1016/S0749-3797(02)00434-8)
23. Hillsdon M, Foster C, Thorogood M. Interventions for promoting physical activity. *Cochrane Database Syst Rev* 2005;**1**:CD003180. <https://doi.org/10.1002/14651858.CD003180.pub2>
24. Ogilvie D, Egan M, Hamilton V, Petticrew M. Promoting walking and cycling as an alternative to using cars: systematic review. *BMJ* 2004;**329**:763. <https://doi.org/10.1136/bmj.38216.714560.55>
25. Scheepers CE, Wendel-Vos GCW, den Broeder JM, van Kempen EEMM, van Wesemael PJV, Schuit AJ. Shifting from car to active transport: a systematic review of the effectiveness of interventions. *Transp Res Part A Policy Pract* 2014;**70**:264–80. <https://doi.org/10.1016/j.tra.2014.10.015>
26. Dugdill L, Brettell A, Hulme C, McCluskey S, Long AF. Workplace physical activity interventions: a systematic review. *Int J Workplace Health Manag* 2008;**1**:20–40. <https://doi.org/10.1108/17538350810865578>
27. National Institute for Health and Care Excellence. *NICE Public Health Guidance 13. Promoting Physical Activity in the Workplace*. Manchester: NICE; 2008.
28. Malik SH, Blake H, Suggs LS. A systematic review of workplace health promotion interventions for increasing physical activity. *Br J Health Psychol* 2014;**19**:149–80. <https://doi.org/10.1111/bjhp.12052>
29. Tully MA, Panter J, Ogilvie D. Individual characteristics associated with mismatches between self-reported and accelerometer-measured physical activity. *PLOS ONE* 2014;**9**:e99636. <https://doi.org/10.1371/journal.pone.0099636>
30. Prince SA, Adamo KB, Hamel ME, Hardt J, Connor Gorber S, Tremblay M. A comparison of direct versus self-report measures for assessing physical activity in adults: a systematic review. *Int J Behav Nutr Phys Act* 2008;**5**:56. <https://doi.org/10.1186/1479-5868-5-56>
31. Vuillemin A, Rostami C, Maes L, Van Cauwenberghe E, Van Lenthe FJ, Brug J, et al. Worksite physical activity interventions and obesity: a review of European studies (the HOPE project). *Obes Facts* 2011;**4**:479–88. <https://doi.org/10.1159/000335255>
32. Arvidsson D, Kawakami N, Ohlsson H, Sundquist K. Physical activity and concordance between objective and perceived walkability. *Med Sci Sports Exerc* 2012;**44**:280–7. <https://doi.org/10.1249/MSS.0b013e31822a9289>

33. Sundquist K, Eriksson U, Kawakami N, Skog L, Ohlsson H, Arvidsson D. Neighborhood walkability, physical activity, and walking behavior: the Swedish Neighborhood and Physical Activity (SNAP) study. *Soc Sci Med* 2011;**72**:1266–73. <https://doi.org/10.1016/j.socscimed.2011.03.004>
34. Gordon-Larsen P, Boone-Heinonen J, Sidney S, Sternfeld B, Jacobs DR, Lewis CE. Active commuting and cardiovascular disease risk: the CARDIA study. *Arch Intern Med* 2009;**169**:1216–23. <https://doi.org/10.1001/archinternmed.2009.163>
35. Yang L, Panter J, Griffin SJ, Ogilvie D. Associations between active commuting and physical activity in working adults: cross-sectional results from the Commuting and Health in Cambridge study. *Prev Med* 2012;**55**:453–7. <https://doi.org/10.1016/j.ypmed.2012.08.019>
36. Davis A. *Value for Money: An Economic Assessment of Investment in Walking and Cycling*. Bristol: Department of Health and Social Care and Government Office of the South West; 2010.
37. Ogilvie D, Foster CE, Rothnie H, Cavill N, Hamilton V, Fitzsimons CF, Mutrie N, Scottish Physical Activity Research Collaboration. Interventions to promote walking: systematic review. *BMJ* 2007;**334**:1204. <https://doi.org/10.1136/bmj.39198.722720.BE>
38. Shaw R, Fenwick E, Baker G, McAdam C, Fitzsimons C, Mutrie N. 'Pedometers cost buttons': the feasibility of implementing a pedometer based walking programme within the community. *BMC Public Health* 2011;**11**:200. <https://doi.org/10.1186/1471-2458-11-200>
39. Sinnett D, Powell J. *Fitter for Walking Economic Evaluation Report in Economic Evaluation of Living Streets' Fitter for Walking Project*. Loughborough: University of Loughborough; 2012.
40. House of Commons Health Committee. *Health Inequalities. Third Report of Session 2008–09*. London: House of Commons Health Committee; 2009.
41. Paths for All. *Our Support for Workplaces*. URL: www.pathsforall.org.uk/pfa/walk-at-work/the-benefits-of-workplace-walking.html (accessed 6 June 2018).
42. Michie S, Richardson M, Johnston M, Abraham C, Francis J, Hardeman W, et al. The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Ann Behav Med* 2013;**46**:81–95. <https://doi.org/10.1007/s12160-013-9486-6>
43. Abraham C, Michie S. A taxonomy of behavior change techniques used in interventions. *Health Psychol* 2008;**27**:379–87. <https://doi.org/10.1037/0278-6133.27.3.379>
44. Michie S, Ashford S, Sniehotta FF, Dombrowski SU, Bishop A, French DP. A refined taxonomy of behaviour change techniques to help people change their physical activity and healthy eating behaviours: the CALO-RE taxonomy. *Psychol Health* 2011;**26**:1479–98. <https://doi.org/10.1080/08870446.2010.540664>
45. Michie S, Abraham C, Whittington C, McAteer J, Gupta S. Effective techniques in healthy eating and physical activity interventions: a meta-regression. *Health Psychol* 2009;**28**:690–701. <https://doi.org/10.1037/a0016136>
46. Abraham C, Graham-Rowe E. Are worksite interventions effective in increasing physical activity? A systematic review and meta-analysis. *Health Psychol Rev* 2009;**3**:108–44. <https://doi.org/10.1080/17437190903151096>
47. Bird EL, Baker G, Mutrie N, Ogilvie D, Sahlqvist S, Powell J. Behavior change techniques used to promote walking and cycling: a systematic review. *Health Psychol* 2013;**32**:829–38. <https://doi.org/10.1037/a0032078>
48. National Institute for Health and Care Excellence. *Behaviour Change: Individual Approaches*. NICE Public Health Guidance 49. Manchester: NICE; 2014.

49. Audrey S, Procter S, Cooper A, Mutrie N, Hollingworth W, Davis A, *et al.* Employer schemes to encourage walking to work: feasibility study incorporating an exploratory randomised controlled trial. *Public Health Res* 2015;**3**(4).
50. Medical Research Council. *Developing and Evaluating Complex Interventions: New Guidance*. London: Medical Research Council; 2008.
51. Audrey S, Cooper AR, Hollingworth W, Metcalfe C, Procter S, Davis A, *et al.* Study protocol: the effectiveness and cost effectiveness of an employer-led intervention to increase walking during the daily commute: the Travel to Work randomised controlled trial. *BMC Public Health* 2015;**15**:154. <https://doi.org/10.1186/s12889-015-1464-4>
52. University of Birmingham. *ICECAP-A*. University of Birmingham; 2015. URL: www.birmingham.ac.uk/research/activity/mds/projects/HaPS/HE/ICECAP/ICECAP-A/index.aspx (accessed 19 December 2017).
53. Nomis. *Labour Market Profile – South Gloucestershire*. Newport: Office for National Statistics; URL: www.nomisweb.co.uk/reports/lmp/la/1946157354/report.aspx (accessed 19 December 2017).
54. South Gloucestershire Council. *South Gloucestershire Economic Review, March 2017*. URL: www.southglos.gov.uk/Documents/COS70146.pdf (accessed 17 April 2019).
55. Nomis. *Labour Market Profile – Bath Parliamentary Constituency*. Newport: Office for National Statistics; URL: www.nomisweb.co.uk/reports/lmp/wpca/1929379858/report.aspx (accessed 19 December 2017).
56. Bath in Focus. *Business Matters*. Archived from the Original on 1 March 2012. Retrieved 12 December 2017. URL: www.web.archive.org/web/20120301081407/http://www.business-matters.biz/site.aspx?i=pg64 (accessed 17 April 2019).
57. Nomis. *Labour Market Profile – Swansea*. Newport: Office for National Statistics; URL: www.nomisweb.co.uk/reports/lmp/la/1946157393/report.aspx (accessed 19 December 2017).
58. Swansea Council. *About Swansea*. Swansea Council; 2019. URL: www.swansea.gov.uk/keyfacts (accessed 19 December 2017).
59. Nomis. *Labour Market Profile – Bristol, City of*. Newport: Office for National Statistics; URL: www.nomisweb.co.uk/reports/lmp/la/1946157348/report.aspx (accessed 19 December 2017).
60. Nomis. *Labour Market Profile – Swindon*. Newport: Office for National Statistics; URL: www.nomisweb.co.uk/reports/lmp/la/1946157355/printable.aspx (accessed 19 December 2017).
61. Swindon Borough Council. *Swindon Local Transport Plan 3: 2011–2026 Main Strategy*; 2011. URL: www.swindon.gov.uk/download/downloads/id/3584/local_transport_plan.pdf (accessed 17 May 2019).
62. Nomis. *Nomis Official Labour Market Statistics*. Newport: Office for National Statistics. URL: www.nomisweb.co.uk (accessed 19 December 2017).
63. Neath Port Talbot County Borough Council. *Regeneration*. URL: www.npt.gov.uk/1308 (accessed 19 December 2017).
64. Nomis. *Labour Market Profile – Newport*. Newport: Office for National Statistics. URL: www.nomisweb.co.uk/reports/lmp/la/1946157404/report.aspx?town=newport (accessed 19 December 2017).
65. Newport City Council. *Newport City Council Local Transport Plan, January 2015*. URL: www.newport.gov.uk/documents/Transport-and-Streets/Local-Transport-Plan-January-2015.pdf (accessed 19 December 2017).
66. Great Britain. *Data Protection Act 2018*. London: The Stationery Office; 2018.
67. ISCRTN Registry. *Travel to Work Study*. URL: www.isrctn.com/ISRCTN15009100 (accessed 6 June 2018).

