Systematic review and narrative synthesis of the effectiveness of local interventions to promote cycling and walking for recreational and travel purposes.

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CONTENTS

ABBREVIATIONS

ADNFS	Allied Dunbar National Fitness Survey
ANOVA	Analyses of Variance
APN	Advanced Practice Nurse
BA	Before and After
BMI	Body Mass Index
CI	Confidence Interval
CS	Cross-Sectional
CVD	Cardiovascular Disease
CVM	College of Veterinary Medicine
ER	Evaluation Report
ET	Enhanced Treatment
EU	European Union
FEV_1	Forced Expiratory Volume per one second
FLP	Fitness for Living Programme
FVC	Forced Vital Capacity
GCT	Grand Canyon Trekkers
GP	General Practitioner
GWKW	Get Walking Keep Walking
HEAC	Health Enhancing Active Community
IPAQ	International Physical Activity Questionnaire
ITS	Interrupted Time Series
ITT	Intention to Treat
IVF	In Vitro Fertilisation
LD	LEE-DESU
LGA	Latent Growth Analysis
MI	Motivational Interviewing
MT	Minimal Treatment
nRCT	non-Randomised Controlled Trial
OR	Odds Ratio
PA	Physical Activity
PACER	Progressive Aerobic Cardiovascular Endurance Run
PALS	Pet Assisted Love and Support
PANAS	Positive and Negative Affect Schedule
PBC	Perceived Behavioural Control
RCT	Randomised Controlled Trial
SCT	Social Cognitive Theory
SE	Standard Error
SD	Standard Deviation
SIMD	Scottish Index of Multiple Deprivation
TLRN	Transport for London Road Network
TTM	Transtheoretical Model
RCT	Randomised Controlled Trial
MVPA	Moderate or Vigorous Physical Activities
WHR	Waist-to-Hip Ratio
WTWD	Walk to Work Day

WSB	Walking School Bus
WWW	Walking for Well-being

EXECUTIVE SUMMARY

Introduction

This review was undertaken to support the development of guidance on walking and cycling: local measures to promote walking and cycling as forms of travel or recreation, and aims to review the evidence on the effectiveness of local interventions. This review will be supported by further work looking at qualitative and economic evidence.

Research questions

Question 1: Which local interventions are effective and cost effective at promoting and increasing cycling and walking for recreational and travel purposes?

Question 2: Which local interventions are effective and cost effective at changing population-level norms and behaviour in relation to cycling and walking for recreational and travel purposes?

Methods

Full details of all methods used are given in the main report.

Summary of study identification

All search results were downloaded to Reference Manager. Potentially relevant papers were identified through the initial searches, and full papers were obtained. Citation searching of key papers as well as scrutinising reference lists and searching on key UK programmes was also carried out. Papers were also suggested by stakeholders. It is important to note that some studies included in recent UK reviews of walking and/or cycling interventions (e.g. Ogilvie 2007, Yang 2010) have not been included as they consisted of documents which could not be obtained (e.g. PhD thesis), or documents written in languages other than English.

Summary of identified research

In total 118 papers were selected for inclusion in the review. 70 effectiveness papers were identified through the initial database searches, 2 through citation searches and one through additional targeting searching, with 25 additional papers identified through scrutinising reference lists and 20 identified by the stakeholders group (additional papers not already identified through searching; Table 2). A full list of included studies is given in Appendix 3. The majority of studies identified were interventions to encourage walking (n=75) with fewer studies focusing on cycling (n=9) or walking and cycling (n=34). Most studies did not distinguish between walking and/or cycling for leisure or transport and so have been reported as addressing both. The two main exceptions to this were interventions which consisted of walking for leisure (n=16), or walking and/or cycling for active travel, mostly to reach school or the workplace (n=47; 4 cycling papers, 12 walking papers, and 31 walking and cycling papers). As discussed above, there were initial concerns over the cycling search terms, but considerable efforts were made to ensure that relevant cycling papers were not overlooked (section 3.1). The possible reasons for the smaller quantity of cycling papers are discussed in Chapter 7. In addition, further reviews which will be presented for the development of this programme guidance will include qualitative papers, surveys, correlates papers, and health economic literature where the split between walking and cycling papers appears more balanced at this stage.

We grouped similar interventions, which we have defined as follows:

- Media campaigns: mass media campaigns targeting the whole population and delivered via a variety of media.
- Health information: targeted programmes providing information tailored to individuals delivered via media such as telephone, email and the internet;
- Multi component interventions: interventions which were delivered as large components consisting of a variety of elements;
- Walking sessions: interventions which were delivered as walking sessions including led walks, motivation to walk independently, and stair walking;
- Pedometer interventions: interventions which used pedometers to encourage walking;
- Motivational interventions: interventions where the main component of the intervention consisted of a motivational element, such as counselling sessions to encourage walking.

It is accepted that the grouping of interventions is subjective and there is no definitive way of representing this. The method used was arrived at post hoc by considering how guidance arising (in part) from this review might be usefully subdivided in respect of implementation by a local public health unit. Accordingly it looked at the possible categorisation of evidence and guidance from viewpoint of its usefulness to a Director of Public Health serving both local authority and NHS. Thus, a local public health unit might have a team (or person) responsible for: health information/publicity; exercise / activity health promotion workers (such as health trainers); etc. Within these, interventions may be targeted or directed at schools, workplace, local communities, each with specific relevant public health staff responsible for them. However, it is acknowledged that there are many other possible ways of grouping these interventions, each with its own pros and cons.

In addition, for each intervention type we reported interventions which measured population level change in related outcomes and those which measured change at an individual level.

Research questions for which no evidence was identified

Considerably fewer cycling rather than walking papers were identified. As discussed above, there were initial concerns over the cycling search terms, but considerable efforts were made to ensure that relevant cycling papers were not overlooked (section 3.1). We excluded a number of papers reporting on cycling interventions (including substantial numbers of references submitted by stakeholders) which reported only on the content of the intervention and did not report effectiveness data. Therefore they were out of the scope of this review but may be appropriate to inform the guidance either through our subsequent reviews or additional means (expert testimonies etc).

Adverse or unexpected outcomes

None of the papers included in this review reported adverse outcomes for the intervention groups in their study.

Applicability in the UK context

We identified 46 papers reported on studies conducted in the UK (although 18 of these reported on the Travelsmart intervention), with the largest other groups being conducted in the USA (n=39) and Australia (Aus) (n=22). Further papers reported studies conducted in Canada (n=4); Japan (n=2); Belgium (n=1); Sweden (n=1); and New Zealand (n=1). Each study population varied but in general studies conducted in Australia or New Zealand and the USA and Canada, as well as the European studies are likely to be applicable in the UK to a reasonable extent, although some will be more applicable than others depending on the exact population studied. In particular several studies conducted in the US were in Latino or Mexican populations (Mier 2011, Avila 1994, Hawthorne 2011, Kong 2010), or African Americans (Parker 2011, Wilbur 2003 and 2008) which are ethnic groups not directly represented in the UK, and so the applicability of the results of these studies to the UK population may be questioned. In addition particular care should be taken when considering the likely applicability of the results of the few studies conducted in Japan and Korea. In addition the importance of intervention context to the applicability of interventions (for example community versus school, university or workplace settings) must be considered, and may have greater impact than the country of origin of each study.

Implications of the review findings

Whilst interpretation of this evidence is to an extent subjective and must be left to the PDG in terms of developing its guidance, an attempt is made here to develop a high-level summary and synthesis. We consider the evidence first by the volume of literature by main outcome measure (increases in walking, cycling, or walking and cycling), and then by the overall effectiveness of each intervention type: provision of health promotion information (either through mass media or interventions targeted at individuals), large multi component programmes, and walking sessions (led or independent, with or without a pedometer).

Walking: The literature which provides evidence for the effectiveness of interventions to increase walking for travel and/or leisure is well developed including large multi-component interventions and provision of health information, along with smaller scale interventions such as walking groups, the provision of pedometers or motivational interventions. The vast majority of the evidence reported positive effects on walking although one mass media intervention failed to show an effect on walking, 2 multi component interventions showed mixed effects, one work place based walking session intervention showed no effect, as did two workplace pedometer interventions. This evidence will be supported by qualitative and economic data in subsequent reviews for this programme of evidence. The evidence is summarised in table 15 (main report). It is not clear from the evidence whether effects persist in the longer term (after completion of an intervention), nor whether there are particular aspects of certain interventions which made them particularly successful.

Cycling: The literature which provides evidence for the effectiveness of interventions to increase cycling for travel and/or leisure is more limited, although all the studies we identified reported on large multi component interventions or the provision of health information through mass media campaigns (no targeted health information interventions were identified) which are likely to have greater impact compared to the smaller interventions (such as those identified to increase walking). All the evidence identified showed positive effects on cycling and studies were followed up to show that effects persisted post intervention (for several years in some cases). It is not clear what particular aspects of these interventions had the most effect on their positive outcomes. This evidence will be supported by qualitative and economic data in subsequent reviews for this programme of evidence. The evidence is summarised in table 16 (main report).

Walking and cycling: The interventions which aimed to increase both walking and cycling was also limited, but consisted of multi component interventions or the provision of health information (in multi-media or targeted interventions) which may be likely to have the greatest impact. Most of the evidence identified showed positive effects on walking, but the effect of targeted health information interventions on cycling was unclear. Mixed effects on both walking and cycling were seen for the multi-component interventions but the quality of the evidence was mixed. Studies were followed up to show that effects persisted post intervention (for several years in some cases). It is not clear what particular aspects of these interventions had the most effect on their positive outcomes. This evidence will be supported by qualitative and economic data in subsequent reviews for this programme of evidence. The evidence is summarised in table 17 (main report).

The evidence on interventions to increase walking and cycling should be considered independently of that to increase just walking or just cycling as the sum of each intervention may be greater than its constituent walking and cycling parts.

Effectiveness by type of intervention: We can also briefly consider the overall effectiveness of interventions groups by type:

The provision of health promotion information: Over all, mass media interventions seem to be effective at increasing walking, but targeted messages seem to be still more effective in a variety of settings. Evidence is less clear about the effectiveness in respect of increasing cycling or where the aim is to increase both walking and cycling.

Large multi component programmes: Multi-component interventions are generally effective at increasing walking and cycling. It is, however, hard to “dissect” which specific components of these interventions are most important – and indeed it may be that the whole is greater than the sum of the parts.

Walking Sessions: These can be broadly divided into those that are not specifically pedometer-based, and those in which the use of a pedometer is a key part of the intervention. Those without a pedometer a broadly effective at increasing walking, but the effectiveness seems to vary by setting (community, workplace, school etc.) Those using a pedometer are more universally effective in all settings, but a key question (not answered by this literature) is how much using a pedometer adds to the basic walking session interventions.

EVIDENCE STATEMENTS

POPULATION LEVEL CHANGE

EVIDENCE STATEMENT 1A. POPULATION LEVEL CHANGE IN MASS MEDIA INTERVENTIONS TO INCREASE WALKING

Moderate evidence from 3 studies suggests that mass media interventions (which included paid advertisements [TV, radio, cable, newspapers], billboards/posters, public relations, educational activities and community participation), delivered in the community are effective in increasing population levels of walking for leisure or travel in adults up to one year post intervention. Two nRCTs showed positive effects on walking. Only one BA study showed no effect on walking and the reporting of data in this study was poor (Wimbush 1998).

Reger-Nash 2005 (nRCT [++] Aus n=750, 12 months) [*Paid advertisements (TV, radio, cable, newspapers), public relations and community participation*]. Intervention population were more likely than control population to have increased daily walking: OR=1.72, 95%CI 1.01-2.95.
Reger 2002 (nRCT [+] USA n=1472, 8 weeks) [*Paid advertising, public relations events to generate media coverage, public health educational activities at work sites, churches and local organisations*]. 23% increase in walking observations in the intervention community versus a 6% decrease in the comparison community: OR 1.31, 95% CI 1.14 – 1.50, p<0.001.
Wimbush 1998 (BA [+] UK n=3476, 12 months) [*40 second TV advert supported by a telephone helpline*]. No change in number of days walking: 4.26 in 1995 and 4.13 in 1996, no significance statistics given.

The population level evidence on mass media interventions to increase walking is partially applicable to the UK as one study was conducted in the UK. The differing environment in Australia and the US must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 2A: POPULATION LEVEL CHANGE IN MASS MEDIA INTERVENTIONS TO INCREASE CYCLING

Moderate evidence from one BA study suggests that a mass media intervention can increase population level awareness of a cycle trail and recall of intervention messages at 3 months post intervention. Media components included local press adverts (including 6 main community language newspapers), map of the trail, promotion on local radio, full colour brochure distributed to local organisations, factories, high schools and motor registries (17,000 brochures distributed), launch event and onsite promotion at 9 city rail stations. There was no direct measure of cycling rates.

Merom 2003 (BA [+] Aus n=568, 3 months). 44% at baseline could not recall any generic message promoting bike riding compared to 34% at post-test: p<0.001. Trail use was significantly higher among bike owners than those without a bike (8.94% vs. 3.3%, p=0.014).

The evidence on mass media interventions to increase cycling is partially applicable to the UK as the study was conducted in Australia. The differing environment in Australia must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 3A. POPULATION LEVEL CHANGE IN MASS MEDIA INTERVENTIONS TO INCREASE WALKING AND CYCLING: AUSTRALIA WALK TO WORK DAY

Moderate evidence from one study (reported in two papers) suggests that the mass media campaign "Australia Walk to Work Day" (a collaborative annual event in which members of the public are encouraged to walk (or cycle) to work) may be effective in increasing population levels of walking and cycling for travel in adults up to one year post intervention. This intervention resulted in positive effects on both walking and cycling.

Merom 2005 (BA [+] Aus n=1100, at least one year). Significant population increase in total walk time: +16min/week t[780]=2.04, p<0.05, and other moderate physical activity including cycling: +20min/week (t[1087]=4.76, p<0.005.
Merom 2008 (BA [+] Aus n=156, 2 months). Significant population level increase in health enhancing active commuting: 3.9%, p=0.01.

The evidence on mass media interventions to increase walking and cycling is only partially applicable to the UK as studies were conducted in Australia. The differing environment in Australia must be considered in reference to these studies. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 4A. POPULATION LEVEL CHANGE IN COMMUNITY DELIVERED TARGETED HEALTH INFORMATION INTERVENTIONS TO INCREASE WALKING

No population change data was reported for these interventions. Individual level changes are reported in ES4B.

EVIDENCE STATEMENT 5A. POPULATION LEVEL CHANGE IN WORKPLACE DELIVERED TARGETED HEALTH INFORMATION INTERVENTIONS TO INCREASE WALKING

No population change data was reported for these interventions. Individual level changes are reported in ES5B.

EVIDENCE STATEMENT 6A. POPULATION LEVEL CHANGE IN TARGETED HEALTH INFORMATION INTERVENTIONS TO INCREASE WALKING AND CYCLING

No population change data was reported for these interventions. Individual level changes are reported in ES6B.