68. Companies House. *UK Standard Industrial Classification (SIC) Categories 2007*. GOV.UK; 2008. URL: www.gov.uk/government/publications/standard-industrial-classification-of-economic-activities-sic (accessed 6 June 2018).
69. Audrey S, Fisher H, Cooper A, Gaunt D, Garfield K, Metcalfe C, Hollingworth W, *et al*. Evaluation of an intervention to promote walking during the commute to work: a cluster randomised controlled trial. *BMC Public Health* 2019;**19**:427. <https://doi.org/10.1186/s12889-019-6791-4>
70. Batista Ferrer H, Cooper A, Audrey S. Associations of mode of travel to work with physical activity, and individual, interpersonal, organisational, and environmental characteristics. *J Transp Health* 2018;**9**:45–55. <https://doi.org/10.1016/j.jth.2018.01.009>
71. Wetten AA, Batterham M, Tan SY, Tapsell L. Relative validity of 3 accelerometer models for estimating energy expenditure during light activity. *J Phys Act Health* 2014;**11**:638–47. <https://doi.org/10.1123/jpah.2011-0167>
72. Freedson PS, Melanson E, Sirard J. Calibration of the Computer Science and Applications, Inc. accelerometer. *Med Sci Sports Exerc* 1998;**30**:777–81. <https://doi.org/10.1097/00005768-199805000-00021>
73. Kerr J, Norman G, Godbole S, Raab F, Demchak B, Patrick K. Validating GPS data with the PALMS system to detect different active transportation modes. *Med Sci Sports Exerc* 2012;**44**:S25–9.
74. Stopher P, FitzGerald C, Zhang J. Search for a global positioning system device to measure person travel. *Transp Res Part C: Emerg Technol* 2008;**16**:350–69. <https://doi.org/10.1016/j.trc.2007.10.002>
75. Panter J, Desousa C, Ogilvie D. Incorporating walking or cycling into car journeys to and from work: the role of individual, workplace and environmental characteristics. *Prev Med* 2013;**56**:211–17. <https://doi.org/10.1016/j.ypmed.2013.01.014>
76. World Health Organization (WHO). *Obesity: Preventing and Managing the Global Epidemic. Report of a WHO Consultation*. Geneva: WHO; 2000.
77. Panter J, Griffin S, Jones A, Mackett R, Ogilvie D. Correlates of time spent walking and cycling to and from work: baseline results from the commuting and health in Cambridge study. *Int J Behav Nutr Phys Act* 2011;**8**:124. <https://doi.org/10.1186/1479-5868-8-124>
78. Adams E, Bull F, Foster C. Are perceptions of the environment in the workplace ‘neighbourhood’ associated with commuter walking? *J Transp Health* 2016;**3**:479–84. <https://doi.org/10.1016/j.jth.2016.01.001>
79. Ogilvie D, Mitchell R, Mutrie N, Petticrew M, Platt S. Perceived characteristics of the environment associated with active travel: development and testing of a new scale. *Int J Behav Nutr Phys Act* 2008;**5**:32. <https://doi.org/10.1186/1479-5868-5-32>
80. National Institute for Health and Care Excellence. *Physical Activity: Walking and Cycling*. NICE. 2012. URL: www.nice.org.uk/guidance/ph41/resources/physical-activity-walking-and-cycling-pdf-1996352901061 (accessed 6 June 2018).
81. Gardner B, Lally P, Wardle J. Making health habitual: the psychology of ‘habit-formation’ and general practice. *Br J Gen Pract* 2012;**62**:664–6. <https://doi.org/10.3399/bjgp12X659466>
82. Procter S, Mutrie N, Davis A, Audrey S. Participants’ views of using behaviour change techniques to encourage walking to work: a qualitative study. *BMC Public Health* 2014;**14**:868. <https://doi.org/10.1186/1471-2458-14-868>
83. Carroll C, Rick J, Leaviss J, Fishwick D, Booth A. A qualitative evidence synthesis of employees’ views of workplace smoking reduction or cessation interventions. *BMC Public Health* 2013;**13**:1095. <https://doi.org/10.1186/1471-2458-13-1095>

84. McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programmes. *Health Educ Q* 1988;**15**:351–77. <https://doi.org/10.1177/109019818801500401>
85. Audrey S, Procter S. Employers' views of promoting walking to work: a qualitative study. *Int J Behav Nutr Phys Act* 2015;**12**:12. <https://doi.org/10.1186/s12966-015-0174-8>
86. Moore G, Audrey S, Barker M, Bond L, Bonell C, Hardeman W, et al. *Process Evaluation of Complex Interventions*. London: Medical Research Council Population Health Science Research Network; 2014.
87. Ritchie J, Lewis J. *Qualitative Research Practice: A Guide for Social Science Students and Researchers*. London: Sage; 2003.
88. Ward M, Rhodes C. *Small Businesses and the UK Economy. Economic Policy and Statistics*. London: House of Commons; 2014.
89. Hart TL, Swartz AM, Cashin SE, Strath SJ. How many days of monitoring predict physical activity and sedentary behaviour in older adults? *Int J Behav Nutr Phys Act* 2011;**8**:62. <https://doi.org/10.1186/1479-5868-8-62>
90. Bristol Randomised Trials Collaboration. *Travel to Work Statistical and Health Economics Analysis Plan Version 1.1 (21 April 2017)*. Bristol: University of Bristol; 2017. URL: http://research-information.bristol.ac.uk/files/118260521/TtW_SHEAP_V.1.1_signed.pdf (accessed 6 June 2018).
91. Kirkwood BR, Sterne JAC. *Essential Medical Statistics*. 2nd edn. Oxford: Blackwell Science; 2003.
92. The Automobile Association. *The AA Schedule of Motoring Costs*. URL: www.theaa.com/motoring_advice/running_costs/ (accessed 24 September 2017).
93. Office for National Statistics. *Annual Survey of Hours and Earnings. 2016 Provisional Results*. Newport: Office for National Statistics; 2016. URL: www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/bulletins/annualsurveyofhoursandearnings/2016/provisionalresults/relateddata (accessed 18 September 2016).
94. Curtis L. *Unit Costs of Health and Social Care 2016*. Canterbury: Personal Social Services Research Unit, University of Kent; 2016.
95. Curtis L. *Unit Costs of Health and Social Care 2012*. Canterbury: Personal Social Services Research Unit, University of Kent; 2012.
96. Department of Health and Social Care (DHSC). *NHS Reference Costs 2015–16*. London: DHSC; 2016.
97. NHS Digital. *Prescription Cost Analysis – England, 2016*. Leeds: NHS Digital; 2017.
98. NHS. *Osteopathy*. NHS; 2017. URL: www.nhs.uk/conditions/Osteopathy/Pages/Introduction.aspx (accessed 23 September 2017).
99. NHS. *Chiropractic*. NHS; 2017. URL: www.nhs.uk/Conditions/chiropractic/Pages/Introduction.aspx (accessed 23 September 2017).
100. National Audit Office. *Out-of-hours GP Services in England*. London: National Audit Office; 2014.
101. Turner J, O'Cathain A, Knowles E, Nicholl J, Tosh J, Sampson F, et al. *Evaluation of NHS 111 pilot sites. Final Report to the Department of Health*. Sheffield: Medical Care Research Unit, University of Sheffield; 2012.
102. Reilly MC, Zbrozek AS, Dukes EM. The validity and reproducibility of a work productivity and activity impairment instrument. *Pharmacoeconomics* 1993;**4**:353–65. <https://doi.org/10.2165/00019053-199304050-00006>

103. Flynn TN, Huynh E, Peters TJ, Al-Janabi H, Clemens S, Moody A, Coast J. Scoring the Icecap-a capability instrument. Estimation of a UK general population tariff. *Health Econ* 2015;**24**:258–69. <https://doi.org/10.1002/hec.3014>
104. Craig R, Mindell J, Hirani V. *Health Survey for England 2008: Physical Activity and Fitness*. Leeds: National Information Centre; 2009.
105. Mutikainen S, Helander E, Pietilä J, Korhonen I, Kujala UM. Objectively measured physical activity in Finnish employees: a cross-sectional study. *BMJ Open* 2014;**4**:e005927. <https://doi.org/10.1136/bmjopen-2014-005927>
106. Hagströmer M, Oja P, Sjöström M. Physical activity and inactivity in an adult population assessed by accelerometry. *Med Sci Sports Exerc* 2007;**39**:1502–8. <https://doi.org/10.1249/mss.0b013e3180a76de5>
107. Thompson D, Batterham AM, Peacock OJ, Western MJ, Booso R. Feedback from physical activity monitors is not compatible with current recommendations: a recalibration study. *Prev Med* 2016;**91**:389–94. <https://doi.org/10.1016/j.ypmed.2016.06.017>
108. McLellan G, Arthur R, Buchan DS. Wear compliance, sedentary behaviour and activity in free-living children from hip-and wrist-mounted ActiGraph GT3X+ accelerometers. *J Sports Sci* 2018;**36**:2424–30. <https://doi.org/10.1080/02640414.2018.1461322>
109. Tudor-Locke C, Barreira TV, Schuna JM Jr. Comparison of step outputs for waist and wrist accelerometer attachment sites. *Med Sci Sports Exerc* 2015;**47**:839–42. <https://doi.org/10.1249/MSS.0000000000000476>
110. Chu AH, Ng SHX, Paknezhad M, Gauterin M, Koh D, Brown MS, Muller-Riemenschneider F. Comparison of wrist-worn Fitbit Flex and waist-worn ActiGraph for measuring steps in free-living adults. *PLOS ONE* 2017;**12**:e0172535. <https://doi.org/10.1371/journal.pone.0172535>
111. Brockman R, Fox KR. Physical activity by stealth? The potential health benefits of a workplace transport plan. *Public Health* 2011;**125**:210–16. <https://doi.org/10.1016/j.puhe.2011.01.005>
112. Verplanken B, Walker I, Davis A, Jurasek M. Context change and travel mode choice: combining the habit discontinuity and self-activation hypotheses. *J Environ Psychol* 2008;**28**:121–7. <https://doi.org/10.1016/j.jenvp.2007.10.005>
113. Kohl HW, Craig CL, Lambert EV, Inoue S, Alkandari JR, Leetongin G, Kahlmeier S, Lancet Physical Activity Series Working Group. The pandemic of physical inactivity: global action for public health. *Lancet* 2012;**380**:294–305. [https://doi.org/10.1016/S0140-6736\(12\)60898-8](https://doi.org/10.1016/S0140-6736(12)60898-8)
114. Faulkner GE, Richichi V, Buliung RN, Fusco C, Moola F. What's 'quickest and easiest?': parental decision making about school trip mode. *Int J Behav Nutr Phys Act* 2010;**7**:62. <https://doi.org/10.1186/1479-5868-7-62>
115. Jain J, Line T, Lyons G. A troublesome transport challenge? Working round the school run. *J Transp Geogr* 2011;**19**:1608–615. <https://doi.org/10.1016/j.jtrangeo.2011.04.007>
116. Dalton AM, Jones AP, Panter JR, Ogilvie D. Neighbourhood, route and workplace-related environmental characteristics predict adults' mode of travel to work. *PLOS ONE* 2013;**8**:e67575. <https://doi.org/10.1371/journal.pone.0067575>
117. Panter JR, Jones AP, van Sluijs EM, Griffin SJ, Wareham NJ. Environmental and psychological correlates of older adult's active commuting. *Med Sci Sports Exerc* 2011;**43**:1235–43. <https://doi.org/10.1249/MSS.0b013e3182078532>
118. Cairns S, Newson C, Davis A. Understanding successful workplace travel initiatives in the UK. *Transp Res Part A Policy Pract* 2010;**44**:473–94. <https://doi.org/10.1016/j.tra.2010.03.010>

119. Guell C, Panter J, Ogilvie D. Walking and cycling to work despite reporting an unsupportive environment: insights from a mixed-method exploration of counterintuitive findings. *BMC Public Health* 2013;**13**:497. <https://doi.org/10.1186/1471-2458-13-497>
120. Goodman A, Sahlqvist S, Ogilvie D, iConnect Consortium. New walking and cycling routes and increased physical activity: one- and 2-year findings from the UK iConnect Study. *Am J Public Health* 2014;**104**:e38–46. <https://doi.org/10.2105/AJPH.2014.302059>
121. Panter J, Ogilvie D, iConnect consortium. Can environmental improvement change the population distribution of walking? *J Epidemiol Community Health* 2017;**71**:528–35. <https://doi.org/10.1136/jech-2016-208417>
122. Song Y, Preston J, Ogilvie D, iConnect consortium. New walking and cycling infrastructure and modal shift in the UK: a quasi-experimental panel study. *Transp Res Part A Policy Pract* 2017;**95**:320–33. <https://doi.org/10.1016/j.tra.2016.11.017>
123. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap) – a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009;**42**:377–81. <https://doi.org/10.1016/j.jbi.2008.08.010>

Appendix 1 Adverse event forms

Adverse event form		
Travel to Work Study Adverse Events Form (AE1)		
<p>Walking to work is considered a 'low risk' activity but we would like to know if you experience any problems, incidents or accidents as a result of walking to work e.g. aches and pains, blisters, road traffic incidents, street crime or anti-social behaviour. We hope walking to work will be an enjoyable and healthy experience for you but if you do have any problems we would be grateful if you would let us know as soon as possible by completing this form and returning it to:</p> <p style="text-align: center;"><i>[Insert contact details for local researcher]</i></p> <p>In case of a Serious Adverse Event (e.g. an accident resulting in hospitalisation) please telephone the Study Team 0117 928 7284 within 24 hours of your knowledge of the event taking place.</p>		
SECTION 1: To be completed by the study participant, Walk to Work promoter or employer		
Workplace		
Participant Name		
Location		
Date of event		
Details of event <i>(Please include what happened and if it was related to the journey to/ from work. Continue overleaf if required)</i>		
Was any action necessary? YES/NO <i>(If YES please give details below)</i>		
Actions taken	Action taken by:	Date
Is event on-going: YES/NO If NO, date resolved:		
For office use only. Participant ID:		Study ID:

Serious adverse event form			
Travel to Work Study Serious Adverse Events Form (AE2)			
<p>This form is to be completed by a member of the research team after receiving a telephone call, email or an AE1 form which indicates that a serious adverse event has taken place and any further information has been gained to assess: whether the event is an SAE, and: whether it is related to study participation. A copy of the relevant AE1 should be attached to this form.</p> <p>A Serious Adverse Event is an occurrence that results in death, is life-threatening, requires inpatient hospitalisation, may jeopardise the participant, or results in persistent or significant disability or incapacity.</p>			
Was this a Serious Adverse Event? YES/NO If yes, please answer the following questions.			
Which category was the Serious Adverse Event? <i>(Please tick one box)</i>			
Results in the death of the participant			
Is life-threatening			
Requires inpatient hospitalisation or may jeopardise the participant			
Results in persistent or significant disability / incapacity			
Was the Serious Adverse Event related to study participation? <i>(Please tick one box)</i>			
Unrelated			
Unlikely to be related			
Possibly related			
Probably related			
Definitely related			
This form should be signed and dated by the researcher (in the box below) and then sent to the Study Manager and Principal Investigator for signature.			
	Name	Signature	Date
Local researcher			
Study Manager			
Principal Investigator			
The Principal Investigator should notify the Chair of the Trial Steering Committee and the Head of School. The Study Manager should send a copy of the form to the Faculty Research Governance and Ethics Officer : <div style="text-align: center;"><i>[insert contact details]</i></div>			
To be completed by Faculty Research Governance and Ethics Officer			
Date received			
Date entered on database			
Entered on database by			
Name of reviewer			
Signature of reviewer			
Date of review			
Comments			

Appendix 2 Employer recruitment leaflet and expression-of-interest form

<p>Information leaflet for employers</p> <p style="text-align: center;">Information for employers</p> <p>Before you decide if you want to take part it is important for you to understand why the research is being done and what it will involve. Please read this leaflet which contains information about the study. If you have any questions, please do not hesitate to contact:</p> <p style="text-align: center;">[Contact details of Principal Investigator] [Contact details of co-applicant for relevant research site]</p> <p>What is the purpose of the study?</p> <p>The purpose of the study is to find out if it is possible to make changes in the way people travel to work and increase the amount of walking during the daily commute.</p> <p>Why has our workplace been approached?</p> <p>We would like to recruit 84 workplaces in Bath, South Gloucestershire and Swansea and match them into pairs that are similar in terms of type of business, location and size (small, medium and large). In each of the 84 workplaces, we would like to collect information from employees and employers about the journey to work. In addition, we will randomly select 42 of the workplaces to take part in a programme to try to increase walking (see later). Unfortunately, you cannot choose whether to take part in the programme: this has to be done randomly. So we need workplaces that are willing to take part in the study and to accept this random allocation.</p> <p>What will happen if our workplace takes part?</p> <p>In all 84 workplaces we would like to do the following:</p> <ol style="list-style-type: none"> 1] Ask employers to help us identify people who would like to take part in the study i.e. by sending all employees an email, or through other communication procedures that suit your workplace. 2] All employees who would like to take part will be asked to complete questionnaires: one at the beginning of the study, one about 3 months later, and another about 12 months later. We will make it clear to employees that they do NOT have to take part in this study, and that they can drop out of the study at any time without giving us a reason. 3] Participating employees will be asked to wear an accelerometer and a GPS monitor for 7 days. (These are small monitors worn around the waist to measure physical activity and tell us something about the route to work.) We will ask them to do this at the beginning of the study and again 12 months later. To acknowledge their help, we will give them a £10 gift voucher when they wear and return the monitors at the beginning of the study, and another £10 gift voucher if they wear and return the monitors 12 months later. 4] Some employees will be invited to take part in interviews about their journeys to work. 5] We would also like to interview some employers. 6] The people who take part in the interviews will also receive a £10 gift voucher to thank them for taking part. <p>Half of the workplaces will be randomly allocated to take part in a programme which aims to increase the amount of walking during the journey to and from work:</p> <ol style="list-style-type: none"> 1] We will offer training to one or more of your employees to promote the programme: this will depend on the size of your workplace but will be approximately one promoter to 25 participating employees. The training will last about 3 hours, and will take place in the workplace or at one of the Universities, depending on the preference of the workplace. 2] We will provide booklets and other resources for the promoters to use in the workplace with the employees who express an interest in trying to change their travel behaviour. 3] The promoters will offer support and encouragement over the following 10 weeks through 4 workplace-based contacts (in person, by telephone or email, whichever is appropriate for your workplace). <p>What are the possible benefits of taking part?</p> <p>We cannot say whether taking part will be of direct benefit to you, but you may find it interesting, worthwhile and beneficial for your public image to be involved in this important research study.</p> <p>There are a number of potential benefits to employers if their employees increase walking during the journey to and from work, including: employees' increased concentration and mental alertness; a reduction in absenteeism; a reduction in people being late because of greater certainty over the</p>

timing of the journey; improved public image as a result of lowering the workplace's carbon footprint, and; savings in car parking costs.

Are there any disadvantages or risks in taking part?

The study has been reviewed by the University of Bristol Faculty of Medicine and Dentistry Research Ethics Committee in order to protect the rights and well-being of those who take part. The study activities are considered to be 'low risk' and we do not believe there are any disadvantages to employers or employees in taking part.

Some employers may feel there are disadvantages in terms of the disruption caused to the working routine if employees to take part in the study activities. We will do our best to keep this to a minimum.

Employees can take part in some or all of the activities and can change their mind and withdraw for the study at any time without giving a reason. All information collected during the study will be treated as confidential and stored securely. We will remove names from any information that is published so individuals and workplaces cannot be recognised.

What if something goes wrong?

We do not expect anything to go wrong. However, if you do have a complaint about the study, please contact Dr Suzanne Audrey, the principal investigator, or one of the study coordinators. Contact details are given at the front of this leaflet.

What will happen to the results of the study?

When the study is complete, we will organise an event to talk about the results. We will also present the information at conferences and publish it in journals. We hope this will provide better understanding about the benefits and difficulties of changing travel behaviour and increasing walking during the journey to work.

Who is undertaking the study?

This study is being undertaken by researchers at the Universities of Bristol, Bath and Swansea and is funded by the NIHR public health research programme. Other organisations are involved with the study including: BusinessWest, Swansea Chamber of Commerce, Sustrans, Loughborough University, University of the West of England, University of South Carolina, and MRC Epidemiology Unit Cambridge.

Workplace expression of interest form

1. Are you interested in participating in the Travel to Work study? Yes / No (*please delete as appropriate*)

If yes, please go to question 3. If no, please go to question 2.

2. If no, it would help our research if you are able to give a brief reason below. We would also be grateful if you would complete further details about your workplace:

.....

.....

3. Name of workplace:

4. Address of workplace:

.....POSTCODE:

5. Main business activities:

6. Number of employees in workplace (including part time): (*please tick one box as appropriate*)

1 - 9

10 - 49

50 - 249

250 and above

7. Total number of employees in the workplace (*if known*)

8. How do most employees travel to and from the workplace? (*please tick one box as appropriate*)

Car or motorised transport (as driver or passenger)

Public transport (e.g. bus or train)

Walk/cycle

I don't really know how our employees travel to work

9. In terms of walking or cycling: (*please tick one box as appropriate*)

None or hardly any employees walk/cycle all the way to work

Some (but less than half) of the employees walk/cycle all the way to work

Most employees walk/cycle all the way to work

All of the employees walk or cycle all the way to work

I don't really know how our employees travel to work

10. Please give the name and contact details of someone who the research team should contact in the future about the Travel to Work study:

Name: **Position:**

Email: **Telephone:**

How would you prefer to be contacted? Email / telephone (*please delete as appropriate*)

Please return this questionnaire by email or in the pre-paid envelope provided.

Appendix 3 Information leaflet for employees

Information leaflet for employees

Employee information

We would like to invite you to take part in a research study about travel to work. Before you decide if you want to take part it is important for you to understand why the research is being done and what it will involve. Please read this leaflet and discuss it with other people if you wish. You can ask us if there is anything that is not clear or if you would like more information (our contact details are at the back of this leaflet).

Thank you for taking the time to read this.

What is the purpose of the study?

The purpose of the study is to understand people's views and experiences of the journey to work and to find out if it is possible to make changes to the way people travel to work. We especially want to know if it is possible to increase the amount of walking that people do on their journey to and from work.

Why have I been chosen?

We have asked workplaces in [list areas] to take part in this study. Your employer has agreed, and we are now asking employees if they would like to be part of the study.

Do I have to take part?

You are free to decide whether or not to take part. If you would like to take part, you will need to sign a consent form. If you consent, but then change your mind later, you can withdraw at any time and you do not have to give a reason.

What will happen if I agree to take part?

To help us understand about people's journeys to work, we will ask everyone who takes part to do the following:

- We would like you to complete 3 questionnaires: one at the beginning of the study, one about 3 months later, and another about 12 months later.
- We would like you to complete a travel diary for 7 days so that we can calculate the costs of the journey to and from work.
- We would like you to wear a GPS monitor to and from work so that we can find out about your journey.
- We would like you to wear an accelerometer (a small monitor) around your waist for 7 days, from waking up in the morning until going to bed at night, so that we can measure your physical activity.
- We will ask you to wear the accelerometer and GPS monitor, and to complete the travel diary, at the beginning of the study and again 12 months later.
- To thank you for your help, we will give you a £10 gift voucher when you return the monitors and diary at the beginning of the study, and another £10 gift voucher if you do the same 12 months later.

What else might I have to do?

Half of the workplaces will also take part in a programme to find out if it is possible to make changes to the way people travel to work and increase the amount of walking. The other workplaces will carry on as usual so that we can compare the two groups to see if the programme makes any difference. We do not know at this stage which workplaces will receive the programme. This will be done through random selection after people have completed the first set of questionnaires and worn the monitors.

In workplaces that receive the programme:

- The employer will identify someone in the workplace to deliver the programme. They will receive training and will identify other employees who are willing to try to walk more during the journey to work.
- Employees who would like to try to change their travel behaviour will be provided with booklets, support and encouragement

What are the possible benefits of taking part?

We cannot say that taking part in this research will be of benefit to you, but we have tested the research activities with other employees and many of them found it interesting and enjoyable to take part. We believe it is important research and will help people in the future through better understanding of their travel options.

Are there any disadvantages or risks in taking part?

The study has been reviewed by the University of Bristol Faculty of Medicine and Dentistry Research Ethics Committee in order to protect the rights and well-being of those who take part. All of the study activities are considered to be 'low risk', and we do not believe there are any disadvantages to taking part. All information collected during the study will be treated as confidential. We will remove your name from any information that is published so that you cannot be recognised.