EVIDENCE STATEMENT 7A. POPULATION LEVEL CHANGE IN TRAVEL SMART AS AN INTERVETION TO INCREASE WALKING AND CYCLING

Moderate evidence from a whole series of evaluation reports suggests that Travelsmart is effective in increasing population levels of walking and cycling for travel in adults at least over one year. Travelsmart uses “Individualised travel marketing” (ITM) which aims to highlight travel choices “people may not know they have” by providing locally relevant information and support to households. The evidence is moderate as the reports only present percentage change data and limited methodologies. However the cumulative evidence is compelling. [See also, other multi component intervention, ES6]. The intervention targets individuals, but data is reported at population level.

TravelSmart 2005 (Evaluation report [+] Aus n=5 regions, various). Household projects routinely showed decreases in car use of 4-15% and rise in use of walking, cycling and public transport.
TravelSmart 2011 (Evaluations reports [+] UK n=19 regions). Cycling for travel increased by between 14% and 69%, travel by car decreased at each site by between 10 and 14%, overall sustainable travel trips increased at each site (between 9% and 29%).

The evidence on this intervention to increase walking and cycling is fully applicable to the UK as most of the data reported is from UK sites. However, the differing environment in Australia must be considered in reference to the data collected there. Individual local contexts as well as the setting will also impact on the applicability of data from individual sites.

EVIDENCE STATEMENT 8A: POPULATION LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE WALKING

Moderate evidence from two studies (reported in three papers) suggests that multi-component interventions may not have a positive effective on increasing population levels of walking for leisure or travel in the long term (up to 2 years). Evidence from 3 nRCT papers reporting one intervention study showed mixed effects.

Brownson 2004 (nRCT [++] USA n=2399 to 7,642, 12 months) [*individually tailored newsletters, interpersonal activities that stressed social support, community wide events such as walk-a-thons*]. Rates of 7 day walking for any purpose or for exercise declined slightly in the intervention communities compared with the comparison sites: -1.4min, p=0.91; and -5.6, p=0.37 respectively.
Brownson 2005 (nRCT [+] USA n=2470, 12 months): [*as above*]. Change in walking was higher in intervention (11.7 minutes) than comparison (6.5 minutes), although not statistically significant. Percentage of respondents who met the recommendation for walking was the same across the intervention and comparison areas: 22.2% and 21.6%, p=0.811.
NSW Health Department 2002 (nRCT [+] Aus n=two wards, 2 years) [*park modifications, media campaign, walking maps*]. Those in the intervention ward were more likely to have walked in the two weeks prior to follow up (no data), but no difference in the number reaching adequate levels of physical activity (health department recommendations.

The population level evidence on multi-component interventions to increase walking is only partially applicable to the UK as studies were conducted in the US and Australia. The differing environment in the US must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 9A: POPULATION LEVEL CHANGE IN CYCLE DEMONSTRATION TOWNS AS INTERVENTIONS TO INCREASE CYCLING

Moderate evidence from one study (reported in 3 papers) suggests that Cycling Demonstration Towns (CDT) (*multi component interventions to increase cycling in 6 towns*) are effective in increasing population levels of cycling for active travel in the general population up to 10 years post intervention. Moderate evidence from an ER, 1 BA and 1 ITS study showed positive effects on cycling in cycle demonstration towns, although the significance of the effects is not reported. [See also, other multi component intervention, ES10a].

Cope 2009 (ITS [+] UK n= 6 towns, 4 years). Automatic counter data indicated an average increase in cycles counted of 27%. Proportion of pupils cycling to school at least once a week increased from 12% pre-survey to 26% post-survey.
Cope 2011 (Evaluation report- UK n=6 towns, 10 years) [*this report also uses data from other interventions*]. Data from automatic cycle counts indicated 12% increase over all cycle routes and up to 60% at specific sites.
Sloman 2009 (BA [+] UK n=1500, 4 years). Proportion of adult cycling for at least 30 minutes once or more per month increased from 11.8% in 2006 to 15.1% in 2008, an increase of 3.3%-points or 28%.

The evidence on cycle demonstration town is directly applicable as it was conducted in the UK.

EVIDENCE STATEMENT 10A: POPULATION LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE CYCLING

Moderate evidence from two studies suggests that multi-component interventions are effective in increasing population levels of cycling for active travel in the general population up to 2 years post intervention. Evidence from 1 nRCT and 1 BA studies showed positive effects on cycling from multi component interventions. [See also cycle demonstration towns, ES9].

Parker 2011 (BA [+] USA n=NR, 6 months) [*promotion campaign and bike facilities (shared and exclusive cycle lanes)*]. 57% (SD 18.5) increase in the mean number of riders per day: from 90.9 pre to 142.5 post intervention, p<0.001.
Rissel 2010 (nRCT [+] Aus n=1450, 2 years) [*multi component community based intervention including: map titled 'Discover Fairfield and Liverpool by Bike' showing the bicycle paths and useful cycling routes in the area*]. Significantly greater use of the bicycle paths in the intervention area (28.3%) at follow-up compared with the comparison area (16.2%): p < 0.001, but no self reported increase in residents who said they cycled in the last year.

The population level evidence on multi-component interventions to increase cycling is only partially applicable to the UK as studies were conducted in the US and Australia. In addition the US study (Parker 2011) was conducted in a population of African Americans which is not an ethnic group directly represented in the UK, and therefore it may be less applicable here. The differing environments in Australia and the US must be considered in all studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 11A: POPULATION LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE WALKING AND CYCLING IN ADULTS

Inconsistent evidence from 6 studies is unclear as to the effect of multi-component interventions (delivered in the community (n=5) or workplace (n=2) on increasing population levels of walking and cycling for travel and/or leisure up to 9 years post intervention. Evidence from, 4 BA, and 2 ITS, showed mixed, but mostly positive, effects of community interventions to encourage cycling and walking for travel and/or leisure.

De Cocker 2009 (BA [+] Belgium n=438, 1 year) [*Physical activity promoted in the entire city of Ghent. Central theme of '10,000 steps/day', with secondary taglines of 'every step counts') and 'every revolution (of bicycle pedals) counts'*]. 47.5% increased average step counts by 896 steps/day or more at one-year follow-up (no statistical analysis; cycling was “converted” to step counts).
Hendricks 2009 (BA [-] USA n=NR, 12 months) [*Multi component intervention to increase safe physical activity opportunities and encourage walking and biking for short trips*]. The number of people seen using active transportation increased from 1028 in 2005 to 1953 in 2006 (63% increase).
Sloman 2010 (BA [+] UK n=12,000, 30 months) [*Sustainable travel towns which implemented intensive town wide Smarter Choice Programmes to encourage use of non car options; bus use, cycling and walking, and less single occupancy cars*]. Cycle trips per head grew substantially in all three towns by 26-30%. Comparison towns cycle trips decreased. Walking trips per head grew substantially by 10-13% compared to a national decline in similar towns.
TenBrick 2009 (ITS [-] USA n=36,000, 5 years) [*Project U-Turn, active transportation (biking, walking, and transit use) through an integrated approach to Active Living*]. Citywide count of people using active transport, showed an annual increase of 63% (2005-2006).
Brockman 2011 (ITS [+] UK n=2829, 9 years) [*University transport plan: limiting the number of available parking spaces and permits, improving changing, installing secure cycle storage, subsidised cycle purchase scheme, car share scheme, free bus travel, and discounted season tickets*]. Respondents who usually walked to work increased from 19 to 30%: Z=4.24, p<0.001, and regular cyclists increased from 7.0% to 11.8% (not significant).
Bull 2008 (BA [+] UK n=2240, 3 years) [*Well@Work programmes which consisted of a diverse set of initiatives and actions aimed at promoting and supporting healthy lifestyles*.]. Increase of 9% in the proportion of employees participating in active travel (walking or cycling), significant increase in employees cycling (4%) or walking (8%) to work.

The population level evidence on multi-component interventions to increase walking and cycling in adults is partially applicable to the UK as three studies were conducted in the UK. The differing environment in the US and Europe must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 12A: POPULATION LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE WALKING AND CYCLING IN CHILDREN

Moderate evidence from 4 studies is unclear as to the effect of school based multi-component interventions to increasing levels of walking and cycling for children. Evidence from 2 BA studies showed positive effects on school population level walking in children but evidence from 2 RCTs (1 of cluster design), showed no effect on cycling and walking for travel.

Cairns 2006a (BA [+] UK n=179, 41 months) [*School travel plan group developed a walking bus scheme, incentive scheme "going for gold" included children cycling or scooting to school, also cycle training, pedestrian training, park and walk scheme, curriculum work, school assemblies and newsletters*]. Walking to school increased from 30% to 58.8%, cycling to school increased from 0 to 4%.
Rowlands 2003 (RCT [++] UK n=21 schools, 12 months) [*multi component school travel plans were developed by a school travel co-ordinator*]. The proportion of children walking or cycling to school was not affected by the intervention.
Staunton 2003 (BA [+] UK n=52 schools, 1 year) [*Safe Routes to School. Identified and creates safe routes to school, invites community wide involvement, full time educator employed to develop curriculum*]. Increase in number of school trips made by walking (64%) and biking (114%).
Wen 2008 (Cluster RCT [+] Aus n=2258, 2 months) [*Health Promoting Schools Policy: classroom activities, pedometer based walking activities (some schools) development of school Travel Access Guides, parent newsletters, and improving environments with local councils*]. Cluster analysis showed no statistically significant differences in mean percentages of change in mode of transport to or from school from baseline to follow up between the intervention and control groups (no data given).

The population level evidence on multi-component interventions to increase walking and cycling in children is partially applicable to the UK as three studies were conducted in the UK. The differing environment in Australia must be considered in reference to the study conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 13A: POPULATION LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE CYCLING IN CHILDREN

Moderate evidence from 1 study suggests that school based multi-component interventions may be effective in increasing school population levels of cycling in children. Evidence from a BA study showed positive effects on walking at the school population level.

Sustrans 2008 (BA [+] UK n=52 schools, 1 year) [*Bike It. School travel plans, cycling champions in schools to demonstrate to parents and pupils that cycling is a popular choice. Aims to create a pro-cycling culture*]. Percentage of school pupils cycling to school every day increased from 3% to 10%. Number of pupils cycling once a week increased from 10% to 27%. Number of pupils who never cycled decreased from 80% to 55%.

The evidence on multi-component interventions to increase cycling in children is applicable in the UK as the study was carried out in the UK.

EVIDENCE STATEMENT 14A. POPULATION LEVEL CHANGE IN COMMUNITY BASED LED WALKING GROUP INTERVENTIONS TO INCREASE WALKING

No population change data was reported for these interventions. Individual level changes are reported in ES14B.

EVIDENCE STATEMENT 15A. POPULATION LEVEL CHANGE IN INTERVENTIONS TO INCREASE INDEPENDENT COMMUNITY BASED WALKING

No population change data was reported for these interventions. Individual level changes are reported in ES15B.

EVIDENCE STATEMENT 16A. POPULATION LEVEL CHANGE IN SCHOOL BASED WALKING SESSION INTERVENTIONS TO INCREASE WALKING

Moderate evidence from 10 studies (reported in 11 papers) suggests that school based walking session interventions may be effective in increasing levels of walking at the school population level for children up to 48 months post intervention. Evidence from 1 nRCT, 1 cluster RCT and 6 BA study showed positive effects on school population walking and a further BA studies showed positive (but non-significant) effects on physical activity (primarily walking). One nRCT showed no effect on walking (TAPESTRY 2003).

Bickerstaff 2000 (BA [+] UK n=309, 14 months) [*walking school buses supported by environmental interventions such as street lighting on walking routes*]. Participants walking increased from 60% to 68.3%, 25% of that was due to walking buses. Also reported in **Cairns 2006c** (BA [+])

Cairns 2006b (BA [+] UK n=585, 48 months) ["*Walk on Tuesday and Thursday WOTT, encouraged walking to school, included incentives*]. Walking to school increased from 53.3% to 58.7% (percentages only reported).

Hawthorne 2011 (BA [+] USA n=1074, 16 weeks) [*Grand Canyon Trekkers, lunchtime walking programme, 3 times per week in elementary schools*]. Cardio-respiratory fitness increased by 37.1% over baseline p<0.01 (number values not given). There was no direct measure of the impact on walking rates outside the intervention.

Johnston 2006 (BA [+] USA n=3 primary schools, follow up unclear) [*Walking School Bus (WSB). The school implemented three routes staffed by parent volunteers, and were compared to two nearby schools without a WSB*]. The number of children who walked to school increased from baseline to follow up by 25% (no further data given).

Kong 2010 (BA [+] USA n=28, 10 weeks) [*Walking School Bus (WSB) run by a part time co-ordinator and parent volunteers. Participants walked a designated route with pick up and drop off points approved for safety by the police*]. Physical activity increased from mean 4.3 days/week (SD 0.49) to 5.3 days/week (SD 0.43), mean difference 1.0 (0.55), p=0.08.

Mackett 2005 (BA [+] UK n=101, 18-30 months) [*Walking buses at 5 schools. Information sent home to parents to encourage participation*]. *Around 62% of those using the walking bus had previously travelled by car, but participation in the walking buses declined over time.*

Mendoza 2009 (nRCT [+] USA n=653, 12 months) [*Walking School Bus (WSB) run by a part time co-ordinator and parent volunteers. The intervention included three routes which ranged from 0.3 to 1.5 miles and took 15-40 minutes. The WSB operated once or twice a week.*]. Higher proportions of students walked to the intervention (25% +/- 2%) verses the control schools (7% +/-1%): p<0.001. Increase in intervention school from 20% (+/-2%) at baseline.

Schofield 2005 (Cluster RCT [+] NZ n=85, 12 weeks) [*physical activity self monitoring and educative programme. The PED group set daily step targets, and the MIN group set daily time based activity goals*]. Both intervention groups had significant increase in steps between baseline and week 12: p<0.001, no significant differences between time points for the control group: p=0.23.

Continued

TAPESTRY 2003 (nRCT [+] UK n=13 schools, 4 weeks) [*Interventions linked to national walk to school week*]. No difference between intervention and control schools in walking before or after the intervention.
Zaccari 2003 (BA [+] Aus n=243, 12 months) [Classroom activities *supported by a weekly newsletter to encourage walking to school*]. Percentage of walking trips increased by 3.4% and car trips decreased by 3.4%.

The evidence on school based walking sessions to increase walking is partially applicable to the UK as 4 studies were conducted in the UK. The differing environments US and New Zealand and Australia must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 17A. POPULATION LEVEL CHANGE IN WORKPLACE BASED INTERVENTIONS TO INCREASE INDEPENDENT WALKING

No population change data was reported for these interventions. Individual level changes are reported in ES17B.

EVIDENCE STATEMENT 18A: POPULATION LEVEL CHANGE IN COMMUNITY BASED PEDOMETER INTERVENTIONS TO INCREASE WALKING

No population change data was reported for these interventions. Individual level changes are reported in ES18B.

EVIDENCE STATEMENT 19A: POPULATION LEVEL CHANGE IN WORKPLACE PEDOMETER INTERVENTIONS TO INCREASE WALKING

No population change data was reported for these interventions. Individual level changes are reported in ES19B.