What if something goes wrong?

We do not expect anything to go wrong. However, if you do have a complaint about the study, please contact a member of the research team (details are given at the end of this leaflet).

What will happen to the results of the study?

When the study is complete, we will organise an event to talk about the results. We will also present the information at conferences and publish it in journals. We hope this will provide better understanding about the benefits and difficulties of walking to work, and may help to shape future policies about travelling to work.

Who is organising the study?

This study is being undertaken by researchers at the Universities of Bristol, Bath and Swansea and is funded by the National Institute for Health Research.

For further information

If you have any questions, please do not hesitate to contact:

[Insert relevant contact details]

Appendix 4 Instructions for participants

<p>Instructions for participants</p>
<p align="center">ABOUT THE ACCELEROMETER, TRAVEL DIARIES AND GPS MONITORS</p> <p>In this important study we are testing new ways to measure journeys to find out about: the journeys to work of people in <i>[insert areas]</i>; how much physical activity is involved, and; the reasons why people travel the way they do.</p> <p>To help us with this we would like you to wear an accelerometer and complete a travel diary for 7 days, and to take a GPS monitor with you on the journey to and from work, starting on:</p> <p align="center">___ / ___ / 20___</p>
<p>A member of the research team will come to collect them and give you a £10 gift voucher to thank you for your help with the study.</p>
<p>THE ACCELEROMETER (Red device – this will be flashing for a while but it is programmed to stop flashing when it is ready to record)</p> <ul style="list-style-type: none"> • The accelerometer should be worn on a belt around the waist, above one hip. It doesn't matter which hip as long as you keep to the same one every day. • Please put the accelerometer on first thing in the morning and take it off when you go to bed at night including at the weekend. This will give us an idea of your activity throughout the full 7 days - whether you are working or not. • Please don't wear the accelerometer if you are having a bath or shower, or if you go swimming, because it is not fully waterproof. • The monitor does not display your activity level – all the information is stored inside. We can print out a graph of the activity if you would like to see some 'results'. <p>THE GPS MONITOR (Black monitor)</p> <ul style="list-style-type: none"> • The GPS monitor can be worn on the same belt as the accelerometer, or carried in your pocket or bag. • Please SWITCH IT TO LOG when you start your journey to work and SWITCH IT OFF when you arrive home. • The GPS monitor needs to be charged every day for about 3 hours. To do this switch it OFF. You may use the cable and adapter provided or a USB port in your computer. (When the power LED is green, the battery is charging; when the light goes off, the battery is fully charged.) • We can print out a map of your journeys if you would like to see these results. • You do not need to wear the GPS monitor on the days you are not working. <p>THE TRAVEL DIARY</p> <ul style="list-style-type: none"> • We would like you to complete the travel diary during the 7 days that you wear the accelerometer. Instructions for using the travel diary are printed inside the diary.
<p>Please bring the accelerometer, GPS monitor and travel diary back to your workplace on</p> <p align="center">.....</p>
<p>If you have any questions, please contact:</p> <p align="center"><i>[insert contact details]</i></p>

Appendix 5 Walk to Work promoters' information leaflet

<p>Information leaflet for Walk to Work promoters</p> <p style="text-align: center;">Walk to Work promoter information</p> <p>Your employer has agreed to take part in a research study about travel to work. We would like to invite you to be a Walk to Work promoter in your workplace, but before you decide if you want to take on this role, it is important for you to understand what it will involve. Please read this leaflet and discuss it with other people if you wish. If you have any questions, please do not hesitate to contact:</p> <p style="text-align: center;"><i>[insert relevant contact details]</i></p> <p>What is the Walk to Work programme?</p> <p>We are asking different workplaces in <i>[list areas]</i> to take part in a Walk to Work programme and your employer has agreed to take part. The aim of the programme is to help people think about the way they travel to work and, if possible, to increase the amount that people walk during the journey. In each workplace, Walk to Work promoters will be recruited. The aims of the training are to provide them with information and resources, and to increase their skills and confidence, to talk with their colleagues about travel to work.</p> <p>When the Walk to Work promoters are trained, they will be given the names of employees in their workplace who are eligible to take part in the Walk to Work programme. Those who want to try to increase walking will be given booklets and pedometers, identify suitable routes, and set goals for walking (this may be part of the way or the whole journey, depending on people's circumstances.) The Walk to Work promoters will offer participating employees support and encouragement during the following 10 weeks. The Walk to Work promoters will also be given support and encouragement from the research team over the 10-week period.</p> <p>What is the role of the Walk to Work promoter?</p> <p>The role of the Walk to Work promoters is a responsible position but we believe it will also be enjoyable and interesting. The aims are:</p> <ul style="list-style-type: none"> • to be the Walk to Work programme 'point of contact' for employers, employees and the University researchers • to promote increased walking during the journeys to work • to be 'role models' for the Walk to Work programme <p>The main responsibilities of the Walk to Work promoter are:</p> <ul style="list-style-type: none"> • to take part in the training provided and learn about: the benefits of walking to work; facilitators and barriers to walking to work; how to motivate employees to walk to work; and the use of available resources e.g. Walkit.com, Walk4Life and Living Streets • to undertake the role of the Walk to Work promoter including: communicating with their employer about the activities of the Walk to Work programme; contacting eligible employees who are interested in increasing the amount of walking during their journey to and from work; helping employees identify appropriate walking routes; offering work-based support to employees through four additional contacts over 10-weeks using the most effective method e.g. email, telephone or face-to-face, and; keeping a short diary of their experiences as Walk to Work promoters • to provide participating employees with advice, support and information about the benefits of walking to work including: benefits to physical health, improved mental well-being, reduction in stress compared with other modes of transport, cost savings, potential time savings, and environmental benefits • to help the University researchers monitor the progress of the Walk to Work programme by: completing an evaluation form after the training; completing a short diary of experiences as a Walk to Work promoter, and; if requested, taking part in interviews to tell us about their views and experiences of the Walk to Work programme. <p>What are the possible benefits of taking part?</p> <p>We hope you will find the training interesting and that you will gain new skills and confidence. Being a Walk to Work promoter may also help to develop positive relationships at work and give you an opportunity to demonstrate leadership skills. If you increase walking yourself, there are health benefits to taking moderate exercise as part of your daily routine.</p> <p>Are there any disadvantages or risks in taking part?</p>
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The study has been reviewed by the University of Bristol Faculty of Medicine and Dentistry Research Ethics Committee to protect the rights and well-being of those who take part. The activities are considered to be 'low risk' but we do realise that, for some people, the role of Walk to Work promoter may seem like too much responsibility on top of your usual job. You may also feel disappointed if you are unable to encourage people to walk to work. If this would upset or worry you, it might be better to say that you do not want to take on the role.

What if something goes wrong?

We do not expect anything to go wrong. However, if you do have any problems or complaints about the study please contact a member of the research team. (Please see the contact details at the front of this leaflet).

Do I have to accept the role of Walk to Work promoter?

You are free to decide, and you do not have to accept the role. If you would like to be a Walk to Work promoter, you will be asked to sign a consent form. If you consent but need to withdraw later, you can stop being a Walk to Work promoter and you do not have to give a reason.

What will happen to the results of the study?

When the study is complete, we will organise an event to talk about the results. We will also present the information at conferences and publish it in academic journals. We hope this will provide better understanding about the benefits and difficulties of walking to work. Any information about you or your colleagues will be treated as confidential. We will remove all names from any information that is published.

Who is organising the study?

This study is being undertaken by researchers at the Universities of Bristol, Bath and Swansea and is funded by the NIHR public health research programme.

Appendix 6 Walk to Work promoter's booklet and diary

Main content of the Walk to Work promoter's booklet
<p>The role of the Walk to Work promoter</p> <p>This is an important role and we are very grateful for your help. The main activities are:</p> <ul style="list-style-type: none"> • To promote walking to work amongst those employees in your workplace who are taking part in the study (the research team will provide you with a list of these employees) • To be the recognised 'point of contact' for the Walk to Work scheme in your workplace • To participate in training provided by the research team • To learn about goal setting, self-monitoring and the use of websites and other tools to support and encourage employees in walking to work • To work with participating employees to identify safe walking routes and set personal goals • To provide advice, support, encouragement and information to participating employees about the benefits of walking to work • To offer support to participating employees through four contacts over a 10-week period (by email, face-to-face or telephone, depending on the workplace routines and environment) • To provide feedback to the research team by completing a research diary and, if requested, taking part in an interview to discuss your experience of the scheme <p>The research team will also provide you with support and encouragement through regular contacts over a 10-week period (by email or telephone depending on workplace routine and environment).</p> <p>Factors that influence people's behaviour</p> <p>There are many factors that influence people's behaviour including their own views and experiences, their relationships with others, where they spend time, and local and national policies. To encourage people to walk to work, it is important to think about the individual, their family commitments and relationships with colleagues, their workplaces, the wider environment, and public policies and guidelines.</p> <p>The individual</p> <p>At the individual level it is important to:</p> <ul style="list-style-type: none"> • Give employees information about the benefits of walking to work • Help them to identify personal barriers to walking to work and how these can be overcome • Help them identify routes and methods to increase walking during the journey to work (either walking all the way, or combining it with public transport or 'park and walk') • Identify and agree goals • Offer individual support and encouragement <p>Family, friends and colleagues</p> <p>Families, friends, neighbours and work colleagues can influence behaviour by what they say and do. If they say positive things about walking to work this will support change, and it is even more encouraging if they walk to work themselves. So, it is important to:</p> <ul style="list-style-type: none"> • Identify and address specific barriers relating to family and work routines e.g. taking children to school, carrying heavy items • Find colleagues and friends who will encourage each other to walk to work <p>The workplace</p> <p>Workplace policies, procedures and facilities can create an environment that encourages and supports employees in walking to work. This can be achieved by:</p> <ul style="list-style-type: none"> • Providing lockers or changing rooms for a change of shoes or clothes • Improving washing facilities e.g. wash basins in private cubicles to enable walkers to freshen up when they arrive at work • Flexible working hours to accommodate the 'school run' or other family responsibilities • Providing information about the benefits of walking to work • Creating an environment in which employees are encouraged to walk to work e.g. putting up posters about the health benefits of walking, or joining in with 'walk to work' days and activities • Valuing the contribution that employees make when they change from car driving to walking e.g. by paying a 'mileage allowance' for walking to meetings or other workplace activities • Offering financial assistance to walkers, similar to that offered to cyclists in some workplaces e.g. help to buy walking shoes, rucksacks or wet weather clothing • Providing free items to reward walkers e.g. workplace umbrellas

It may not be easy for employees to change things in their workplace, but employers may be willing to make changes if they are aware that helping employees to be more active can have benefits for the workplace. These may include:

- Employees' increased concentration and mental alertness
- Reduction in late arrivals because of greater certainty over journey time
- Reduce absenteeism
- Improved public image
- Savings in car parking costs

The wider environment

It is easier and more pleasant to walk in some areas than others. Good quality pavements, safe places to cross roads, well-lit streets, seeing other walkers, and having interesting shops and facilities along the way can all contribute to a 'walkable' environment. It is important to:

- Identify safe and feasible walking routes
- Identify local groups and organisations that provide information and support to enhance the walking environment

Public policies

Local and central government are keen to promote walking to work because of the benefits to health and the environment. Encouragement is given through:

- Websites and resources that offer information, support and encouragement to walk to work
- Initiatives and events e.g. Walk to Work week

Useful websites

- maps.google.co.uk - can be used as a walking route planner
- www.livingstreets.org.uk - lots of resources to encourage walking
- www.walk4life.info - find a walk and track your progress
- www.nhs.uk/Livewell/loseweight/Pages/10000stepschallenge.aspx - information and encouragement to increase your daily step count
- <http://www.walkingforhealth.org.uk/> - support to get active, stay active
- <http://traveline.info/> - sustainable travel advice
- www.sustrans.org.uk - lots of information about healthy active travel
- www.dft.gov.uk/think - the government's road safety campaign website

Recruiting employees

All employees who are taking part in the Travel to Work study are eligible to take part in the Walk to Work scheme. We will provide you with a list of these employees and a pack for each of them. The research team have also provided your employer with a booklet with ideas about how they can support walking to work.

Your first task as the Walk to Work promoter will be to distribute the packs to all the employees on the list. Each pack contains a booklet '**Taking one step at a time**', together with a free pedometer for those who would like to try counting the number of steps they take.

Not all the employees who are taking part in the Travel to Work study (i.e. giving us information about their journeys to work) will be able to change the way they travel to work. However, please give all of them a pack. Your first contact with employees on the list will be to explain the scheme and ask if they would like to try increasing the amount of walking they do during their journey to work. The way you contact them is up to you and your employer. For some it may be sensible to have a larger group session, but for others it may be better on a one-to-one basis. You can decide this between you.

When you know which employees would like to try increasing the amount that they walk during the journey to work, your role is to offer support and encouragement to them through four contacts over the next 10 weeks. Some people may be happy with an email but others may prefer a longer chat. Again, you can decide this depending on the routines of your workplace and the people involved.

The research team will also contact you around four times during the 10-week period to see how you are getting on and to give you some support in your role as Walk to Work promoter.

The Walk to Work promoter's booklet: keeping a diary

Throughout the booklet, we describe the purpose of each of the four contacts with employees and refer you to the relevant pages in the 'Taking one step at a time' booklet. We have also given you a page a week to record your thoughts and experiences. We would like you to tell us about:

- Support you have offered to walkers. For example: you had a chat with someone over lunch about a better route to avoid busy traffic, or: you texted someone to say "Well done" after several weeks of walking to work
- Issues raised by walkers about their journey to work. For example: reasons why someone felt they had to give up walking, or someone else telling you that they find it is easier to get to work on time if they walk
- Issues in the workplace. For example: a busy week when you just didn't have time to speak with anyone about walking to work, or; your employer arranging lockers for employees who walk to work and need somewhere to store a change of shoes

The information you give will be useful to help us understand if it is really possible to ask Walk to Work promoters in the workplace to encourage other people to walk to work.

Contact 1 – Getting Started

Your first contact with participating employees will focus on:

- An overview of the 'Taking one step at a time' booklet
- Focussing on the benefits of walking to work
- Identifying barriers and thinking of possible solutions
- Setting goals for the short, intermediate and long-term
- Distributing pedometers to those who would like to use them
- Encouraging employees to keep a record in their booklet

Participants may already know of a suitable route to walk to work but, if they don't, you can help them to identify a route using a website such as [maps.google.co.uk](https://www.google.co.uk/maps) or a local A-Z street atlas.

Contact 2 - Support and encouragement

After two weeks, we would like you to contact participating employees to check how they are getting on. During this second contact, we would like you to focus on the issue of support. You will need to judge whether some of the employees need extra support to reach their goals for walking to work. Support means giving assistance, encouragement, guidance and motivation to a person. The chances of people walking to work may be enhanced if they get support from family, friends or colleagues. Walking with a friend or colleague can make it a sociable activity, or perhaps make people feel safer. Some issues to consider are:

- Is it possible to put the walkers in touch with each other to give extra support and encouragement? Perhaps in email group or an informal chat over a coffee break?
- Do you need to give some one-to-one encouragement?
- Could you set up a 'buddying' scheme to enable people who live nearby to identify each other and walk to work together?
- It may be a good idea to go back to the list of benefits and barriers now that some employees have made a start in walking to work.
- Are there any simple measures the employer can take to create a supportive walking environment e.g. posters about walking in the staff canteen, free umbrellas for walkers?
- Are the walkers making use of websites that give information and support to walkers?

Contact 3 - Review of goals

At about the half way point (week 5 or 6) it may be a good idea to review the employee's goals. Look back over their short, intermediate and long-term goals and refine them to better suit their capability and how they are currently getting on.

Contact 4 - Follow-up

If an employee feels that they have not kept up the walking to work as originally planned due to some setback then it is a good idea to acknowledge this. Sometimes it takes a few attempts to find out what works and what doesn't. There may be an opportunity to encourage them to try again. Other people may be doing really well so this is a chance to give some praise and encouragement to keep going.

Walk to Work promoter's booklet: sample diary page
Week 1. Week commencing:
Number of employees contacted: _____
Total time spent offering support to walkers: _____ hours _____ minutes
Support offered to walkers:
Issues raised by walkers:
Issues in the workplace:

Appendix 7 Walk to Work promoters' newsletters

Main content of Newsletter 1 for Walk to Work promoters

Thank you for agreeing to take on the role of Walk to Work promoter in your workplace. The aim of this newsletter is to give you some support and encouragement in your role. Please don't hesitate to get in touch with the research team if you have any questions or issues you would like to discuss:

[contact details]

Your role as Walk to Work promoter

We hope by now you have had the opportunity to:

- Distribute the Walk to Work booklets and pedometers to employees who are taking part in the Travel to Work study
- Play the DVD to remind you about the training you received and the role of the Walk to Work promoter

Following the training your main tasks were to:

- Identify which employees would like to incorporate more walking during the journey to and/or from work
- Consider barriers to walking to work and, where possible, identify solutions to suit the individuals concerned
- Help to identify safe walking routes including, if appropriate, combining walking with public transport or 'park and stride'
- Encourage employees to set realistic personal goals
- Encourage self-monitoring using the diaries and/or pedometers

In your second contact with participants, we would like you to focus on the issue of social support (page 11 of the Promoter's booklet).

- Is it possible to put walkers in touch with each other for extra support e.g. an email group or informal chat over a coffee break?
- Do you need to give some one-to-one encouragement?
- Could you set up a 'buddying' scheme to enable people who live nearby to identify each other and walk to/from work together?
- Are you able to refresh any posters about walking to create a supportive walking environment?
- Is the workplace offering any support you can tell people about e.g. free umbrellas, improved washing or drying facilities?
- Are the walkers making use of websites that give information and support to walkers?

By now you will probably realise that some people want more support or encouragement than others. Furthermore, keeping in touch with walkers needs to be done in a way that suits your workplace and the work routines of you and your colleagues. It is fine to adapt the role so that you communicate with employees by email, telephone or in person, and offer them the level of support and encouragement that feels appropriate.

Main content of Newsletter 2 for Walk to Work promoters

Thank you for continuing to support our study in your role as Walk to Work promoter. In this third and final newsletter we provide some more ideas and information which we hope will encourage you as you complete the 10-week programme of support for your colleagues who are taking part. Please don't hesitate to get in touch with the research team if you have any questions or issues you would like to discuss:

[Contact details]

Your role as Walk to Work promoter

We hope you are enjoying the role of Walk to Work promoter. Please let us know if you require any more of the study materials to help you complete the role. These include:

- Booklets
- Pedometers
- The training DVD

We will be pleased to provide them for you.

Throughout the programme the aim has been to encourage people to consider the following issues in order to increase walking in their journeys to and/or from work:

- Barriers and solutions to walking to work
- Safe walking routes including, if appropriate, combining walking with public transport or 'park and stride'
- Realistic short, medium and long-term personal goals
- Self-monitoring using the diaries and/or pedometers

In your final contact with participants, we would like you to follow-up the progress of the participants to see if you can offer any final support or encouragement.

- Some employees may have found it impossible to include more walking in their journey to work. It may require a change of personal or work circumstances beyond their control. It is a good idea to acknowledge this.
- Some employees may have tried but given up walking to work as originally planned due to some set back. Sometimes it takes a few attempts to find out what works and what doesn't. There may be an opportunity to encourage them to try again.
- Other people may be doing really well so this is a chance to give some praise and encouragement to keep going.

Main content of Newsletter 3 for Walk to Work promoters

Your role as Walk to Work promoter

We hope you are enjoying the role of Walk to Work promoter. Please let us know if you require any more of the study materials to help you complete the role. These include:

- Booklets
- Pedometers
- The training DVD

We will be pleased to provide them for you.

Throughout the programme the aim has been to encourage people to consider the following issues in order to increase walking in their journeys to and/or from work:

- Barriers and solutions to walking to work
- Safe walking routes including, if appropriate, combining walking with public transport or 'park and stride'
- Realistic short, medium and long-term personal goals
- Self-monitoring using the diaries and/or pedometers

In your final contact with participants, we would like you to follow-up the progress of the participants to see if you can offer any final support or encouragement.

- Some employees may have found it impossible to include more walking in their journey to work. It may require a change of personal or work circumstances beyond their control. It is a good idea to acknowledge this.
- Some employees may have tried but given up walking to work as originally planned due to some set back. Sometimes it takes a few attempts to find out what works and what doesn't. There may be an opportunity to encourage them to try again.
- Other people may be doing really well so this is a chance to give some praise and encouragement to keep going

Appendix 8 Participant newsletters

Main content of Newsletter 1

Thank you for agreeing to take part in the Travel to Work study in your workplace. The aim of this newsletter is to give you some support and encouragement to increase walking during your journeys to and/or from work role. Please don't hesitate to get in touch with your workplace Walk to Work promoter or the research team if you have any questions or issues you would like to discuss:

[Contact details]

The Walk to Work programme

We hope by now you have had the opportunity to:

- Read the participant booklet – we hope this will encourage you to consider the benefits of walking to work
- Consider barriers to walking to work and, where possible, identify solutions to suit your circumstances
- Identify safe walking routes including, if appropriate, combining walking with public transport or 'park and stride'
- Set realistic personal goals - not everyone can walk to work every day, but it may be possible to include walking in some of your journeys to and/or from work
- Started monitoring your travel behaviour using the diary pages of your booklet and/or the pedometer

At this stage it may help to focus on the issue of social support.

- Would it help to get in touch with colleagues who are walking to work so that you can give each other extra support e.g. an email group or informal chat over a coffee break?
- Have you spoken to family or friends about walking to work, and are they able to help with any barriers, or possible solutions you have identified?
- Would you consider trying a 'buddying' scheme to enable people who live near each other to walk to/from work together?
- Are there posters in your workplace about walking which help to create a supportive walking environment?
- Is the workplace offering any support you can tell people about e.g. free umbrellas, improved washing or drying facilities?

Have you made use of any websites that give information and support to walkers?

You may be interested in the following news stories and research findings.

Walking or cycling to work 'improves well-being'

<http://www.bbc.co.uk/news/health-29175088>

The BBC News website, 14 September 2014, reported on research conducted at the University of East Anglia which examined data from 18,000 UK commuters over 18 years. Active commuters, and public transport users, felt more able to concentrate and under less strain than when travelling by car. Lead researcher Adam Martin said: "Our study shows that the longer people spend commuting in cars, the worse their psychological well-being. And correspondingly, people feel better when they have a longer walk to work." In relation to public transport, he added. "You might think that things like disruption to services or crowds of commuters might have been a cause of considerable stress. But as buses or trains also give people time to relax, read, socialise, and there is usually an associated walk to the bus stop or railway station, it appears to cheer people up." The study findings were published in the journal, Preventive Medicine.

Commuters who shun car travel keep slimmer, study concludes

<http://www.bbc.co.uk/news/health-35812984>

Another article on the BBC News website, 17 March 2016, presented the results of a study undertaken at the London School of Hygiene and Tropical Medicine which measured and weighed around 150,000 UK adults aged 40 or older and asked them to fill in a survey about their typical journey to and from work. The study showed that people who cycle, walk or catch the train or bus to work keep more weight off than commuters who travel by car. Study author Dr Ellen Flint said "This study shows basically that people who do manage to build some level of physical exertion into their commute, even if it's just walking to a bus stop or cycling a short distance, they tend to be less heavy and have less body fat than people who drive all the way to work." She added that it was important that policy makers and town planners make it easy for people to walk and cycle to work.