INDIVIDUAL LEVEL CHANGE

EVIDENCE STATEMENT 1B. INDIVIDUAL LEVEL CHANGE IN MASS MEDIA INTERVENTIONS TO INCREASE WALKING

Moderate evidence from 2 studies suggests that mass media interventions (which included paid advertisements [TV, radio, cable, newspapers], billboards/posters, public relations, educational activities and community participation), delivered in the community are effective in increasing individual levels of walking for leisure or travel in adults up to one year post intervention. Two CS studies showed positive effects on walking.

Vernon 2002 (CS [+] UK n=322, 18 months) [*Ten attractive, accessible, local walks promoted. Enclosed within the walking packs was general information about the benefits of regular physical activity, clear directions of the walks, information of local interest and a record sheet for participants to record their achievements. Five hundred free packs were disseminated to the general public through general practitioner (GP) surgeries and health centres, leisure centres, libraries, social service departments and voluntary organisations*]. 55% of the respondents who classified themselves as 'sedentary' at baseline reported a shift in activity status to "active" after 18 months ($p<0.001$).
Wray 2005 (CS [-] USA n=297, 5 months) [*Billboard, newspaper, radio, and poster advertisements*]. Those exposed to the campaign were more likely to walk for at least 10 minutes on more days of the week than to the control group: (4.52 days vs. 2.73 days $t[7]=2.34$, $p=0.02$.

The individual level evidence on mass media interventions to increase walking is partially applicable to the UK as one study was conducted in the UK. The differing environment in the US must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 2B: INDIVIDUAL LEVEL CHANGE IN MASS MEDIA INTERVENTIONS TO INCREASE CYCLING

Moderate evidence from one study suggests that a mass media intervention may be effective in increase individual level cycling for leisure in adults. Evidence from one BA study showed a positive effect on cycling one month after the intervention.

Bowles 2006 (BA [+] Aus n=918, 2 months) [*Promotion of, and participation in a mass cycling intervention*]. Respondents with low pre-event self reported cycling ability reported an average of 4 sessions of cycling in the month before the event and an average of 6.8 session in the month after the event (t=5.25, p<0.001).

The evidence on mass media interventions to increase cycling is only partially applicable to the UK as the study was conducted in Australia. The differing environment in Australia must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 3B. INDIVIDUAL LEVEL CHANGE IN MASS MEDIA INTERVENTIONS TO INCREASE WALKING AND CYCLING: AUSTRALIA WALK TO WORK DAY

No individual level change data was reported for this intervention. Population level changes are reported in ES3A.

EVIDENCE STATEMENT 4B. INDIVIDUAL LEVEL CHANGE IN COMMUNITY DELIVERED TARGETED HEALTH INFORMATION INTERVENTIONS TO INCREASE WALKING

Strong evidence from 7 studies suggests that individual, targeted provision of health information (including printed media, telephone support and text messages) delivered in the community are effective in increasing individual levels of walking for leisure or travel in adults up to one year post intervention. Six RCTs showed positive effects on walking. One further RCT (Rovnick 2005) also showed positive effects on walking, but was designed to test intervention fidelity.

Dunton 2008 (RCT [++] USA n=156, 3 months) [*weekly emails containing links to a webpage with an interactive information tailoring tool to promote physical activity*]. Walking increased at a faster rate in the intervention group than the control group: β=15.04 (SE=8.38), p=.035 (one-tailed).
Humpel 2004 (RCT [++] Aus n=399, 10 weeks) [*Print only (participants were mailed self-help brochures weekly for 3 weeks) or Print plus Telephone (participants received the same print program plus three weekly telephone support calls*]. Both intervention groups significantly increased time reported walking for exercise per week: from 130 to 147 minutes: t(1,277)=-3.50, p<0.001; and from 132 to 150 minutes, t(1,106)=-2.44, p=0.016.
Merom 2009 (RCT [++] Aus n=369, 3 months) [*participants were mailed self-help brochures weekly with or without weekly telephone support calls*]. Intervention group were significantly more likely than controls to increase total walking time where street lights or environment aesthetics were perceived to be low: Exp (b) = 2.53, p<0.01 t=2.56, p=0.011.
Nies 2003 (RCT [++] USA n=197, 6 months) [*weekly telephone calls to assess physical activity levels and problem solve how to fit adequate walking activity into their week.*]. Women in the intervention group reported more time walked each day than the control women: F (1,191)=4.10, p<0.05.
Nies 2006 (RCT [++] USA n=313, 12 months) [*telephone calls with or without counselling, or a control video*]. Women in intervention group showed a linear increase in walking from baseline to 6 months (latent growth analysis to assess the relationship between time and intervention group membership).
Prestwich 2010 (RCT [++] UK n=149, 4 weeks) [*Two theory-based interventions consisting of forming "implementation intentions" along with text message reminders to achieve walking-related plans or goals*]. Differential change across groups in brisk walking F(2,130)=3.12, p=0.048 or fast walking F(2,130)= 3.12, p=0.048. 2 intervention groups which differed in having a plan reminder or goal reminder had a 42% and 45% increase in number of days meeting PA daily guidelines respectively, with a 22% increase in the control group
Rovniak 2005 (RCT [++] USA n=50, 12 months) [*two interventions consisting of forming "implementation intentions" along with text message reminders to achieve walking-related plans or goals*]. High fidelity intervention increased walking by 34.23min +/-81.91 compared to a low fidelity increase of 7.91min +/-47.93, F=3.207 p=0.08.

The evidence on community delivered health information interventions is only partially applicable to the UK as most studies were conducted in Australia or the US with only one UK study included. The differing environment in Australia and the US must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 5B. INDIVIDUAL LEVEL CHANGE IN WORKPLACE DELIVERED TARGETED HEALTH INFORMATION INTERVENTIONS TO INCREASE WALKING

Moderate evidence from two studies suggests that individual, targeted provision of health information delivered in the workplace (including flyers, email, telephone calls, website postings, and information booths) may be effective in increasing individual levels of walking for leisure or travel in adults up to 4 months post intervention. One RCT study showed a positive effect on walking and one BA study showed a small (borderline significance) positive effect on walking.

Lombard 1995 (RCT [+] USA n=135, 16 weeks) [*phone calls once a week versus every 3 weeks, and structured vs. non structured feedback*]. Survival curves indicated that there was a significant effect on walking for treated (the combined four treatment conditions) versus the control condition, LD= 17.661 p<0.001.
Napolitano 2006 (BA [+] USA n=6300, 6 weeks) [*Promotional material distributed via flyers, email, website postings, and during bi-weekly information booths*]. Borderline statistically significant increases in walking activity from baseline midway through the campaign (p=0.069) and following the campaign: p=0.075 (p values only reported).

The evidence on workplace health information interventions is only partially applicable to the UK as the studies were conducted in the US. The differing environment in the US must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 6B: INDIVIDUAL LEVEL CHANGE TARGETED HEALTH INFORMATION INTERVENTIONS TO INCREASE WALKING AND CYCLING

Moderate evidence from two studies suggests that individual, targeted provision of health information (including a booklet of interactive materials, social marketing and individualised marketing strategies) may be effective in increasing individual levels of walking, but not cycling, for travel in adults for up to 12 months post intervention. One RCT and one BA study showed positive effects on walking (or replacing car use) but the effect on cycling was unclear. [See also, Travelsmart, ES7A].

Mutrie 2002 (RCT [++] UK n=295, 6 months) [*interactive materials on: choosing routes, maintaining personal safety, shower and safe cycle storage information, and useful contacts*]. Significant increase in time per week spent walking to work (mean 125 min/week intervention vs. 61 min/week control), but no difference in average weekly minutes of cycling between cyclists in the intervention group (n=9) and control group (n=9).
Wen 2005 (BA [+] Aus n=68, 12 months) [*Development of resources with target group involvement, social marketing and individualised marketing strategies*]. Decrease in those who said they had been driving their car to work in the last month (from 6.7% to 13.3%): p=0.039, marginal homogeneity test.

The evidence on health information intervention to increase walking and cycling is partially applicable to the UK as one study was conducted in the UK with a second the study conducted in Australia. The differing environment in Australia must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 7B. INDIVIDUAL LEVEL CHANGE IN TRAVEL SMART AS AN INTERVENTION TO INCREASE WALKING AND CYCLING

No individual change data was reported for these interventions. Population level changes are reported in ES7A. The intervention targets individuals, but data is reported at population level.

EVIDENCE STATEMENT 8B: INDIVIDUAL LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE WALKING

Moderate evidence from two studies suggests that multi-component interventions have a positive effective on increasing individual levels of walking for leisure or travel. Evidence from a 2 BA studies show positive effects on walking up to three months post intervention.

Clarke 2007 (BA+ USA n=124, 8 weeks) [*multi physical activity and dietary program*]. Post intervention, 46.2% (n=43) met the 10,000 steps/day criteria for high activity (no further statistics). This increased from 11.8% at baseline.
Krieger 2009 (BA [+] USA n=53, 3 months) [*sponsored walking groups, improving walking routes, providing information about walking options, and advocating for pedestrian* safety]. Self reported walking activity increased from 65 to 109 minutes per day: 44.1%, 95%CI 28.0-60.2, p=0.001.

The individual level evidence on multi-component interventions to increase walking is only partially applicable to the UK as studies were conducted in the US. The differing environment in the US must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 9B. INDIVIDUAL LEVEL CHANGE IN CYCLE DEMONSTRATION TOWNS AS INTERVENTIONS TO INCREASE CYCLING

No individual change data was reported for these interventions. Population level changes are reported in ES9A.

EVIDENCE STATEMENT 10B: INDIVIDUAL LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE CYCLING

Moderate evidence from one study suggests that multi-component interventions may be effective in increasing individual levels of cycling for active travel in the general population up to 2 years post intervention. Evidence from 1 BA study showed positive effects on cycling from a multi component intervention.

Telfer 2006 (BA [+] Aus n=113, 2 months) [*practical skills development and supervised on road or cycle path training. Free courses for beginner and intermediate level cyclists were conducted. Promoted through flyers, posters, media releases, articles and TV and newspaper adverts*]. Non cyclists at baseline reported significant increase ($p<0.001$) in minutes cycling; 40% cycled at least one in the previous week at 2 month follow up.

The individual level evidence on multi-component interventions to increase cycling is only partially applicable to the UK as the study was conducted in Australia. The differing environment in Australia must be considered in all studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 11B: INDIVIDUAL LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE WALKING AND CYCLING IN ADULTS

Inconsistent evidence from 1 study is unclear as to the effect of multi-component interventions on increasing individual levels of walking and cycling for travel and/or leisure up to 18 months post intervention. Evidence from one RCT study showed a positive effect on cycling only, with no effect on walking.

Hemmingsson 2009 (RCT [++] Sweden n=120, 18 months) [*Physician meetings, physical activity prescriptions, group counselling, and bicycle provision*]. Intervention group were more likely to achieve recommended level of cycling than controls: 38.7 vs. 8.9%, OR=7.8, 95%CI 4.0-15.0, $p<0.001$, but there was no difference in compliance with the walking recommendation: 45.7 vs. 39.3%, OR 1.2, 95%CI 0.7-2.0, $p=0.5$.

The individual level evidence on multi-component interventions to increase walking and cycling in adults is only partially applicable to the UK as the study was conducted in the Sweden. The differing environment in Sweden must be considered in reference to this study conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 12B: INDIVIDUAL LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE WALKING AND CYCLING IN CHILDREN

Moderate evidence from 2 studies suggest that school based multi-component interventions may be effective in increasing individual levels of walking and cycling for children in the short term (up to 10 weeks). Evidence from an nRCT and an ITS showed positive effects on individual level walking in children

Cirignano 2010 (ITS [+] USA n=184, 6 weeks) [*pedometers and a "Fit Bits" programme to implement physical activity breaks in the classroom*]. Mean steps increased from 19,149 (95%CI 18,224–20,073) week 1 to 21,248 (95%CI 19,730-22,765) week 6: p<0.001.
McKee 2007 (nRCT [+] UK n=60, 10 weeks) [*School based active travel project. Active travel was integrated into the curriculum, and participants used interactive travel planning resources at home*]. Mean distance travelled to school by walking increased significantly more in the intervention (389%) than the control (17%): t(38)=-4.679, p<0.001, 95% CI -315 to -795m.

The individual level evidence on multi-component interventions to increase walking and cycling in children is partially applicable to the UK as one study was conducted in the UK. The differing environment in the US and Australia must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 13B. INDIVIDUAL LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE CYCLING IN CHILDREN

No individual change data was reported for these interventions. Population level changes are reported in ES13A.

EVIDENCE STATEMENT 14B. INDIVIDUAL LEVEL CHANGE IN COMMUNITY BASED LED WALKING GROUP INTERVENTIONS TO INCREASE WALKING

Strong evidence from 10 studies suggests that community based led walking group interventions to increase walking may be effective in increasing individual walking for leisure or travel up to 18 months post intervention in the whole community (n=1 studies); up to 12 months post intervention in adults, (n=7 studies); and up to 48 weeks post intervention in women (n=2 studies). Evidence from 5 RCTs and 3 BA studies show positive effects on walking, but evidence from a further RCT showed no difference between groups at 12 months.

Avila 1994 (RCT [++] USA n=44, 3 months) [*included instruction for diet modification and walking for exercise, led in 20 minutes of walking per session*]. Significant increases (intervention compared to control) in fitness: $F(1,26)=6.89$, $p<0.05$, exercise rate (primarily walking): $F(1,35)=21.28$, $p<0.001$, and exercise frequency: $F(1,31)=8.95$, $p<0.01$.

Cox 2008 (RCT [++] Aus n=116, 6 months) [*6 month swimming or walking programme consisting of 3 sessions a week with/without an additional behavioural intervention*]. During the supervised programme both groups exercised at target with no significant difference between groups swimming 60.9% (58.9-62.8) vs. walking 59.7% (57.9-61.6).

Estabrooks 2008 (BA [+] USA n=1493, 8 weeks) [*Recruit teams of six individuals who would collectively walk the 423 mile distance across Kansas over an 8 week period*]. Previously inactive participants increased from no moderate activity (walking) to an average of 172.85min/week (SE=15.0) per week.

Fisher 2004 (Cluster RCT [++] USA n=582, 6 months) [*Leader-led walking group activity or an information-only control group*]. Significant increase observed in walking activity: $p<0.05$.

Jancey 2008 (BA [+] Aus n=260, 6 months) [*Walk leaders received a prescriptive progressive weekly exercise program that contained written information on the appropriate length for the walking program; stretching exercises; and ball skills, such as side twist leader ball*]. Baseline mean walking time for recreation was one hour (SD =1.65), increasing to 2.69 hours (SD =2.02) per week by the end of the program

Johnson 2010 (BA [+] USA n=26, 26 weeks): [*Dog walking intervention. The dogs were part of the College of Veterinary Medicine's Pet Assistance Love and Support (PALS) programme*]. BMI decreased significantly: mean= −1.9, SD= 2.71, p=0.021. At 7 weeks, all participants were able to walk 20 minutes, 5 days per week.