Resources and websites

One of the best videos outlining the health benefits of including walking in your daily routine can be found here: <http://www.evanshealthlab.com/23-and-12-hours/>

The video lasts about 9 minutes and makes clever use of graphics to show the evidence that walking for about 30 minutes a day can reduce the risk of many health problems.

The following website is useful for further ideas about how to increase social support for walking:

<http://www.walk4life.info/groups>

Using this website, it is possible to create a group or join an existing group. You may also consider setting a challenge for your group such as the total number of miles walked by the group in one month or more.

What's next?

Another short newsletter will be distributed in about 3 weeks. In the meantime, we hope you will use the travel diary to record your journeys to and from work and especially any opportunities you have to increase walking.

Main content of Newsletter 2.

Thank you for taking part in the Travel to Work study. The aim of this second newsletter is to give you some support and encouragement to increase walking during your journeys to and/or from work. Please don't hesitate to get in touch with your workplace Walk to Work promoter, or the research team, if you have any questions or issues you would like to discuss:

[contact details]

Walking to work

You are now about half way through the Walk to Work programme. At this stage it may be a good idea to remind you of the stages we have asked people to consider in order to increase walking in their journeys to and/or from work. These include:

- Consider barriers to walking to work and, where possible, identify solutions to suit the individuals concerned
- Identify safe walking routes including, if appropriate, combining walking with public transport or 'park and stride'
- Set realistic personal goals
- Self-monitoring using the diaries and/or pedometers

Please let the Walk to Work promoter or the research team know if you would like any more of the study materials to help you to increase walking in your journeys to and from work. These include:

- Booklets
- Pedometers

We will be pleased to provide them for you.

At this stage we would like you to focus on the review of goals

- Check your short, intermediate and long-term goals
- Do they need to be changed to better suit your circumstances or any progress you have made in walking to date?
- If you have stopped walking but would like to start again, do you need any help or encouragement to set new goals?
- If you haven't tried to increase your walking yet, it is not too late to start
- Refer to goal setting on page 10 in the 'Taking one step at a time' booklet

You may find the following news stories and research findings interesting.

Goal setting can help you increase your physical activity

<http://www.alexmak.com/blog/the-science-of-new-years-resolutions-do-activity-monitors-actually-help-you-increase-your-physical-activity>

Leading health psychologist Professor Susan Michie and colleagues researched which techniques are most effective at changing behaviour, including physical activity, by exploring data from 44,700 participants across 101 studies. They found self-monitoring was the most effective technique, which is when people keep track of their actual behaviour. This was even more effective when combined

with goal setting techniques including: deciding to set a general goal e.g. walking more; forming a specific goal e.g. walking to work twice a week, and; reviewing and adjusting goals over time.

Are men more motivated by goal setting than women?

<http://www2.le.ac.uk/offices/press/press-releases/2015/july/men-more-likely-to-achieve-targets-if-they-are-set-goals>

Research at the University of Leicester suggests men may be more responsive to goal-setting than women. 109 participants took part in a task for which they were given no goal, a low goal, or a higher goal. The results suggested that having a goal leads to better focus for everyone. However, the men taking part in the study were more motivated by achieving goals than the women. The research was published in Economics Letters, and was funded by the Economic and Social Research Council (ESRC).

Walk 20 minutes to live longer

<http://www.dailymail.co.uk/health/article-2910206/Lack-exercise-kills-TWICE-people-obesity.html>

Mail online, 13 August 2015

A large study of 334,000 people found that a brisk walk of just 20 minutes per day can add years to your life. The researchers said lack of exercise killed twice as many people as obesity. Those who are obese could expect a 16% reduced risk of dying early; and those with a healthy weight could benefit by 30%. Professor Ulf Ekelund, who led the study, said: "Just a small amount of physical activity each day could have substantial health benefits for people who are physically inactive." The study was reported in the American Journal of Clinical Nutrition.

Walking improves creativity

<http://www.goodnewsnetwork.org/give-ideas-legs-study-finds-walking-improves-creativity/>

Have you ever found yourself walking around in order to think? A study by Stanford researchers suggests this urge to move may be important for creative thinking. The research involved 176 students and other adults who were asked to complete tasks commonly used by to assess creative thinking. Creativity levels in people rose by an average of 60% if they walked instead of staying seated. Marily Oppezzo, a Stanford doctoral graduate in educational psychology, said: "This study is another justification for integrating bouts of physical activity into the day. We'd be healthier, and maybe more innovative for it."

Resources and websites

The following website gives 10 useful tips for walking to work:

<http://walking.about.com/od/pedestrians/a/walktoworktips.htm>

Here are some links to free pedometer apps for your smartphone:

<https://itunes.apple.com/gb/app/pedometer++/id712286167?mt=8>

<https://play.google.com/store/apps/details?id=com.tayu.tau.pedometer>

<https://play.google.com/store/apps/details?id=com.runtastic.android.pedometer.lite&hl=en>

Main content of Newsletter 3

Thank you for continuing to be part of the Travel to Work study. In this third and final newsletter are some more ideas and information which we hope will encourage you as you try to include more walking in your journeys to and from work. Please don't hesitate to get in touch with the Walk to Work promoter in your workplace, or the research team, if you have any questions or issues you would like to discuss:

[Contact details]

Walking to Work

Please let the Walk to Work promoter or the research team know if you would like any more of the study materials to help you to increase walking in your journeys to and from work. These include:

- Booklets
- Pedometers

We will be pleased to provide them for you.

Throughout the programme the aim has been to encourage people to consider the following issues in order to increase walking in their journeys to and/or from work:

- Barriers and solutions to walking to work

- Safe walking routes including, if appropriate, combining walking with public transport or 'park and stride'
- Realistic short, medium and long-term personal goals
- Self-monitoring using the diaries and/or pedometers

At this stage we would like you to consider how much progress you have been able to make in increasing walking, and to offer you some final support or encouragement.

- You may have found it impossible to include more walking in your journey to work. If so, you may be able to consider other ways to include walking in your daily routine.
- You may have started to increase walking during your journeys to and from work and then given up due to a set-back. Sometimes it takes a few attempts to find out what works and what doesn't. If you can, it is worth trying again. Many people try more than once before adopting new routines.
- You may now be regularly walking during your commute. If so, well done! We hope you are enjoying your journeys to and from work, and already noticing some of the benefits. Here are some more news stories and research findings to encourage you to walk more in your journeys to and from work.

The health benefits of walking to work

http://www.eurekalert.org/pub_releases/2013-08/icl-wtw080513.php

People who walk to work are less likely to have high blood pressure than those who drive. Researchers at Imperial College London and University College London examined survey data relating to 20,000 people across the UK. People who walk to work were 17% less likely than people who drive to have high blood pressure. The findings were published in the *American Journal of Preventive Medicine*. Anthony Laverty, from the School of Public Health at Imperial College London, said: "This study highlights that building physical activity into the daily routine by walking, cycling or using public transport to get to work is good for personal health."

How long does it take to form a habit?

<https://www.ucl.ac.uk/news/news-articles/0908/09080401>

It takes an average 66 days to form a new habit, according to research by Phillippa Lally and colleagues at University College London and published in the *European Journal of Social Psychology*, 2009. Habits are behaviours which are 'automatic' because they have been performed frequently in the past. The study showed that missing one opportunity did not significantly undermine habit formation, but people who were very inconsistent in performing the new behaviour were less successful. Those who want to form a new habit should specify what they will do and in what situation, and try to be consistent. Over time it will happen more easily and require less effort.

Old commuting habits die hard

<http://phys.org/news/2015-04-commuting-habits-die-hard.html>

Walker et al. Old Habits Die Hard: Travel Habit Formation and Decay During an Office Relocation." *Environment and Behavior*, 2014. DOI: 10.1177/0013916514549619

The way we travel to work often becomes a habit but when the WWF moved office there was an opportunity to encourage staff to make changes: free parking was removed and subsidies were offered for public transport. Around 200 staff members completed surveys which showed: Train use increased from 19% before the move to 56% immediately afterward and remained steady; car use dropped from 55% to 23% and then rose slightly. Even very environmentally conscious people still had the urge to drive after a month, suggesting long-term support is important for people who change to active travel.

Factors that support walking to work

http://www.eurekalert.org/pub_releases/2013-05/ps-wob052913.php

Health researchers suggest that people who walk to work are likely to influence their colleagues and partners to do the same. The wider community and employers also influence whether people choose to actively commute. In the online issue of the *American Journal of Health Behavior*, Melissa Bopp, Penn State Assistant Professor of Kinesiology, and colleagues reported on a study examining the connection between interpersonal relationships and active travel. Having a spouse or co-workers who actively commute had a positive influence on the decision to do the same. Other factors that support active commuting include working for an employer who supports active travel and believing that the community is supportive of pedestrians and bicyclists.

Resources and websites

Some practical advice for walking in winter:

http://www.weightwatchers.com/util/art/index_art.aspx?tabnum=1&art_id=239

Some top tips to make walking part of your everyday life:

<https://www.walkingforhealth.org.uk/keep-walking/top-tips-stay-motivated>

Appendix 9 Participant booklet

Participant booklet: intention formation

Why walk to work?

Walking to work:

- Can be less stressful than driving a car or using public transport
- May not take as long as you think and may even be quicker than other forms of transport
- Can help you get to work on time - you don't have to worry about traffic jams or parking issues
- Makes it easier for you to plan your journey time
- Can save you money – you don't have to pay for fuel or fares

Personal benefits

Taking regular exercise as part of your daily routine can have important health benefits to you. If you become more active on a regular basis you may:

- Reduce your risk of developing heart disease, stroke, some cancers, type 2 diabetes, dementia and osteoporosis
- Help to prevent high blood pressure
- Help to control your weight
- Help to maintain good mental health and cope with stress

Physical activity guidelines

The Department of Health recommends that people should be active on a daily basis. A good way to do this is to build activity into your daily routine - such as walking to work! For general health adults should aim to do 30 minutes of **moderate** intensity physical activity on five days a week. This amounts to 2 hours 30 minutes of physical activity a week. The good news is that activity does not have to be in one go and can be built up in bouts of 10 minutes or more throughout the day.

What is 'moderate intensity' activity?

People have different fitness levels and it is usually wise to start slowly and build up your walking. Moderate activity means that you:

- Feel warm
- Get slightly out of breath but can still carry on a conversation

You don't have to push yourself really hard so that you arrive at work all hot and sweaty. But if you want to increase your exercise, you could speed up on the way home - it's cheaper than the gym!

Caring for your environment

Walking to work can play an important role in improving the quality of our environment. Motor vehicles contribute to traffic congestion and road danger, and increase noise levels in the city. Motor vehicles also contribute to air pollution by emitting harmful exhaust fumes. Car engines can take some time to warm up and the emissions are greatest when the engine is cold. A great way to contribute to reducing air pollution is to walk instead of using the car for short journeys.

Saving money

Although using the car can be convenient, high fuel and parking costs can make it expensive especially for short trips. The annual average cost of commuting to work by car is £2,500. Leaving the car at home could save you money.

Combining walking with public transport

Some people will not be able to walk all the way to work. For longer trips, it may be possible to make part of the journey by public transport. Research has shown that combining walking with trains or buses can help people to meet the recommended physical activity levels.

What will motivate you?

There are lots of reasons to consider walking to work. Different people have different motivations:

- Improving health
- Saving money
- Feeling good
- Guaranteed journey time
- A less stressful journey
- Concern for the environment
- Keeping fit
- Losing weight or controlling weight gain

Participant booklet: identifying barriers and solutions	
Getting ready to make your journey to work active If you are considering walking to work, write down what you consider to be the main benefits and barriers for you in walking to work	
Benefits	Barriers
<i>E.g. Avoiding the traffic jam</i>	<i>E.g. Need to take children to school</i>
Weigh it up If you've listed more benefits than barriers, you're on the road to becoming a healthier commuter. If you've listed more barriers than benefits - read on for some tips on how to minimise them. Some barriers and solutions Here we set out some possible solutions to barriers that people often mention when they are asked about walking to work.	
Barriers	Solutions
I need to take the children to school	Could you share this with someone so that you could walk to work every other day? If they are older, and their route to school is safe, could you trust them to walk to school with friends?
I've got a lot to carry	Lots of us carry things backwards and forwards to work and hardly look at them. Empty your bag or briefcase and only carry the stuff you need for the day. If you do need to carry a lot, have you considered using a rucksack? Rucksacks are better for your posture and are also good for carrying the odd bit of shopping on the way home.
I need to wear smart shoes at work	That's an easy one. Leave your smart shoes somewhere safe at work e.g. in your desk drawer or locker and wear walking shoes for the journey— they all do it in New York!
I'm not very fit	You don't really need to be very fit to start walking, and you can build up your fitness in stages. For example, try walking to work and back on 1 day the first week, 2 days the second week, 3 days the third week and so on
I need my car for work	Do you actually need your car every day for work? Are there some days you could leave car at home if you do not have any meetings out of the office planned?
List your own barriers and proposed solutions here	
Barriers	Solutions

Participant booklet: goal setting

Getting started with goal setting

You may be ready to start walking to work every day or you may decide to start gradually and work your way up. About 15 minutes walking in the morning and again in the evening is a suitable goal if you're not very active at the moment.

Example 1

Jackie lives about 2 miles away from work and currently drives but wants to stop using her car for the journey to and from work. There is a possible bus but in the long term she would like to walk as much as possible.

Short term: Pick two days to catch the bus to work and walk back, and drive the rest of the week.

Intermediate (in one month): Walk to and from work one day a week; catch the bus to work and walk home two days per week, and; drive the rest of the week.

Long term (in three months' time): Walk to and from work at least three times a week.

Example 2

Chris lives 6 miles away from work and currently drives. He would like to walk some of the way as a means of getting fitter but there is no convenient public transport.

Short term Pick one day to park 1 mile from the workplace and walk to and from the car to the workplace.

Intermediate (in one month): Pick three days a 1 mile from the workplace and walk to and from workplace.

Long term (in three months' time): Park the car further away (1.5 miles from the workplace) and walk to and from the car to the workplace at least three days a week.

Setting your own goals

- Write your goals in the table below. Maybe the number of times you want to walk to work or the number of steps if you are using a pedometer.
- Make sure the goals are **realistic for you** (you can review them in a few weeks).
- Be **flexible** as some weeks will just not work out the way you plan. If you can't walk for a few days due to illness or a holiday, just start again when you can.
- **Don't feel guilty** if things don't go well at first. Just re-plan for the next week. The most important aim is to walk to work on a regular basis over the longer term. If you miss a day here and there, it won't make a big difference. If you need to reset your goals, think through more realistic goals and chart them on a new sheet.
- Decide on what your long-term goal is – what you want to be doing in three months and how you might be able to achieve this in stages.

Short term**Intermediate (in one month)****Long term (in three months)****Participant booklet: self-monitoring****Monitoring your progress**

A good way to monitor how many steps you do in a day and encourage you to increase the distance walked is by using a pedometer. To estimate your daily step count, clip a pedometer to

your belt or waistband in the morning and wear it until you go to bed at night.

It has been estimated that the average person walks between 3,000 and 4,000 steps per day. Walking 10,000 steps a day can really improve your health but it may take a while to work up to it!

Build up your steps gradually, by adding a few more steps every so often, until you're regularly walking 10,000 steps a day. Set yourself a reasonable target - perhaps an extra 1,000 per day (10 minutes walking) during the first week. There is space at the back of this booklet to record the number of steps each night to help you keep track.

Tracking your progress

Research has shown that tracking your progress can help you to achieve your goals. One way to do this is by keeping a diary. In the pages that follow we have given you a 'page a week' diary to record information about your journey to and from work and any comments about your journey, for example:

- How you travelled to and from work.
- Brief notes about your journey to work e.g. Why did you use this method? Did you combine the journey home with other activities e.g. shopping?
- If you decide to use a pedometer, you can also record the number of steps walked per day.

On the following pages, there is a travel diary where you can record your journeys. This is for your own personal use and we will not collect it from you, although we will interview some people about their experiences of trying to increase walking during their journey to and from work.

Participant booklet: Self-monitoring diary page				
Week 1	Journey	Method of travel <i>(Please circle all methods used)</i>		Any comments? <i>(If you are using a pedometer, you might like to fill in the number of steps)</i>
Mon	To work	Walk Car Other	Cycle Train Bus	
	Back home	Walk Car Other	Cycle Train Bus	
Tues	To work	Walk Car Other	Cycle Train Bus	
	Back home	Walk Car Other	Cycle Train Bus	
Wed	To work	Walk Car Other	Cycle Train Bus	
	Back home	Walk Car Other	Cycle Train Bus	
Thurs	To work	Walk Car Other	Cycle Train Bus	
	Back home	Walk Car Other	Cycle Train Bus	
Continued through to Sunday				

Participant booklet: general encouragement and social support

Support and encouragement

The chances of people walking to work may be helped by getting support from family, friends or colleagues at work. Can anyone help with the school run? Is it possible to walk part of the route with a colleague? What about some competition between walkers?

Comfort and safety considerations

A waterproof jacket or umbrella can help to keep you warm and dry, and a rucksack is a great way to carry things when you are walking. You might find it better to wear training shoes or walking shoes to keep your feet dry and comfortable and keep a spare pair at work.

Safety during your journey to work is an important issue. If you feel nervous in quieter areas, you may be able to find a route with more people about, or ask a friend or colleague to walk with you. Wearing reflective clothing can help road users to see you.

Useful websites

The following websites give useful information and encouragement to people who want to be more active and walk to work:

- maps.google.co.uk - can be used as a walking route planner
- www.livingstreets.org.uk - lots of resources to encourage walking
- www.walk4life.info - find a walk and track your progress
- www.nhs.uk/Livewell/loseweight/Pages/10000stepschallenge.aspx - information and encouragement to increase your daily step count
- <http://www.walkingforhealth.org.uk/> - support to get active, stay active
- <http://traveline.info/> - sustainable travel advice
- www.sustrans.org.uk - lots of information about healthy active travel
- www.dft.gov.uk/think - the government's road safety campaign website

Appendix 10 Walk to Work employers' pack

Walk to Work: letter to employers

Thank you for your interest and support for the Travel to Work study in which we are examining the way people travel to and from work. We are pleased to say your workplace has been randomised to receive the Walk to Work programme. This means a Walk to Work promoter from your workplace will receive brief training and will then contact employees who are taking part in the study to provide them with information about including more walking in their commute. Those who are interested will be offered support and encouragement by the Walk to Work Promoter during the following 10-weeks of the programme.

This **Walk to Work Employer's Pack** contains three booklets. Two of the booklets are for information only: 'Taking One Step at a Time' is for employees taking part in the study, and the Walk to Work Promoter's booklet provides guidance for the promoter. The third booklet is for you as an employer/manager.

The Employer's Booklet contains information about the benefits of walking to work, and ideas about the ways in which employers/managers may be able to provide support for walkers. These range from putting up posters, to offering financial incentives or improving washing facilities. The ability of workplaces to implement these ideas depends on many factors including the size and structure of the workplace and work routines. However, **we hope you will be able to consider whether some of the ideas could be implemented to support the role of the Walk to Work promoter in your workplace.** There is also space for you to comment on any barriers, opportunities or costs involved. In addition, the Walk to Work Employer's pack contains posters to encourage walking to work. We have also provided these for the Walk to Work promoter who may require your permission to display them in appropriate places in your workplace.

We will contact you soon (by telephone and/or email) to give you the opportunity to raise any issues or queries about the Employers Pack. In addition, please do not hesitate to contact me (my contact details are above) or your local researcher (see below) if you have any questions or suggestions about the study and the Walk to Work programme.

[contact details]

Walk to Work: main content of employers' booklet

Introduction

This booklet provides guidance for employers who are taking part in the Travel to Work study and have been asked to support walking to work. We hope you find the information useful. In addition, posters will be provided for display in the workplace.

The Travel to Work study

The aim of this study is to examine whether it is possible to increase the amount of walking that people do during their journey to and from work. **Walk to Work promoters** will be recruited and trained to encourage other employees to walk to work. Those living further away will be encouraged to combine public transport with walking, or to park their cars further away and walk the rest of the journey. Everyone taking part in the study will be given the **Taking one step at a time** booklet and a pedometer. Those who want to try to increase walking will be helped to identify safe routes and encouraged to set goals for walking to work. Extra encouragement will be provided through regular contacts from the Walk to Work promoters over a 10-week period.

Walking to work: Benefits to the employer

There are potential benefits to employers if their employees increase walking during the daily commute. These benefits may include:

- Increased concentration and mental alertness of staff
- Better timekeeping because of greater certainty over the timing of the journey
- Improved public image as a result of being seen to support the environment
- Reduced demand for car parking space
- Contribution to the organisation's sustainability objectives
- Improved health and wellbeing of staff, leading to reduced absenteeism and increased productivity
- Reduced employee stress

- Improved team spirit amongst employees who support each other to walk to work

Benefits for the employee

Some employers may feel it is not really 'their business' to say how their employees get to work. However, taking a genuine interest in the health and wellbeing of employees can contribute to staff morale. It is worth thinking about how employees can benefit from incorporating more walking within their journey to work.

Walking as active 'transport'

Walking is such a familiar activity that people may not think of it as transport, but it has many benefits as a method of 'active transport'. Walking:

- Does not require high fitness levels
- Can be done at a pace that suits the individual
- Can be done by most people of all ages
- Can be less stressful than driving a car or using public transport
- May not take as long as people think, and may even be quicker than other forms of transport
- Makes it easier to plan journey times and get to work on time
- Does not involve worries about traffic jams and parking issues
- Is free and can save money on fuel, parking or the cost of fares

Cycling is often promoted as an alternative to car use, but there are good reasons to promote walking for those who are not keen to cycle:

- It is perceived as a safer and cheaper option
- No special equipment is required
- Walking is less likely to involve direct competition with motorised traffic for road space
- For longer journeys, walking can more easily be combined with other transport modes such as buses and trains

Physical activity guidelines

The Department of Health recommends that people should be active every day. A good way to do this is to build activity into the daily routine - such as walking to work. For general health, adults should aim for 30 minutes of **moderate** intensity physical activity five times a week. This activity can be built up in bouts of 10 minutes or more throughout the week. Walking to work can be a great way to reach these targets. Adults should also minimise the amount of time spent being sedentary (sitting) for extended periods. Helping more staff to walk all or part of their journey to work is a low-cost strategy for improving their physical and mental health.

A daily commute on foot can:

- Reduce the risk of developing heart disease, stroke, some cancers, type 2 diabetes, dementia and osteoporosis
- Help prevent high blood pressure
- Help control your weight
- Help maintain good mental health and ability to cope with stress

Encouraging walking to work during the Travel to Work study

As an employer it may seem difficult to know how to promote walking to work. This is a challenge faced by other employers and managers. Below there are some ideas that you may be able to implement in your workplace to support people who want to try walking to work.