Lamb 2001 (RCT [++] UK n=438, 12 months) [*Accompanied walks were provided at several different times in the day and evening, during the week and at weekends, and were led by lay volunteers*]. At 12 months, although both walking and control groups increased activity (by 28.7% and 22.9% respectively), there was no significant difference between them.

McAuley 2000 (RCT [++] USA n=174, 6 months) [*Subjects were led in stretching exercises by the exercise leader for approximately 10 minutes each session. They then participated in the walking program*]. 75% of the stretching/toning participants continued to exercise at programme levels compared to only 51.3% of the walking condition.

McAuley 1994 (RCT [++] USA n=114, 20 weeks) [*Exercise classes were conducted by trained exercise specialists and employed brisk walking as the aerobic component*]. At the end of the 20 week program, subjects in the intervention group walked more miles per week than the control group: $p<0.05$.

Continued

Reger-Nash 2006 (nRCT [+] USA n= 4 communities, 8 weeks) [*10, 20 and then 30 minutes of daily moderately intense walking in led groups*]. 32% of insufficiently active persons in Wheeling reported meeting the criteria for regular walking immediately post campaign compared to an 18% increase in the comparator community (OR=2.12, 95%CI 1.41-2.24). An increase in reaching regular walking was observed for the most sedentary group in WV walks (p<0.05). The intervention community in Welch walks demonstrated a twofold (OR=2.0 95%CI 1.01-3.97) gain in weekly walking by at least 30 minutes versus the comparison community. 41% of the BC walks intervention community increased walking by 30 min/week compared to 30% in the control (OR=1.56 95% CI 1.07-2.28).

The evidence on community based walking group sessions to increase walking is only partially applicable to the UK as only one study was conducted in the UK. The differing environment in the US and Australia must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies

EVIDENCE STATEMENT 15B. INDIVIDUAL LEVEL CHANGE IN INTERVENTIONS TO INCREASE INDEPENDENT COMMUNITY BASED WALKING

Strong evidence from 10 studies suggests that interventions to increase independent community based walking may be effective in increasing individual walking for leisure or travel up to 12 weeks post intervention, but not in the longer term (to 48 weeks). Evidence from 4 RCT, 2 nRCT, and 2 BA studies show positive effects on walking up to 12 weeks in adults or the whole community, but mixed evidence from 2 nRCT and 1 RCT is unclear as to the effect on walking in women, and suggests there may not be a positive effect.

CLES 2011 (nRCT [++] UK n=7883, 12 weeks) [*"Get walking, keep walking": Bespoke, led walks and sessions aimed at encouraging children and young people to walk*]. 67% of participants increased the amount of exercise they did each week. Walking from "place to place" increased by 1.1 day/week and walking for leisure by 1 day/week.

Culos-Reed 2008 (BA [+] Canada n=52, 8 weeks) ["*mall walking programme". Participants self selected the pace, time, and frequency of walking. Encouraged to attend as often as possible between 8am and 10am Monday to Friday*]. Average daily mall walk steps increased from 5055 (SD 1374) to 5969 (SD 1543): p<0.002, and average daily mall walk time increased from 42.9 (SD 10.6) min to 50.4 (SD 13.5) min: p<0.002.

Darker 2010 (RCT [++] UK n=130, 4 weeks) [*Motivational component had 3 stages: participants were shown 10 statements about what would make it easier for them to walk more, asked to complete a scale to show how confident they would be about walking in each situation, and discussed with facilitator and walking plan developed. Pedometers were worn*]. Significant difference in number of minutes spent walking to week 2 between the control group (M=138.7, SD=93.3) and the intervention group (M=22.5 SD=100.3), from a mean of 19.8min to 32.2min per day (increase of over 60%). Also a significant increase in number of minutes spent walking per week for intervention group week 1-week 4 (mean 287.3, SD=129.4) [t(46)=8.12, p<0.001).

Mier 2011 (BA [+] USA n=16, 12 weeks) [*Walking intervention facilitated by community health workers. Weekly sessions encouraged participants to accumulate at least 30 min of moderate intensity walking on most/all days of the week*.]. Exposure to the programme resulted in significant increase in walking: 915.8min/week, p=0.002.

Continued

Milton 2009 (nRCT [+] UK n=34, 12 weeks) ["*Furness Families Walk4Life" which is a 12 week multi component intervention designed to encourage regular independent walking close to home as part of everyday life*.]. Increase in self reported walking for purpose was greater in the intervention group than the control group (not significant, no data)
Murphy 2006 (RCT [++] UK n=37, 8 weeks) [*Week one, 25 minute walk on two days. Week two, walked for 35 minutes on two days. From week three to week eight, all walkers completed two 45 minute walks per week].* Walkers took significantly more steps on Walk-days compared to Rest-days: p < 0.001
Perry 2007 (RCT [++] USA n=46, 12 weeks) [*Individual-oriented motivational interviewing (MI) intervention. To assist the women in exploring their mixed feelings toward behaviour change, articulating the pros to change, and developing an action plan to increase*]. Women in intervention group had a greater improvement in cardio-respiratory fitness (p=0.057) and in social support (p =0 .004) compared with women in the comparison group.
Steele 2007 (RCT [++] Aus n=192, 12 weeks) [*Delivered as a face to face, internet mediated or internet only intervention. It was based on social cognitive theory and self management skills and consisted of Health eSteps: a variety of topics focusing on lifestyle physical activity, benefits and barriers, goal setting, self monitoring, self talk, self-reinforcement, time and stress management, relapse prevention, social support*]. There was no group x time interaction for physical activity (F(6,567)=1.64, p>0.05) and no main effect for group (F(2.189)=1.58, p>0.05). However a main effect for time (F(3,567=75.7, p<0.01) was observed for each group. Therefore the results provide support for internet delivery of physical activity interventions but show no difference between mediated an unmediated delivery.
Wilbur 2003 (nRCT [+] USA n=153, 24 weeks) [*Personal exercise prescription, instructions, and support from a nurse research team member*]. Adherence to both duration and intensity walking outcomes was greater than 90%, indicating that once the women walked, they walked at the appropriate duration and intensity (no further data).
Wilbur 2008 (nRCT [+] USA n=281, 48 weeks) [*24 week intensive adoption phase, 24 week maintenance phase. Workshops on benefits of walking, overcoming personal and environmental barriers to walking, anticipating and handling barriers*]. No difference in walking intensity between the groups (data not given), but a significant increase in fitness: p=0.024. Walking adherence declined between 24 and 48 weeks from 67.2% to 42.7% p<0.001.

The evidence on interventions to increase independent community based walking is partially applicable to the UK as four studies were conducted in the UK. The differing environment in the US, Australia and Canada must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 16B. INDIVIDUAL LEVEL CHANGE IN SCHOOL BASED WALKING SESSION INTERVENTIONS TO INCREASE WALKING

No individual change data was reported for these interventions. Population level changes are reported in ES16A.

EVIDENCE STATEMENT 17B. INDIVIDUAL LEVEL CHANGE IN WORKPLACE BASED INTERVENTIONS TO INCREASE INDEPENDENT WALKING

Strong evidence from 4 studies suggests that workplace walking session interventions (conducted in universities) may be effective in increasing individual levels of walking for staff and/or student participants up to 12 months post intervention. Evidence from 3 RCTs showed positive effects on walking. However, evidence from one further RCT study (Eastep 2004) showed no effect on walking.

Coleman 1999 (RCT [++] USA n=32, 32 weeks) [*The three walking conditions were 30 continuous minutes, three 10-minute bouts, and 30 minutes in any combination of bouts as long as each bout was at least 5 minutes*.]. Self-reported walking for all intervention groups significantly increased throughout the program: F(6, 186)= 26.16; p<0.001.
Gilson 2006 (RCT [++] UK n=61, 10 weeks) [*Walking Routes which employed prescribed walks around campus with participants asked to complete at least 15min continuous brisk walking every day and Walking in Task which encouraged the accumulation of step counts through the working day*]. Decrease in steps for the control group (-767 steps/day) and increases in intervention groups for walking routes (+926 steps/day) and walking in tasks (+997 steps/day). Control vs. walking routes p<0.008, control vs. walking in tasks p<0.005.
Gilson 2009 (RCT [++] UK n=64, 7 months) [*Participants in the first intervention group were directed to achieve this through brisk, sustained, route-based walking during work breaks. The second intervention group was asked to engage in incidental walking and accumulate step counts during working tasks*]. Average step count data decrease in the control group: -391 steps/day t=1.76; p <0.08, and significant increases in both the routes: 968 steps/day; t=3.9; p<0.001, and the incidental 699 steps/day; t=2.5; p<0.014 group.
Eastep 2004 (RCT [++] USA n=26, 6 weeks) [*Two eight week walking for fitness classes*]. Neither group increased walking time or number of steps significantly over time.

The evidence on workplace (university) based walking sessions to increase walking is partially applicable to the UK as two studies were conducted in the UK. The differing environments must be considered in reference to the studies conducted in the US. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 18B: INDIVIDUAL LEVEL CHANGE IN COMMUNITY BASED PEDOMETER INTERVENTIONS TO INCREASE WALKING

Strong evidence from 9 studies (reported in 10 papers) suggests that pedometer based interventions delivered in the community are effective in adults (or women only) to increase individual levels of walking for leisure or travel, up to 6 months post intervention. Evidence from 3 RCT and 1 BA study shows positive effects on walking for leisure and/or travel in adults. This is supported by data from a CS study. Evidence from 3 RCT and 1 BA study shows substantial positive effects on walking for leisure and/or travel in women.

Baker 2008a (RCT [++] UK n=50, 52 weeks) [*walking programme with goals set in steps using an open pedometer for feedback*]. Both groups significantly increased step counts from baseline to week 4. Significantly greater number of participants in the intervention (77%) compared with the control (54%) achieved their week 4 goals (X2= 4.752, p=0.03). There was no significant change in step counts from week 4 to 16 and a significant decrease from week 16 to 52.
The intervention was also reported by **Baker 2011** (RCT [++] UK n=61. 52 weeks) [*walking programme with goals set in minutes, or steps or using a pedometer*]. Pedometer group increased walking at 4 weeks (p<0.001), but decreased between 4 weeks and 12 months. No change in minutes or control groups.
Baker 2008b (RCT [++] UK n=63, 12 weeks) [*The sessions were based on the Transtheoretical Model of exercise behaviour change. Strategies used included enhancing motivation, overcoming barriers and developing appropriate walking plans. Followed a 12-week pedometer-based walking program*]. Significant increase in steps/day for the intervention group between baseline (M=6802, SD=3212) and week 12 (M=9977, SD=4669, t(38)=-6.06, p<0.001, d=0.79, CI 2,115–4236). No significant difference was observed in the control group (t(39)= -0.50, p=0.618, CI -463–770).
Dinger 2005 (BA [+] USA n=43, 6 weeks) [*Women who were designated as insufficiently active were given brochures and pedometers and were sent emails. Participants received a pedometer, 6 weeks of step log sheets, self addressed envelopes, and three commercial brochures describing strategies for increasing physical activity and the risks and benefits of physical activity*]. Participants significantly increased their total walking minutes from baseline (median 55) to post intervention (median 245): Z=4.03, p=0.001; including walking whilst at work (Z=2.79, p=0.005, d=0.63), for transport (Z=2.86, p=0.004, d=0.60) and during leisure time (Z=3.54, p=0.001, d=0.81).
Koizumi 2009 (RCT [++] Japan n=68, not reported) [*Feedback based on accelerometer daily physical activity, number of daily steps and time spent performing daily moderate physical activity (MPA) which was provided to each participant every two weeks. Participants were recommended to accumulate 9000 steps and 30 minutes of MPA per day*]. Significant group interaction was observed for steps: f=10.53, p<0.01. The intervention group increased their steps by 16% (7811 +/-3268 to 9046 +/-2620 steps). There was no significant change in the control group.

Continued

Merom 2007 (RCT [++] Aus n=369, 3 months) [*Self-help booklet, plus six weekly diaries printed on reply-paid postcards, and pedometer. Three incremental stages, starting with short walks (<15 minutes) three days a week, typically by incidental walking, gradually increasing the duration of walks to three to four days, then (continuously) walking briskly for 30 minutes*]. Mean changes in total sessions walking/week significantly greater in intervention and comparison than control group: control 1.2 sessions/week (0.6-1.8), t=3.97, p<0.001. Comparisons 1.3 sessions/week (0.5-2.0), t=3.32, p<0.001. Intervention 2.3 sessions/week (1.6-3.1), t=6.30, (<0.001. $X^2 = 7.41$; p<0.021.

Miyazaki 2011 (BA [+] Japan n=56, 4 months) [*Subjects were given a pedometer and instructed to walk at least 7,500 steps each day. They were also given additional monthly advice on healthy diet and lifestyle provided in a newsletter*]. Mean steps per day increased significantly from 9389 to 11846: p<0.01.

Moreau 2001 (RCT [++] USA n=24, 24 weeks) [*Given pedometer and initially, all women were prescribed a distance of 1.4 km/day above their baseline. Distance was then increased by 0.5 km/day until the desired walking distance was met*]. Intervention group increased their daily walking by 4300 steps (2.9 ± 0.2 km/day); significantly different from baseline and from the control group: both p<0.05.

Pal 2009 (RCT [++] Aus n=26, 12 weeks) [*Participants in the pedometer group were told to record their pedometer steps on a daily basis for 12 weeks; those in the control group were asked to wear a sealed pedometer for 12 weeks with weekly recording. The pedometer group was also encouraged to reach a daily step goal of 10,000 steps/day*]. Pedometer group daily average number of steps at weeks 6 (8321 ± 884 steps/day) and 12 (9703 ± 921 steps/day) were significantly higher than the baseline daily average of 6242 ± 541 steps/day: p=0.046 and p=0.035, respectively.

Ryder 2009 (CS [-] Canada n=41, 6 months) [*Lending pedometers to patrons of 5 public. The pedometers were loaned for maximum of 9 weeks. Education packages were handed out with pedometer including: info on pedometer use, physical activity/walking recommendations, maps of local trails, and a Walking Challenge Questionnaire*]. 39.5% indicated they walked more since borrowing the pedometer and 60.5% reported walking about the same.

The evidence on community pedometer interventions to increase walking is only partially applicable to the UK. Only one study were conducted in the UK, with the majority in the US, Australian, Canada, and Japan The differing environments must be considered in reference to the studies, particular for those conducted in Japan. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 19B: INDIVIDUAL LEVEL CHANGE IN WORKPLACE PEDOMETER INTERVENTIONS TO INCREASE WALKING

Moderate evidence from 9 studies suggests that pedometer based interventions delivered in the workplace may be effective in increasing individual levels of walking for leisure or travel, up to 12 months post intervention. Evidence from, 1 RCT, 1 nRCT and 3 BA and 2 ITS study shows positive effects on walking for leisure and/or travel (although one study saw the effect decline over 12 weeks), but evidence from 1 RCT showed no effect on walking and evidence from 1 ITS showed a small negative effect on walking.

Borg 2010 (nRCT [+] Aus n=322, 12 months) [*Staff define as inactive received three month walking programme and pedometer plus four maintenance newsletters over nine months to assist them to maintain their new activity levels. Control received pedometer and programme but no maintenance*]. Both intervention groups significantly increased minutes walking (p=0.01).
Behrens 2007 (ITS [+] USA n=2600, 12 weeks) [*Competition based employer sponsored physical activity programme using pedometers. Employees formed groups of 10 to undertake the challenge of attaining 10,000 steps per day*]. Significant difference in team steps, with post hoc comparisons indicating significant differences from baseline step counts during weeks 6-8: F=71.15, p<0.001, but not at the end of the programme.
Chan 2004 (ITS [+] Canada n=106, 12 weeks) [*Adoption phase: participants met in workplace-based groups with a facilitator for 30–60 minutes each week during a lunch break. Set individual steps per day goals and self-monitored their progress using a pedometer to record daily accumulated steps taken. Then adherence measured for 8 weeks*]. Some decreases in activity relative to baseline steps per day, ranging from -2.4% to -20.6% (12.0% ± 7.6%).
Dinger 2007 (BA [+] Aus n=NR, 6 weeks) [*The intervention group received a pedometer and step logs. Set a daily step goal based on the previous week's step counts. They received weekly email reminders to wear the pedometer and return that week's log. Also received three commercial brochures*]. Daily steps increased significantly from 6419 ± 2386 during week 1 to 7984 ± 2742 during week 6: p<0.001 for both groups combined. Increases did not differ between groups.
Faghri 2008 (ITS [+] USA n=206, 10 weeks) [*Each day participants put on pedometers upon arriving at work, prior to getting out of their cars. To increase motivation, participants were encouraged to develop teams, and each team chose a team leader. Weekly motivational emails were sent to participants*]. Significant increase in the number of steps per week for weeks 2, 3, 4, 6 and 8 compared to baseline: p=0.001.
Jackson 2008 (BA [+] USA n=290, 12 weeks) [*Participants wore a pedometer 5 days per week for 12 weeks and completed questionnaires assessing demographic information. After baseline they were given suggested number of steps to meet recommendations, instructions for goal setting and other behaviour change strategies to gradually increase number of daily steps*]. Average number of steps increased from week 1 to week 6: p<0.001; and week 12: p=0.002
Spence 2009 (RCT [++] Canada n=63, 1 week) [*Intervention group pedometer was worn for one week for all waking hours to encourage walking. Control (non-pedometer) participants were informed they could wear a pedometer the following week*]. Compared to the no pedometer group, the pedometer group reported more walking: F=5.22, p=0.03.

Continued

Tully 2007 (RCT [++] UK n=106, 12 weeks) [*Given a pedometer and a diary and asked to record the number of steps taken, duration of walk, level of breathlessness, and any comments or difficulties. One group 3 days a week and other group 5 days a week*]. Distance walked in the 10 meter shuttle walk test showed no significant differences between the three day and the five day group: p=0.81.

Warren 2010 (BA [+] USA n=188, 10 weeks) [*Participants were provided with pedometers and given personalised daily and weekly step goals over the 10 week intervention. Local strategies available to the participants included walking groups, marked walking circuits and posted walking maps*]. Mean increase of 1503 steps (38% increase over baseline). Mean weekly step counts values for all intervention weeks were significantly higher than baseline: p<0.01.

The evidence on workplace pedometer interventions to increase walking is only partially applicable to the UK. One study was conducted in the UK but most studies were conducted in US, Australian, and Canada which may limit the applicability in some cases. The differing environments must be considered in reference to the studies. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

1. INTRODUCTION

1.1. Aims and objectives

This review was undertaken to support the development of guidance on walking and cycling: local measures to promote walking and cycling as forms of travel or recreation, and aims to review the evidence on the effectiveness of local interventions. This review will be supported by further work looking at qualitative and economic evidence.

1.2 Research questions

Question 1: Which local interventions are effective and cost effective at promoting and increasing cycling and walking for recreational and travel purposes?

Question 2: Which local interventions are effective and cost effective at changing population-level norms and behaviour in relation to cycling and walking for recreational and travel purposes?

2. BACKGROUND

Physical activity is essential for good health (DH 2004); it can help reduce the risk of coronary heart disease, stroke and type 2 diabetes by up to 50%. It also keeps the musculoskeletal system healthy and promotes mental wellbeing. However, based on self-reporting, 61% of men (71% of women) in England aged 16 and over did not meet the national recommended levels (Craig et al. 2009). Guidance for adults has recently been revised to recommend 150mins (two and half hours) each week of moderate to vigorous intensity physical activity (and adults should aim to do some physical activity every day). Muscle strengthening activity should also be included twice a week (Department of Health 2011). The proportion of men who are physically active enough to meet national recommended levels decreases markedly as they get older (from 53% at age 16–24 to 16% at 65 plus). The level of activity among women is considerably lower once they reach age 65. (Around 12% of women over 65 meet the recommended levels compared to 28–36% of younger women.) In children, sixty three per cent of girls (72% of boys) aged between 2–15 report being physically active for 60 minutes or more on 7 days a week. (Girls' activity declines after the age of 10.) (The Information Centre 2007). However, objective data suggest this is an overestimate. Only 2.5% (boys 5.1%, girls 0.4%) actually did more than 60 minutes of moderate to vigorous physical activity daily (Riddoch et al. 2007). Black African and Asian adults and black Caribbean women are less likely to meet the recommended activity levels of physical activity than the general population (The Information Centre 2006).

Walking is reported to be the most common, and cycling the fourth most common recreational and sporting activity undertaken by adults in Britain (Fox and Rickards 2004). Among women of all ages, walking (for any purpose) is the most important way of achieving the recommended physical activity levels. (It accounted for between 37% and 45% of the total time they spend doing moderate or vigorous physical activities [MVPA]). It is also one of the most important physical activities for men of all ages –accounting for between 26% and 42% of total MVPA (Belanger et al. 2011).

Of all trips made in Great Britain in 2009, 20% covered less than 1 mile. More than half (56%) of car journeys were less than 5 miles (Department for Transport 2010b). It is estimated that, on an average day in London, around 4.3 million trips are 'potentially cyclable' (Transport for London 2010). However, in Britain, the average time spent travelling on foot or by bicycle has decreased, from 12.9 minutes per day in 1995/97 to 11 minutes per day in 2007 (Department for Transport 2010c). Cycle use in Britain is lower than in other European Union (EU) countries. It is estimated that bicycles are used for 2% of journeys in Britain compared to about 26% of journeys in the Netherlands, 10% in Denmark and 5% in France (Ministry of Transport, Public Works and Water Management 2009).

Changes in the number of people walking and cycling could have an impact on health, the environment and the economy. These may be positive or negative, and can be experienced by individuals or populations. Health outcomes include increased physical activity and changes to conditions such as obesity, cardiovascular disease (CVD), type 2 diabetes, some cancers, and mental wellbeing. Cycling and walking are also important ways for people to get to local places and services (such as education, employment, shops, healthcare and recreation). This, in turn, could boost the local economy while having a positive impact on the environment. For example, a decision to cycle or walk rather than drive reduces the emission of air pollutants and carbon dioxide.

Walking and cycling may have unintended consequences, some of which may be counter-intuitive. For example, deciding to cycle might replace another more intense activity (such as going to the gym) which may result in an overall reduction in physical activity. In addition, walking or cycling, rather than driving, may result in a different level of exposure to air pollution. Generally, cyclists and pedestrians experience higher rates of injuries than motorists (Department for Transport 2010b). However, there is also some evidence to support the hypothesis that increasing the number of cyclists reduces the risk of injury, possibly by making drivers and cyclists more familiar with each other

(Jacobsen 2003). The decision to drive rather than walk may expose others to risk of injury from a collision.

Motorised transport in urban areas is associated with considerable costs. Congestion, poor air quality, collisions and physical inactivity in English urban areas each cost around £10 billion a year (Department for Transport 2009). The cost of greenhouse gas emissions and the annoyance associated with noise are smaller, but still significant. In the case of greenhouse gases, costs are expected to rise sharply in future years (Department for Transport 2009).

Interventions to promote walking or cycling may have an impact on health inequalities. For instance, the change experienced as a result may vary for people with limited mobility. Ensuring planning decisions improve access on foot or by cycling may help those who are unable to drive. Changes in vehicle use may alter the risk of injury – which itself varies significantly according to people's socioeconomic background. As exposure to air pollution also varies across the social gradient, so changes in the level of pollutants may be more significant for some groups than others.

3. METHODS

3.1 Search methods

The standard NICE Methods, as outlined in the Methods for the Development of NICE Public Health Guidance (2009) were used to guide the development of the search methods. The aim of the search strategy was to retrieve the best available evidence to inform the development of the effectiveness review.

An initial overarching search was undertaken at the outset of all reviews for this programme guidance. This search was generated by identifying concepts from the programme scope and from studies identified from key known literature as being relevant to the review questions. Free text and subject heading terms were then devised. A broad coverage of health and social science databases and transport specific databases were searched. The databases searched were: Medline and Medline in Process via OVID SP; CINAHL via EBSCO; Sociological Abstracts via Proquest; Embase via OVID SP; ASSIA via Proquest; British Nursing Index and Archive via OVID SP; The Cochrane Library via Wiley; Science Citation Index via Thomson ISI; Social Science Citation Index via Thomson ISI; PsycINFO via OVID SP; The Transport Database via OVID SP; Social Policy and Practice via OVID SP; Selected EPPI Centre Databases.

After the evidence retrieved from this search had been examined it became clear that there was a paucity of cycling papers which were of an appropriate study type for this review. It was unclear whether this was due to lack of published evidence or due to challenges encountered in evidence retrieval. When designing the initial search strategy it became apparent that terms such as “cycle” or “cycling” retrieved a large number of irrelevant papers in medical and health databases (e.g. IVF cycles) even when employing techniques such as adjacency operators; therefore they were not used. Alternative terms such as “biking” and “bicycle” were included as well as relevant subject heading terms. “Cycling” and “cycle” were used in Transport databases.

In order to resolve the challenges outlined above a number of additional searches (listed below) were undertaken which were discussed with and approved by the NICE team:

- Search for citations of relevant articles in Web of Science citation indices;
- Searches for specific identified programmes (in key databases);
- Searches for key phrases identified from the relevant papers retrieved (in key databases);
- A search employing an appropriate study filter (details below).

Cycling papers identified as relevant to the effectiveness review were examined to identify any additional terms which could be used in a further search, unfortunately no extra terms were identified which had not already been tried. A search was undertaken using the subject heading for cycling with the addition of selected sub-headings, as it was found for example, that the addition of the sub-heading for physiology resulted in a high return of papers focusing on elite athletes and cycling. The subject heading as described was added to a study filter created by McMaster University Health Information Research Unit as part of their "hedges" project (McMaster 2011) in addition to other terms designed to retrieve effectiveness papers e.g. non-randomised, quasi-experimental.

- Specific websites were also examined and searched within for suitable evidence.

All searches were limited to English Language, 1990-current and human studies where data sources allowed.

A thorough audit trail of the search process was maintained; this includes all searches, number of results and number of relevant references identified. This process ensures that the search process is transparent, systematic and replicable.

An overview of evidence sources are listed below, with detailed information including location of websites and sample search strategies presented in Appendix 6.

Other sources of evidence were as follows:

- The PDG were asked for recommendations of articles, books, reports etc. which meet the scope of the systematic review;

- Evidence submitted by stakeholder call for evidence.

3.2 Inclusion and exclusion criteria

Populations

Groups that will be covered: Everyone including, where the evidence permits, specific groups (for instance, those with impaired mobility) or those undertaking particular types of journey (for instance, journeys to work).

Groups that will not be covered: Disease rehabilitation studies conducted in populations with very specific conditions, which include walking and cycling interventions, but have outcomes related only to improvements in the disease condition.

Activities/interventions

Activities/interventions that will be covered:

Local interventions which aim to raise awareness of, encourage or increase uptake of, walking and cycling for recreational and travel purposes and to improve general health. Also local interventions which aim to reduce the barriers to these activities. This will include those interventions targeted at particularly vulnerable and high-risk groups, where the evidence permits. Interventions aimed at individuals and those targeting population-level attitudes, norms and behaviour will be included, along with multi-component approaches that aim to do both. (The latter may include changes to the physical environment).

Interventions may include: a) Local, media-based activities (including broadcast, print, telephone, Internet and digital media) to raise awareness of the benefits and convenience of walking and cycling; b) Other local media-based activities that aim to change behaviour using accepted theories of behaviour change; c) Promotional activities, events and challenges (such as group rides, walking groups and events linked to sport); d) Resource provision (such as cycle hire, pedometers, cycle purchase schemes or safety equipment), e) Information resources (such as maps, route or travel plans, road safety leaflets and personalised travel planning); f) Skills training (such as cycle training, organised rides or walks and safety tips); g) Integrated programmes combining environmental and behavioural interventions.

Note: ’local’ may refer to a geographically defined area larger than that covered by a single local authority such as greater London, Manchester or Merseyside. It may also refer to a smaller area such as a housing estate or small town.

Activities/interventions that will not be covered:

a) National policy, fiscal and legislative changes. For example, fuel and vehicle duty, national speed limits and drink-driving or cycle-helmets legislation; b) Local interventions which solely aim to change the physical environment (such as traffic-calming measures, provision of cycling parking facilities or construction of cycle routes). These interventions have been considered in existing NICE guidance (public health guidance 8); c) Brief advice given in primary care to increase people's physical activity levels. This has been considered in existing NICE guidance (public health guidance 2); d) Interventions which solely report on sports-related outcomes, such as training programmes which report on someone’s sport performance.

3.3 Data extraction strategy

Data relating to study design, outcomes and quality were extracted by one reviewer and each extraction was independently checked for accuracy by a second reviewer. Disagreements were resolved by consensus and consulting a third reviewer where necessary. The data extraction tables are presented in Appendix 1.

Study designs were grouped and reported as follows:

RCT: randomised controlled trial (outcome measures reported both before and after intervention and with concurrent control group: random allocation);

nRCT: non-randomised controlled trial (outcome measures reported both before and after intervention and with concurrent control group: non-random allocation);

BA: before and after study (outcome measures reported before and after intervention without a concurrent control group);

ITS: interrupted time series (as a BA study but with data taken at multiple time points before and after intervention without a concurrent control group);

CS: cross-sectional study (outcome measures reported at one time point only);

ER: Evaluation report (large reports encompassing more than one study design or where detail of the design of the study was not given).

3.4 Quality assessment criteria for effectiveness studies

In addition to extracting key information from included papers, there was consideration of the study quality as per recommended NICE methods (NICE, 2009). The criteria for assessment are given in Appendix 2. The studies were placed in one of three grades as follows based on the methodology checklist

Table 1. Criteria used for study grading

Code	Quality criteria
++	All or most of the criteria have been fulfilled. Where they have not been fulfilled the conclusions of the study or review are thought very unlikely to alter
+	Some of the criteria have been fulfilled. Those criteria that have not been fulfilled or not adequately described are through unlikely to affect conclusions
-	Few or no criteria fulfilled. The conclusions of the study are thought likely or very likely to alter

For the purpose of generating evidence statements, evidence was graded as strong (mostly [++] studies), moderate (mostly [+] studies), weak (mostly [-] studies) or mixed.