Recruiting and encouraging a Walk to Work promoter

The Walk to Work promoter needs to be enthusiastic about walking, and able to provide support and encouragement to others. For the Travel to Work study, the promoter will be trained by the research team and provided with resources to support walkers. They also need to be given time and support to perform the role in the workplace. Trying to change travel behaviour is a difficult task, so remember to give some acknowledgement and praise for their efforts.

Flexible working hours

Flexible working hours may enable employees to combine their other responsibilities with the walk to work e.g. the 'school run' or other caring responsibilities. It is also helpful if work patterns can be adjusted to fit with public transport e.g. train or bus timetables. Supporting staff in this way can mean a happier, more loyal workforce.

Providing bus and train information

Providing information about the nearest bus stops and train stations, as well as calculating the distances and best routes to the workplace, can reassure employees that some journeys are more straightforward than they may have thought. Keeping some up-to-date bus and train timetables on site will help people to plan their commute and include some walking in their journey to work. Consider setting up travel champions to be experts in their chosen mode of travel (e.g. bus, train, 'park and stride'), who are able to give information about transport routes, timetables and maps of the area.

Combining active travel and public transport can help adults achieve their physical activity levels. A brisk 10-minute walk to and from the bus stop every day will make an important contribution to their physical activity levels and has important health benefits.

Discounts or subsidies for public transport may encourage employees to change their travel behaviour. If an employee gives up a valuable parking space, are you able to pass on the saving to them? Alternatively, check if the local bus or train operator is willing to offer discounted tickets.

Local distances to the workplace

Many people overestimate distances and the amount of time it would take them to walk. The Walk to Work promoter will be given posters which can be adapted to include estimated distances and times for walking from local transport stations to the main entrance of the workplace. It may help if these are displayed in prominent areas of the workplace. Google Maps or Walkit.com can help with calculating walking distances and routes. It usually takes a healthy adult 15-20 minutes to walk one mile. If public transport information and walking directions are promoted as the preferred mode of travel for visitors in all company literature, employees may be more inclined to accept active travel messages for themselves.

Mileage allowances for walkers as well as motorists

Many employers pay a mileage allowance for people who use their cars for company business. Some employers are now encouraging active travel by including a mileage allowance for cyclists. Why not be one of the first employers to provide a mileage allowance for those who walk to meetings? Allowing 15-20 minutes to walk a mile between meetings gives 'thinking time' that is not always possible when having to concentrate on driving or cycling. At 20p per mile a 'walking allowance' will not cost the business much, but is a strong statement of support for walking as active travel.

How to make parking restraints more acceptable

Introducing car parking restraints (e.g. permits and charges, or fewer parking spaces) can cause tension in the workplace. However, it is one of the most important influences in how employees travel to work. Below are some ideas which may help to make this more acceptable.

- **Provide information about how savings/revenue will be used to support employees to use other methods of travel**, for example:
 - subsidised bus or train passes
 - subsidised walking shoes or wet weather clothing (you may be able to negotiate a discount with a local shop)
 - free rucksacks for carrying laptops and papers
- **Improve facilities to support active travel**, for example:
 - lockers
 - cloakroom facilities with drying space for coats and jackets
 - wash basins in private cubicles to enable employees to 'freshen up' in privacy on arrival at work
- **Give incentives**, for example:
 - provide free umbrellas, shoe bags, torches, reflective clothing or strips (you may want to add your workplace logo)
 - instigate and publicise a 'walking mileage allowance', for example 20p per mile

Communication and support

It is important to communicate regularly with employees about travel related issues. For example:

- Give regular information about ideas, competitions and events (such as Walk to Work week)
- Provide the latest information about public transport timetables
- Remind employees about special offers you have negotiated with local shops or any 'freebies' you are giving to walkers
- Encourage employees who live in the same locality to consider walking together
- Refresh any posters to keep the information up to date

- Set up an internal communication system (e.g. intranet site) to give real-time information on public transport and timetable changes

Financial help for employers

It is worth contacting the local authority, regional Travel Plan coordinator or a relevant third sector organisation to see if there are any grants or funds available for employers who are promoting sustainable travel. For example, matched funds may be available for lockers or improvements to washing facilities.

Useful websites

The following websites give useful information and encouragement to people who want to be more active and walk to work:

- maps.google.co.uk - can be used as a walking route planner
- www.livingstreets.org.uk - lots of resources to encourage walking
- www.walk4life.info - find a walk and track your progress
- www.nhs.uk/Livewell/loseweight/Pages/10000stepschallenge.aspx - information and encouragement to increase your daily step count
- <http://www.walkingforhealth.org.uk/> - support to get active, stay active
- <http://traveline.info/> - sustainable travel advice
- www.sustrans.org.uk - lots of information about healthy active travel
- www.dft.gov.uk/think - the government's road safety campaign website

Employers' booklet: sections for recording support for walking

Recording support for your Walk to Work promoter and employees

We hope you find the booklets and resources helpful in encouraging employees to increase walking during their journey to work. We would be grateful if you would note any measures you have taken to support the Walk to Work promoter in your workplace as part of the Travel to Work study. We would like to assess the time and cost involved for employers and managers in trying to support active travel, as well as the opportunities and barriers involved when trying to promote walking during the journey to work. We know it is not easy to change travel behaviour and so the information you provide is valuable to us.

Please record in the table below any measures you have taken to support the Walk to Work promoter and your employees to increase walking during the journey to and from work. In the cost column, please write '0' if there is no cost to the workplace, or 'not known' if you do not know the relevant cost.

Financial

Activity	Please give brief details of what was done and any opportunities or barriers	Cost to workplace
Subsidising public transport use		£_____
Subsidising shoes or wet weather clothing		£_____
Negotiating discounts with local outdoors/sports shops		£_____
Walking mileage allowance		£_____
Other financial incentives/items given to employees		£_____

Facilities

Activity	Please give brief details of what was done and any opportunities or barriers	Cost to workplace
----------	--	-------------------

Provision of lockers and storage		£ _____
Improvements to cloakrooms / drying facilities / washing facilities		£ _____
Other facilities provided or upgraded		£ _____
Please also give brief details of other support given for walking to work		
Information and support		
Encouragement given to Walk to Work promoter		
Walking competitions, events		
Calculating and/or providing distances to the workplace		
Providing public transport timetables and information		
Posters displayed in key areas to promote walking to work		
Other information or support for employees about walking to work		
Employee contracts		
Changes to working hours		
While you have been taking part in the Walk to Work study, have you been successful in gaining any funds to promote walking to work?		
Financial – income or savings		
Activity	Please give brief details of what was done and any opportunities or barriers	Income/ savings to workplace
Funding gained to support walk to work initiatives		£ _____
Any other income or savings from changes linked to promoting walking to work		£ _____
<p>After the 10-week period in which the Walk to Work promoter undertakes their role, we will contact you with a short questionnaire to complete about any measures you have been able to implement as an employer/manager, and the opportunities and barriers to promoting walking to work in your workplace. We may also ask if you are willing to be interviewed. You may find your notes in the table above helpful in prompting your memory.</p> <p>Thank you for your interest and support for the Travel to Work study.</p>		

Appendix 11 Example of interview topic guide

Interview topic guide: employees in intervention arm	
<p><i>Thank you for agreeing to be interviewed. I would like to hear your views about the Walk to Work scheme and whether it is possible for workplaces to encourage people to increase the amount of walking in their journey to and from work. We will be recording the discussion but what you say will be confidential. If we quote anything you say, we will use an ID number and not your name or your company's name. Please be as honest as you can.</i></p>	
a) Influences on travelling to work	<p>I would like to start by asking what you think are the most important influences on the way people travel to work. (PROMPT: Personal, family, job, workplace location, public transport, working hours)</p>
b) The Walk to Work scheme	<p><i>In your workplace, has a Walk to Work promoter contacted you about walking to work?</i></p> <p>If no Did you know if there was a Walk to Work promoter (workplace contact) in your workplace? If there was, can you think of any reasons why they may not have contacted you?</p> <p>If yes <i>How did they contact you (face to face, email, telephone)?</i> How many times did the Walk to Work promoter (workplace contact) contact you to encourage you to walk to work? Where and when did the contacts take place? How useful were these contacts?</p> <p>Overall, what are your views about the idea of having a Walk to Work promoter in the workplace?</p>
<u>Taking one step at a time booklet</u>	
Were you given a 'Taking one step at a time ...' booklet? (<i>Show the booklet</i>)	
If no	<p>Did you know anyone else who was given the booklet? Can you think of any reasons why you did not receive one? (<i>Now continue to pedometer section on the next page</i>)</p>
If yes	<p>What did you think of the booklet? Did you use the booklet at all?</p>
If no,	<p>What were the main reasons why you didn't use the booklet? (<i>Now continue to pedometer section on the next page</i>)</p>
If yes	<p>When did you use the booklets (PROMPT: at the start or all the way through) Did you list the benefits and barriers and possible solutions for you to walk to work? If yes, can you give examples of barriers and solutions which did/did not work for you? Did you set goals for yourself? (PROMPT: Short, intermediate and long term goals) If yes, what goals did you set? Did you find it helpful? If no, why not?</p> <p>Did you need to review your goals? If yes, can you describe what you needed to change?</p> <p>Did you experience any setbacks that may have stopped you walking to work? If yes, what happened? Did you overcome the setback and start walking to work again? If yes, what did you do?</p> <p>Did you record your progress in the diary pages at the back of the booklet? If yes, did you find it helpful? If no, why not?</p> <p>Did you look at any of the websites suggested in the booklet (page 24)? If yes, which ones? Were they helpful? If no, why not?</p> <p>Can you think of anything else we could include in the booklet that would be helpful?</p>
<u>Pedometer</u>	

Were you given a pedometer / or did you download a free pedometer on your smartphone?

If no Did you know anyone else who was given/downloaded a pedometer?

Can you think of any reasons why you did not receive or download a pedometer?

If yes Did you record your steps in the diary?

Did you find the pedometer helpful?

If yes, why?

If no, why not?

Newsletters

Did you receive the newsletters at each of the contact points? (*Show sample newsletters*)

If no Did you know anyone else who received newsletters?

Can you think of any reasons why you did not receive them?

If yes Did you find them helpful? What did you like/dislike about them?

Did you receive them by email/post/both?

Do you prefer email/post or both?

Can you think of anything else we could include in the newsletters which would be helpful?

c) Support in your workplace

Did you notice any changes in your workplace during the scheme (PROMPT: posters, bus or train timetables, workplace facilities, competitions, financial incentives?)

If yes, what were they?

Did you find them helpful?

If yes, how?

If no, why not?

Have you received any other support to encourage you to walk to work?

If yes, what? (PROMPT: Employer, work colleagues, family, friends)

Do you think that support in the workplace can be effective in encouraging some people to walk to work?

If yes, why?

If no, why not?

d) Walking to work

Thank you for filling in Questionnaire 2.

EITHER: I understand you **HAVE NOT** increased the amount you walked to work.

What were the main reasons for not increasing the amount you walk to work?

Can you think of anything that would make it easier for you to walk to work?

If yes, what?

Could we have done anything differently in the Walk to Work scheme to help you to increase your walking to work?

OR: I understand you **HAVE** increased walking to work.

Can you tell us how much walking you do now compared with what you were doing before the scheme?

How do you decide whether or not you're going to walk to work on a given day?

Would you say it is part of your daily, weekly, monthly routine?

Do you think you will maintain this increase in walking to work?

Do you do anything to encourage yourself to keep walking to work when other options may seem more attractive?

Finally, is there anything else you would like to say about travel to work or about walking before we end the interview?

Thank you for your help with our research.

A decorative graphic consisting of numerous thin, parallel green lines that curve from the left side of the page towards the right, creating a sense of movement and depth.

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