3.5 Summary of study identification

All search results were downloaded to Reference Manager. Potentially relevant papers were identified through the initial searches, and full papers were obtained. Citation searching of key papers as well as scrutinising reference lists and searching on key UK programmes was also carried out. Papers were also suggested by stakeholders. It is important to note that some studies included in recent UK reviews of walking and/or cycling interventions (e.g. Ogilvie 2007, Yang 2010) have not been included as they consisted of documents which could not be obtained (e.g. PhD thesis), or documents written in languages other than English.

4. SUMMARY RESULTS

4.1. Quantity of the evidence available

In total 118 papers were selected for inclusion in the review. 70 effectiveness papers were identified through the initial database searches, 2 through citation searches and one through additional targeting searching, with 25 additional papers identified through scrutinising reference lists and 20 identified by the stakeholders group (additional papers not already identified through searching; Table 2). A full list of included studies is given in Appendix 3.

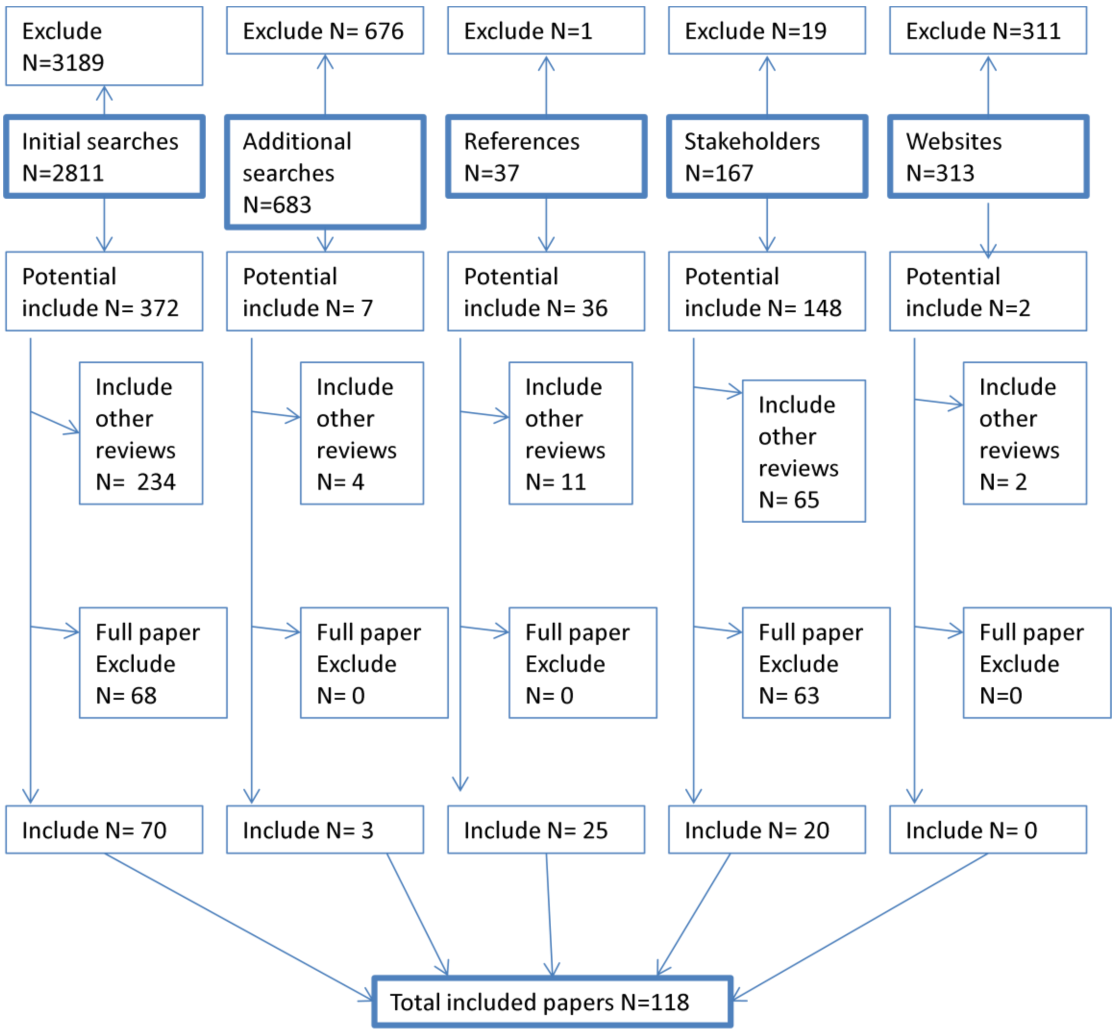
Table 2. Summary of study identification

Source	**Number of hits**	**Papers included**
Initial searches	2811	70
Additional searches	218	1
Citation searches of included papers	165	2
Reference list of included papers and systematic reviews	55	25
Stakeholders/PDG	167	20
Websites	313	0
Total	**3729**	**118**

We excluded 131 papers which were obtained as full papers but subsequently found to be outside of the scope of the review. A list of these papers and the reasons for their exclusion is given in Appendix 4. Figure 1. gives a full Quorum diagram of the studies identified, their source and the number of studies excluded and included (including those identified as relevant to others reviews in this programme of work).

The majority of studies identified were interventions to encourage walking (n=75) with fewer studies focusing on cycling (n=9) or walking and cycling (n=34). Most studies did not distinguish between walking and/or cycling for leisure or transport and so have been reported as addressing both. The two main exceptions to this were interventions which consisted of walking for leisure (n=16), or walking and/or cycling for active travel, mostly to reach school or the workplace (n=47; 4 cycling papers, 12 walking papers, and 31 walking and cycling papers). As discussed above, there were initial concerns over the cycling search terms, but considerable efforts were made to ensure that relevant cycling papers were not overlooked (section 3.1). The possible reasons for the smaller quantity of cycling papers are discussed in Chapter 7. In addition, further reviews which will be presented for the development of this programme guidance will include qualitative papers, surveys, correlates papers, and health economic literature where the split between walking and cycling papers appears more balanced at this stage.

Figure 1. Quorum diagram



4.2 Study designs

Section 3.3 gives the definition of each study design. We identified the following number of studies in each design group: RCT: n=37 (including 5 of cluster design); nRCT: n=14; BA: n=37; ITS: n=7; CS: n=3; and ER: n=20.

4.3 Quality of the evidence available

Details of the study quality assessments are shown in Appendix 2. Criteria 2.3 considering allocation of concealment, and 2.4 which considers blinding have been shaded out as they were not addressed in any of the included studies. Blinding is not usually practical for the types of interventions considered here.

Therefore, the main limitation of study quality at RCT level was blinding: for studies of health promotion interventions it is often impossible to blind the participants and there are many practical challenges to blinding the assessors. Other types of studies are fundamentally limited in their design, and several also had small samples resulting in concerns over study power, or were presented with limited analysis and/or poor presentation of data as is discussed in more detail below.

The studies included here are generally of good quality with 35 scored as [++] and 79 scored as [+] (4 studies were rated [-]). Those studies which employed an RCT design generally scored best overall on the quality rating scale, with 31 (out of 37 studies) scoring [++] after making allowances for blinding etc. (section 3.4). However, it is important to note that the quality grading instrument is subjective overall, and, due to having only one instrument to assess all quantitative intervention studies, there is some bias towards the RCT design when this many not be most appropriate in all cases. In addition, poor reporting in some cases made study grading challenging as it can be difficult to distinguish between poor study design and poor reporting.

4.4 Populations and settings

Papers reported on studies which were conducted in the following countries: UK (n=46); USA (n=39); Australia (Aus) (n=22); Canada (n=4); Japan (n=2); Belgium (n=1); Sweden (n=1); and New Zealand (n=1). Most studies were delivered in community settings (n=83) (2 of these studies also had additional aspects in workplace or educational settings), with fewer studies delivered in the workplace (n=17, including 10 in universities) and in education settings (n=18 studies in schools). The community delivered studies included the whole community (n=32), all adults (n=32) although individual age ranges varied, or women only (n=16). All school based studies were delivered to primary school pupils, with one including girls only. Workplace studies were delivered to all employees with the exception of one which included women only, those conducted in Universities were delivered to a mix of staff and students with two including women only. Individual study populations varied and further details are given in section 4.6.

4.5 Outcome measures

Table 3. shows the type of outcome measure reported by the included studies. The main outcome measures were rates of walking, cycling, or both walking and cycling as discussed above. Cycling was reported as amount of time spent cycling or number of cyclists. Walking was reported as minutes walked, distance walked, number of steps taken (recorded on pedometers), or number of walkers. Changes in walking and cycling were also recorded as a shift from one transport mode to another to encompass active travel (walking and cycling with or without public transport). Some studies also reported rates of overall physical activity (including meeting national recommendations for rates of physical activity). Reported health outcomes included: fitness or cardio-respiratory fitness; VO_2 max; blood pressure; heart rate; weight; body fat or cholesterol; BMI; waist circumference; and hip circumference. Studies also reported wellbeing type outcomes such as: well-being; Quality of Life; depression; stress; anxiety; mood; and social support. Further outcomes reported included: behavioural change outcomes; change in diet; and adherence to, participation in or awareness of, an intervention. There was a mixture of self reported and directly observed outcomes with many studies reporting both. The frequencies in which outcomes were reported by the studies are given in table 3. Individual study outcomes are given in Appendix 3 and the data extraction tables (Appendix 2).

Table 3. Frequency of outcome measures in included studies

Outcome	Frequency
Cycling (all)	34
Walking time	40
Steps taken	32
Distance walked	29
Number/ proportion of walkers	10
Transport mode	34
Physical activity (including recommendations	25
Fitness / cardio-respiratory fitness/	11
Adherence / Participation/Awareness	11
BMI	15
Waist circumference	11
Heart rate	1
Body fat / cholesterol	1
Blood pressure	6
Hip circumference	5
Weight	4
Well- being / QoL	6
Change in diet	3
Depression, Stress, Anxiety, Mood	2
Behavioural change outcome	11

4.6 Interventions

The heterogeneity of the interventions' aim, design, and outcome measures used preclude a meta-analysis of their results. We have therefore completed a narrative synthesis of the data, primarily in terms of study impact, design, type of intervention and outcome.

The following synthesis (chapter 5) is reported by type of intervention. We grouped similar interventions, which we have defined as follows:

- Media campaigns: mass media campaigns targeting the whole population and delivered via a variety of media.
- Health information: targeted programmes providing information tailored to individuals delivered via media such as telephone, email and the internet;
- Multi component interventions: interventions which were delivered as large components consisting of a variety of elements;

- Walking sessions: interventions which were delivered as walking sessions including led walks, motivation to walk independently, and stair walking;
- Pedometer interventions: interventions which used pedometers to encourage walking;
- Motivational interventions: interventions where the main component of the intervention consisted of a motivational element, such as counselling sessions to encourage walking.

Studies were then further grouped by their main activity type (walking, cycling, or walking and cycling) and then by setting (community, education, workplace), and the included population (e.g. whole population, adults, children, women) where the number of studies in each subset made this appropriate.

It is accepted that the grouping of interventions is subjective and there is no definitive way of representing this. The method used was arrived at post hoc by considering how guidance arising (in part) from this review might be usefully subdivided in respect of implementation by a local public health unit. Accordingly it looked at the possible categorisation of evidence and guidance from viewpoint of its usefulness to a Director of Public Health serving both local authority and NHS. Thus, a local public health unit might have a team (or person) responsible for: health information/publicity; exercise / activity health promotion workers (such as health trainers); etc. Within these, interventions may be targeted or directed at schools, workplace, or local communities, each with specific relevant public health staff responsible for them. However, it is acknowledged that there are many other possible ways of grouping these interventions, each with its own pros and cons.

In addition, for each intervention type we reported interventions which measured population level change in related outcomes and those which measured change at an individual level.

This generated the following typology (with number of identified interventions). Note, some interventions were reported in multiple papers:

Media campaigns (8)
- Walking (5)
- Cycling (2)
- Walking and cycling (1)

Health information (12)
- Walking (9)
- Walking and cycling (3)

Multi component interventions (22)
- Walking interventions (4)
- Cycling interventions (5)
- Walking and cycling interventions (13)

Walking sessions (34)
- Community interventions (20)
  - Walking groups (10)
  - Independent walking (10)
- School based interventions (10)
- Workplace interventions (4)

Pedometer interventions (18)
- Community based studies (9)
- Workplace studies (9)

Each type of study design included a variety of types of intervention and the populations varied in terms of their size and demographic characteristics. Those of poorer design may create bias and it is therefore important to keep in mind the potential of study design to affect the results of the study (that is; lesser quality designs may present less reliable results). The individual studies are discussed in detail below.

The main characteristics of each study are summarised in Table 4.

Table 4. Summary study characteristics

Study	Country	N	Population	Walking Cycling	Travel Leisure	Location	Intervention Type	Type
Dunton 2008	USA	156	Women	W	L/T	Community	Health information	RCT [+ +]

Humpel 2004	Aus	399	Adults	W	L/T	Community	Health information	RCT [+ +]
Lombard 1995	USA	135	Adults	W	L/T	University	Health information	RCT [+]
Merom 2003	Aus	568	Adults	C	L/T	Community	Health information	BA [+]
Merom 2009	Aus	369	Adults	W	L/T	Community	Health information	RCT [+ +]
Mutrie 2002	UK	295	Adults	W+C	T	Workplace	Health information	RCT [+ +]
Napolitano 2006	USA	6300	Adults	W	L/T	Workplace	Health information	BA [+]
Nies 2003	USA	197	Women	W	L/T	Community	Health information	RCT [+ +]
Nies 2006	USA	313	Women	W	L/T	Community	Health information	RCT [+ +]
Prestwich 2010	UK	149	Adults	W	L/T	Community	Health information	RCT [+ +]
Rovniak 2005	USA	50	Women	W	L/T	Community	Health information	RCT [+ +]
Travelsmart East Inverness	UK	Target popn 1,500	Whole population	W+C	T	Community	Health information	ER [+]
Travelsmart Cramlington	UK	NR	Whole population	W+C	T	Community	Health information	ER [+]
Travelsmart Doncaster	UK	Target popn 2275	Whole population	W+C	T	Community	Health information	ER [+]
Travelsmart Sheffield	UK	NR	Whole population	W+C	T	Community	Health information	ER [+]
Travelsmart Nottingham	UK	NR	Whole population	W+C	T	Community	Health information	ER [+]
Travelsmart Peterborough	UK	Target popn 30000	Whole population	W+C	T	Community	Health information	ER [+]
Travelsmart Lowestoft	UK	Target popn 25000	Whole population	W+C	T	Community	Health information	ER [+]
Travelsmart Ipswich *	UK	NR	Whole population	W+C	T	Community	Health information	ER [+]
Travelsmart Broxbourne*	UK	NR	Whole population	W+C	T	Community	Health information	ER [+]
Travelsmart Watford	UK	Target popn 25000	Whole population	W+C	T	Community	Health information	ER [+]
Travelsmart London (Kingston)	UK	NR	Whole population	W+C	T	Community	Health information	ER [+]
Travelsmart Exeter	UK	Target popn 25000	Whole population	W+C	T	Community	Health information	ER [+]
Travelsmart Bristol (Windmill Hill and Southville)	UK	NR	Whole population	W+C	T	Community	Health information	ER [+]
Travelsmart Bristol (Bishopston)	UK	Target popn 25000	Whole population	W+C	T	Community	Health information	ER [+]
Travelsmart	UK	Target	Whole	W+C	T	Community	Health	ER [+]

Gloucester (Barton, Tredworth and White City)		popn 4000	population				information	
Travelsmart Worcester	UK	Target popn 23500	Whole population	W+C	T	Community	Health information	ER [+]
Travelsmart Lancaster City & Morecambe	UK	Target popn 5000	Whole population	W+C	T	Community	Health information	ER [+]
Travelsmart Gloucester (Quedgeley)	UK	Target popn 4000	Whole population	W+C	T	Community	Health information	ER [+]
Travelsmart Preston and South Ribble	UK	Target popn 25000	Whole population	W+C	T	Community	Health information	ER [+]
Travelsmart 2005	Aus	N= 5 region s	Whole population	W+C	T	Community	Health information	ER [+]
Travelsmart 2011	UK	19 UK region s	Whole population	W+C	T	Community	Health information	ER [+]
Wen 2005	Aus	68	Adults	W+C	L/T	Workplace	Health information	BA [+]
Baker 2011	UK	61	Adults	W	L	Community	Media campaign	BA [+]
Merom 2005	Aus	1100	Adults	W+C	T	Community	Media campaign	BA [+]
Merom 2008	Aus	794	Adults	W+C	T	Community	Media campaign	BA [+]
Reger 2002	USA	1472	Adults	W	L/T	Community	Media campaign	nRCT [+]
Reger-Nash 2005	Aus	750	Adults	W	L/T	Community	Media campaign	nRCT [++]
Wimbush 1998	UK	3476	Adults 30-55	W	L/T	Community	Media campaign	BA [+]
Wray 2005	USA	297	Adults	W	L/T	Community	Media campaign	CS [+]
Vernon 2002	UK	322	Whole population	W	L	Community	Media campaign	CS [+]
Brockman 2011	UK	2829	Adults	W+C	T	University	Multi-component	ITS [+]
Brownson 2004	USA	2399 – 17,642	Adults	W	L/T	Community	Multi-component	nRCT [+]
Brownson 2005	USA	2470	Whole population	W	L/T	Community	Multi-component	nRCT [+]
Bull 2008	UK	2240	Adults	W+C	T	Community	Multi-component	BA [+]
Cairns 2006a	UK	179	School pupils	W/C	T	School	Multi-component	BA [+]
Cirignano 2010	USA	184	School pupils	W	L/T	School	Multi-component	ITS [+]
Clarke 2007	USA	124	Overweight mothers	W	L/T	Community	Multi-component	BA [+]
CLES 2011	UK	7883	Whole population	W	L/T	Community School	Multi-component	nRCT [++]
Cope 2009	UK	6	Whole	C	T	Community	Multi-	ITS [+]

		towns	population				component	
Cope 2011	UK	6 reg ions	Whole population	C	T	Community	Multi-component	ER [-]
De Cocker 2009	Belgium	438	Adults	W/C	L/T	Community	Multi-component	BA [+]
Hemmingsson 2009	Sweden	120	Women	W+C	T	Community	Multi-component	RCT [++]
Hendricks 2009	USA	NR	School pupils	W+C	L/T	Community	Multi-component	BA [-]
Krieger 2009	USA	53	Adults	W	L/T	Community	Multi-component	BA [+]
McKee 2007	UK	60	School pupils	W	T	School	Multi-component	nRCT [+]
NSW 2002	Aus	2 areas	Whole population	W	L	Community	Multi-component	nRCT [+]
Parker 2011	USA	NR	Whole population	C	L/T	Community	Multi-component	BA [+]
Rissel 2010	Aus	1450	Adults	C	L/T	Community	Multi-component	nRCT [+]
Rowland 2003	UK	21 schls	School pupils	W+C	T	School	Multi-component	Cluster RCT [++]
Sloman 2009	UK	1500	Whole population	C	L/T	Community	Multi-component	BA [+]
Sloman 2010	UK	12000	Whole population	W+C	T	Community	Multi-component	BA [+]
Staunton 2003	USA	21 schls	School pupils	W+C	T	Community	Multi-component	BA [+]
Sustrans 2008	UK	11000	School pupils	C	T	School	Multi-component	BA [+]
Telfer 2006	Aus	113	Adults	C	L/T	Community	Multi-component	BA [+]
TenBrick 2009	USA	36,000	Whole population	W+C	T	Community	Multi-component	ITS [-]
Wen 2008	Aus	2258	School pupils	W+C	T	School	Multi-component	Cluster RCT [+]
Baker 2008b	UK	50	Adults	W	L/T	Community	Pedometer	RCT [++]
Behrens 2007	USA	2600	Adults	W	L/T	Workplace	Pedometer	ITS [+]
Borg 2010	Aus	332	Adults	W	L/T	Work place	Pedometer	nRCT [+]
Chan 2004	Canada	106	Adults	W	L/T	Work place	Pedometer	ITS [+]
Dinger 2005	USA	43	Women	W	L/T	Community	Pedometer	BA [+]
Dinger 2007	Aus	NR	Women	W	L/T	University	Pedometer	BA [+]
Faghri 2008	USA	206	Adults	W	L	Workplace	Pedometer	ITS [+]
Jackson 2008	USA	290	College students.	W	L/T	University	Pedometer	BA [+]
Koizumi 2009	Japan	68	Women Retired	W	L/T	Community	Pedometer	RCT [+ +]
Merom 2007	Aus	369	Adults	W	L/T	Community	Pedometer	RCT [+ +]
Miyazaki 2011	Japan	56	Adults Retired	W	L/T	Community	Pedometer	BA [+]
Moreau 2001	USA	24	Women	W	L/T	Community	Pedometer	RCT [+ +]

Pal 2009	Aus	26	Women	W	L/T	Community	Pedometer	RCT [+ +]
Ryder 2009	Canada	41	Adults	W	L/T	Community	Pedometer	CS [-]
Spence 2009	Canada	63	Female students.	W	L/T	University	Pedometer	RCT [+ +]
Tully 2007	UK	106	Adults	W	L	Workplace	Pedometer	RCT [+ +]
Warren 2010	USA	188	Women	W	L/T	Work place	Pedometer	BA [+]
Baker 2008a	UK	63	Adults	W	L/T	University	Pedometer	RCT [++]
Darker 2010	UK	130	Adults	W	L/T	Community	Walking session	RCT [++]
Perry 2007	USA	46	Women	W	L/T	Community	Walking session	RCT [++]
Steele 2007	Aus	192	Adults	W	L/T	Community	Walking session	RCT [++]
Avila 1994	USA	44	Adults	W	L/T	Community	Walking sessions	RCT [+ +]
Bickerstaff 2000	UK	309	School pupils	W	T	School	Walking sessions	BA [+]
Cairns 2006b	UK	585	School pupils	W	T	School	Walking sessions	BA [+]
Cairns 2006c	UK	309	School pupils	W	T	School	Walking sessions	BA [+]
Coleman 1999	USA	32	Adults	W	L/T	University	Walking sessions	RCT [+ +]
Cox 2008	Aus	116	Women	W	L/T	Community	Walking sessions	RCT [+ +]
Culos-Reed 2008	Canada	52	Adults	W	L	Community	Walking sessions	BA [+]
Eastep 2004	USA	26	Adults	W	L/T	University	Walking sessions	RCT [+ +]
Estabrooks 2008	USA	1493	Adults	W	L	Community	Walking sessions	BA [+]
Fisher 2004	USA	582	Adults 65+	W	L	Community	Walking sessions	Cluster RCT [+ +]
Gilson 2006	UK	61	Adults	W	L/T	University	Walking sessions	RCT [+ +]
Gilson 2009	UK	64	Adults	W	L/T	University	Walking sessions	RCT [+ +]
Hawthorne 2011	USA	1074	School pupils	W	L	School	Walking sessions	BA [+]
Jancey 2008	Aus	260	Adults Retired	W	L	Community	Walking sessions	BA [+]
Johnson 2010	USA	26	Adults	W	L	Community	Walking sessions	BA [+]
Johnston 2006	USA	NR	School pupils	W	T	School	Walking sessions	nRCT [+]
Kong 2010	USA	28	School pupils	W	T	School	Walking sessions	BA [+]
Lamb 2001	UK	438	Adults	W	L	Community	Walking sessions	RCT [+ +]
Mackett 2005	UK	101	School pupils	W	T	School	Walking sessions	BA [+]
McAuley 1994	USA	114	Adults	W	L	Community	Walking sessions	RCT [+ +]

McAuley 2000	USA	174	Adults	W	L	Community	Walking sessions	RCT [+ +]
Mendoza 2009	USA	653	School pupils	W	T	School	Walking sessions	nRCT [+]
Mier 2011	USA	16	Women	W	L	Community	Walking sessions	BA [+]
Milton 2009	UK	119	Whole population	W	L/T	Community	Walking sessions	nRCT [+]
Murphy 2006	UK	37	Adults	W	L	Community	Walking sessions	RCT [+ +]
Reger-Nash 2006	Aus	4 comm	Whole population	W	L/T	Community	Walking sessions	RCT [+]
Schofield 2005	New Zealand	85	Girls	W	L/T	School	Walking sessions	Cluster RCT [++]
TAPESTRY 2003	Aus	243	School pupils	W	T	School	Walking sessions	nRCT [+]
Wilbur 2003	USA	153	Women	W	L	Community	Walking sessions	nRCT [+]
Wilbur 2008	USA	281	Women Age 40-65	W	L	Community	Walking sessions	Cluster RCT [+
Zaccari 2003	Aus	243	School pupils	W	T	School	Walking sessions	BA [+]

5. NARRATIVE SYNTHESIS

Note; all results are presented as reported in the papers. For example, where only percentage change data, or p values rather than confidence intervals are given, no further statistics were reported by the study authors. These reporting limitations are reflected to some extent in the quality grades and this is further discussed in chapter 7 of this report.

5.1 Mass media campaigns

We identified 8 mass media campaigns (reported in 9 papers) to increase walking and/or cycling. Five reported outcome measures at the level of population change and three reported individual level change only. Five campaigns aimed to increase walking, one aimed to improve rates of both walking and cycling (Merom 2005/2008) and two to improve cycling only (Bowles 2006, Merom 2003). Most campaigns did not distinguish between travel or leisure, with the exception of one study reporting specifically on active travel (Merom 2005/8). All interventions were delivered in the community and targeted adults of working age. The types of study design varied; there were 2 nRCTs, 5 BA studies, and 2 CS studies. Campaigns were conducted in the USA, Australia and the UK. The interventions are summarised in Table 5.

Table 5. Summary of content of mass media interventions.

Mass media campaigns to increase walking	
Reger-Nash 2005	Paid advertisements (TV, radio, cable, newspapers), public relations and community participation
Reger 2002	Paid advertising, public relations events to generate media coverage, public health educational activities at work sites, churches and local organisations.
Vernon 2002	Ten attractive, accessible, local walks ranging between 20 and 65 minutes in duration with an appeal to the general population. Involvement consisted of at least six walks in the last three months.
Wimbush 1998	40 second TV advert and was supported by a telephone helpline (Fitline).
Wray 2005	Billboard, newspaper, radio, and poster advertisements.
Mass media campaigns to increase cycling	
Bowles 2006	Participation in a mass cycling intervention.
Merom 2003	Local press adverts (including 6 main community language newspapers), map of the trail, promotion on local radio, full

	colour brochure distributed to local organisations, factories, high schools and motor registries, launch event and onsite promotion.
Mass media campaigns to increase walking and cycling	
Merom 2005	Australia walk to work day: Mass media campaign is a collaborative annual event in which members of the public are encouraged to walk (or cycle) to work.
Merom 2008	

5.1.1 Media campaigns: walking

Five papers reported on community delivered media campaigns targeting adults which aimed to increase walking.

Reger-Nash 2005 (nRCT++ Aus n=750) conducted an 8 week mass media, community wide physical activity intervention to promote sustained changes in walking by recommending at least 30 minutes of moderate intensity, daily walking. The campaign consisted of paid advertisements (TV, radio, cable, newspapers), public relations and community participation. There was also a booster campaign in month 11. The study population consisted of sedentary 50 to 65 year olds and was compared to a second, no intervention community. The intervention community had higher proportions of sufficiently active walkers over time from 3-12 months than the control. For the most sedentary (intervention group A) this was significant at 3 months (31% vs. 17%) and 12 months (32% vs. 18%) compared to baseline (no p value given). Intervention group A compared to control were almost twice as likely to have made any increase in their daily walking at 3 months (OR=1.93, 95%CI 1.21-3.08, p<0.01), and 12 months (OR=1.72, 95%CI 1.01-2.95) and significantly more likely to have achieved sufficiently active walking status at 3 months (OR=2.13, 95%CI 1.25-3.62 p<0.01) and 12 months (OR=1.94, 95%CI 1.06-3.55, p<0.05). Therefore the intervention increased walking amongst the least active and the effect was sustained at 12 months.

Reger 2002 (nRCT+ USA n=1472) reported on “Wheeling Walks”, an eight week campaign to promote 30 minutes of daily walking, which included paid advertising, special public relations events designed to generate additional media coverage, and public health educational activities at work sites, churches and local organisations. The intervention targeted sedentary and irregularly active adults aged 50 to 65 years, living in Wheeling, West Virginia. This was compared to a second, comparable city with no advertising campaign. There was a 23% increase in walking observations in the intervention community versus a 6% decrease in the comparison community (OR 1.31, 95%CI 1.14 – 1.50, p<0.001). In addition, self-reported behaviour changes were recorded. Of the pre-test sedentary adults, 32.5% reached recommended levels of walking in the intervention community versus 18% in the comparison community (odds ratio 2.12, 95%CI 1.41–2.24). Respondents in the intervention community reported walking more minutes per week (mean = 129 minutes) versus comparison community (mean 87.6), p<0.003. The number of minutes reported walking also increased from pre-test (mean 63.8) to post-test (mean 143) across both communities (p<0.001).

Vernon 2002 (CS+ UK n=322) reported on an intervention titled “Doorstep Walk”. The aim of this initiative was to design a pack of ten attractive, accessible, local walks ranging between 20 and 65 minutes in duration with an appeal to the general population. Seven of the walks linked ‘green areas’ within the City of Salisbury (Wiltshire) and three were in the countryside on the outskirts. The walks were classified on a five-point scale of ease (distance and gradient) to allow participants to increase the intensity and duration as their fitness progressed. Enclosed within the walking packs was general information about the benefits of regular physical activity, clear directions of the walks, information of local interest and a record sheet for participants to record their achievements. Five hundred free packs were disseminated to the general public through general practitioner (GP) surgeries and health centres, leisure centres, libraries, social service departments and voluntary organisations. The study adopted a pre- and post-intervention design utilising a subjective, self-administered postal questionnaire. Of the respondents 82 per cent were women and 62 per cent were aged between 41 and 70 years. Over a quarter of the respondents (26.7 per cent of the ’continued users’) indicated that their involvement consisted of at least six walks in the last three months. Six walks equates to a minimum of two hours ’Doorstep Walking’ or a maximum of 6.5 hours ’Doorstep Walking’ per 3-month period, depending upon which ’Doorstep Walk’ was used. 56.7% said their involvement was between one and five walks. Those who continued to use the pack were more likely to report that they had been encouraged to go on alternative walks than those who did not ($p<0.001$). Similarly continued users were more likely to say that the pack had increased the distance they were prepared to walk ($p<0.001$). 55% of the respondents (n=22) who classified themselves as 'sedentary' on the ADNFS at the time of receiving the pack reported a shift in activity status to 'active after 18 months ($p<0.001$). Of the 60 respondents still using the pack 25% were sedentary when they received it. However, after 18 months of use only 3.3% remained inactive; 96.7% of the previously sedentary who still used the pack became active. These increases were statistically significant ($p<0.001$).

Wimbush 1998 (BA+ UK n=3476) reported on a mass media campaign which targeted Scottish adults who were not regular exercisers. The intervention consisted of a 40 second TV advert and was supported by a telephone helpline (Fitline). Advertising ran for 4 weeks in September/October 1995 and again in March/April 1996. Fitline callers were 59% female and 46% were 30-55 years old (20% were older than 55, 34% were younger than 30). They were followed up at one year post intervention. There was no direct comparison group. At the population level, the authors state that the campaign had a notable positive impact on knowledge about walking (with an increase from 20% before the intervention to 56% after the intervention of the population who agreed with statements such as walking is good for exercise), but no impact on walking behaviour, with number of days walked at least 30 minutes per week being 4.26 in 1995 and 4.13 in 1996 (no significance statistics given). Among helpline callers: 48% of those followed up at 1 year claimed to be more physically active; 46% reported they were exercising at the same level; and 7% reported they were less physically active (no further statistics given). In addition, there was an overall shift in the behaviour change model from contemplation towards action stage of change at both 10 week and 1 year follow up. This study is limited by the way the data is reported as percentage changes are not substantiated with measures of significance.

Wray 2005 (CS- USA n=297) reported on a media campaign to increase walking which consisted of billboard, newspaper, radio, and poster advertisements. The campaign was designed to reach adult residents of St Joseph, Missouri, a midsize town with a population of 84,909 in 2003. The strategy for media placement was to achieve the greatest visibility at the outset, in May and June, followed by reduced numbers of advertisements from July through September. Television spots were not used because of the expense of “buying airtime”. In a press conference to initiate the campaign, local political leaders and coalition partners announced the Walk Missouri campaign to local radio, television, and newspaper outlets. Post campaign, the authors report that the exposed group reported a greater level of participation in three of six wellness or walking behaviours than the unexposed group at a statistically significant level. Compared to the control group, those exposed to the campaign were more likely to participate in the sponsored walk (4.3% vs. 0.5% $X^2[1] = 5.4$, p=0.02), participate in the health fair (20% vs. 10% $X^2[1] = 5.9$, p=0.02), and walk for at least 10 minutes on more days of the week (2.73 days vs. 4.52 days t [7] =2.34, p=0.02. There was no significant difference in participation in worksite wellness, walking once for at least 10 minutes during a usual week, or walking intensity. Amount of exposure is also reported to be associated with the same three behaviours at a statistically significant level (p= 0.01-0.02). This study was limited as it did not record baseline data before the intervention.

EVIDENCE STATEMENT 1A. POPULATION LEVEL CHANGE IN MASS MEDIA INTERVENTIONS TO INCREASE WALKING

Moderate evidence from 3 studies suggests that mass media interventions (which included paid advertisements [TV, radio, cable, newspapers], billboards/posters, public relations, educational activities and community participation), delivered in the community are effective in increasing population levels of walking for leisure or travel in adults up to one year post intervention. Two nRCTs showed positive effects on walking. Only one BA study showed no effect on walking and the reporting of data in this study was poor (Wimbush 1998).

Reger-Nash 2005 (nRCT [++] Aus n=750, 12 months) [*Paid advertisements (TV, radio, cable, newspapers), public relations and community participation*]. Intervention population were more likely than control population to have increased daily walking: OR=1.72, 95%CI 1.01-2.95.
Reger 2002 (nRCT [+] USA n=1472, 8 weeks) [*Paid advertising, public relations events to generate media coverage, public health educational activities at work sites, churches and local organisations*]. 23% increase in walking observations in the intervention community versus a 6% decrease in the comparison community: OR 1.31, 95% CI 1.14 – 1.50, $p<0.001$.
Wimbush 1998 (BA [+] UK n=3476, 12 months) [*40 second TV advert supported by a telephone helpline*]. No change in number of days walking: 4.26 in 1995 and 4.13 in 1996, no significance statistics given.

The population level evidence on mass media interventions to increase walking is partially applicable to the UK as one study was conducted in the UK. The differing environment in Australia and the US must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 1B. INDIVIDUAL LEVEL CHANGE IN MASS MEDIA INTERVENTIONS TO INCREASE WALKING

Moderate evidence from 2 studies suggests that mass media interventions (which included paid advertisements [TV, radio, cable, newspapers], billboards/posters, public relations, educational activities and community participation), delivered in the community are effective in increasing individual levels of walking for leisure or travel in adults up to one year post intervention. Two CS studies showed positive effects on walking.

Vernon 2002 (CS [+] UK n=322, 18 months) [*Ten attractive, accessible, local walks promoted. Enclosed within the walking packs was general information about the benefits of regular physical activity, clear directions of the walks, information of local interest and a record sheet for participants to record their achievements. Five hundred free packs were disseminated to the general public through general practitioner (GP) surgeries and health centres, leisure centres, libraries, social service departments and voluntary organisations*]. 55% of the respondents who classified themselves as ‘sedentary’ at baseline reported a shift in activity status to “active” after 18 months ($p<0.001$).
Wray 2005 (CS [-] USA n=297, 5 months) [*Billboard, newspaper, radio, and poster advertisements*]. Those exposed to the campaign were more likely to walk for at least 10 minutes on more days of the week than to the control group: (4.52 days vs. 2.73 days $t[7]=2.34$, $p=0.02$.

The individual level evidence on mass media interventions to increase walking is partially applicable to the UK as one study was conducted in the UK. The differing environment in the US must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

5.1.2 Mass media campaigns: cycling

Two studies reported on mass media campaigns to increase cycling.

Bowles 2006 (BA+ Aus n=918) reported on advertising of and participation in, a mass cycling intervention. Participants reported cycling ability and number of times cycled one month before and after the event which was part of an annual scenic ride across Sydney organised by cycling NGOs. Participants had the option of cycling 20 or 50km. 13% reported themselves as low ability in the pre event survey. Half of the survey respondents (51.1%) who reported their cycling ability as low before the event subsequently rated themselves as high after the event. Respondents with low pre-event self reported cycling ability reported an average of 4 sessions of cycling in the month before the event and an average of 6.8 session in the month after the event ($t=5.25$, $p<0.001$).

Merom 2003 (BA+ Aus n=568) reported on a short-term local promotional campaign based around a new Rail Trail cycleway. Media components included local press adverts (including 6 main community language newspapers), map of the trail, promotion on local radio, full colour brochure distributed to local organisations, factories, high schools and motor registries (17,000 brochures distributed), launch event and onsite promotion at 9 city rail stations. Campaign target groups were potential cyclists and pedestrians living within 5 km of the rail trail in four Local Government Areas. A comprehensive full-colour brochure with information and a map was distributed through local organisations, factories, high school, and motor registries. Media components included local press advertisements. The campaign ran from 2nd December 2000 to 29th February 2001. In analysis of unprompted message recall, 198 (44%) respondents at baseline could not recall any generic message promoting bike riding compared to 153 (34%) at post-test, the reduction was significant ($p<0.001$). The highest percentage of Trail awareness was observed among inner city cyclists (51%), while smaller proportions were noted among inner city pedestrians (20.1%) and outer cyclists (29.3%) $p=0.001$. Significantly more males than females were aware

EVIDENCE STATEMENT 2A: POPULATION LEVEL CHANGE IN MASS MEDIA INTERVENTIONS TO INCREASE CYCLING

Moderate evidence from one BA study suggests that a mass media intervention can increase population level awareness of a cycle trail and recall of intervention messages at 3 months post intervention. Media components included local press adverts (including 6 main community language newspapers), map of the trail, promotion on local radio, full colour brochure distributed to local organisations, factories, high schools and motor registries (17,000 brochures distributed), launch event and onsite promotion at 9 city rail stations. There was no direct measure of cycling rates.

Merom 2003 (BA [+] Aus n=568, 3 months). 44% at baseline could not recall any generic message promoting bike riding compared to 34% at post-test: $p<0.001$. Trail use was significantly higher among bike owners than those without a bike (8.94% vs. 3.3%, $p=0.014$).

The evidence on mass media interventions to increase cycling is partially applicable to the UK as the study was conducted in Australia. The differing environment in Australia must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 2B: INDIVIDUAL LEVEL CHANGE IN MASS MEDIA INTERVENTIONS TO INCREASE CYCLING

Moderate evidence from one study suggests that a mass media intervention may be effective in increase individual level cycling for leisure in adults. Evidence from one BA study showed a positive effect on cycling one month after the intervention.

Bowles 2006 (BA [+] Aus n=918, 2 months) [*Promotion of, and participation in a mass cycling intervention*]. Respondents with low pre-event self reported cycling ability reported an average of 4 sessions of cycling in the month before the event and an average of 6.8 session in the month after the event ($t=5.25$, $p<0.001$).

The evidence on mass media interventions to increase cycling is only partially applicable to the UK as the study was conducted in Australia. The differing environment in Australia must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

5.1.3 Mass media campaigns: Walking and cycling

Two papers reported on Australia walk to work day, a media campaign to increase walking and cycling:

Merom 2005 (BA+ Aus n=1100) reported on Australian Walk to Work Day (WTWD). This mass media campaign is a collaborative annual event in which members of the public are encouraged to walk (or cycle) to work. The study population consisted of adults aged 18-65 (40% aged less than 40 yrs) who were 60% female, 62% married, 37% degree level educated, 93% English speaking and 72% employed. The main outcome measures were initiating/maintaining active community (walking/cycle and public transport) on a single day and HEAC (health enhancing active commuting) in a usual week. The event was evaluated by a telephone survey pre and post (two months) campaign, and there was no direct comparison group. This paper reported that among participants who didn't usually actively commute to work there was a significant decrease in "car only" use and an increase in walking combined with public transport ($p<0.005$). Amongst those who were employed was a significant increase in total walk time (+16min/week t [780] =2.04, $p<0.05$), and other moderate physical activity including cycling (+20min/week (t [1087] =4.76, $p<0.005$) resulting in a significant decrease in people who were inactive ($X^2(1)$ =6.1, $p<0.05$) and an increase in the proportion who were sufficiently active (5.4% $p<0.005$). In addition, **Merom 2008 (BA+ Aus n=156):** also reported on Australian Walk to Work Day (WTWD), again using telephone surveys pre and post campaign. The population for this study were described as working age (18-65), 54.8% female, and 41% degree educated. Only a small percentage 9.6% lived 2.5km or less from work, and 70% usually commuted by car. A significant population level increase in HEAC was seen (3.9%, p=0.01) with 136 (19%) achieving HEAC post campaign. No further statistics to support this are given but high confidence in incorporating walking or cycling into commute, being active pre-campaign and being younger (<46) were positively associated with both outcomes.

EVIDENCE STATEMENT 3A. POPULATION LEVEL CHANGE IN MASS MEDIA INTERVENTIONS TO INCREASE WALKING AND CYCLING: AUSTRALIA WALK TO WORK DAY

Moderate evidence from one study (reported in two papers) suggests that the mass media campaign “Australia Walk to Work Day” (a collaborative annual event in which members of the public are encouraged to walk (or cycle) to work) may be effective in increasing population levels of walking and cycling for travel in adults up to one year post intervention. This intervention resulted in positive effects on both walking and cycling.

Merom 2005 (BA [+] Aus n=1100, at least one year). Significant population increase in total walk time: +16min/week t[780]=2.04, p<0.05, and other moderate physical activity including cycling: +20min/week (t[1087]=4.76, p<0.005.
Merom 2008 (BA [+] Aus n=156, 2 months). Significant population level increase in health enhancing active commuting: 3.9%, p=0.01.

The evidence on mass media interventions to increase walking and cycling is only partially applicable to the UK as studies were conducted in Australia. The differing environment in Australia must be considered in reference to these studies. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 3B. INDIVIDUAL LEVEL CHANGE IN MASS MEDIA INTERVENTIONS TO INCREASE WALKING AND CYCLING: AUSTRALIA WALK TO WORK DAY

No individual level change data was reported for this intervention. Population level changes are reported in ES3A.

5.2 Health information

We identified 29 papers reporting on 12 interventions consisting of the provision of individual, targeted health information to increase walking and/or cycling. Eleven campaigns reported individual level change, and only one reported population level change in walking and cycling. Nine campaigns aimed to increase walking and three aimed to increase rates of both walking and cycling (Mutire 2002, Wen 2005 and Travelsmart 2005-2011). With the exception of Travelsmart, studies did not distinguish between travel or leisure. Eight interventions were delivered in the community, 3 in the workplace, and one in a university setting. All targeted adults of working age although three included populations of women only. There were 9 RCTs, and 2 BA studies, with Travelsmart being reported in a series of evaluation reports. Six campaigns were conducted in the USA, 3 in Australia and 2 in the UK. Travelsmart was conducted in the UK and Australia. The content of the interventions are summarised in Table 6.

Table 6. Summary of content of individual, targeted health information interventions.

Individual, targeted health information provision to increase walking	
Humpel 2004	Print only (participants were mailed self-help brochures weekly for 3 weeks) or Print plus Telephone (participants received the same print program plus three weekly telephone support calls).
Merom 2009	Single mail out of a theoretically based self help walking programme guide
Prestwich 2010	Two theory-based interventions consisting of forming “implementation intentions” along with text message reminders to achieve walking-related plans or goals
Dunton 2008	Intervention group received 10 weekly emails containing links to a webpage with an interactive information tailoring tool to promote physical activity. Complete standardized inventory of 29 activities (including walking) on a monthly basis. Waiting list control.
Nies 2003	Intervention participants received telephone calls for 24 weeks to assess their physical activity levels and to help them problem solve how to fit adequate walking activity into their week.
Nies 2006	Participants were randomly assigned to receive telephone calls with or without counselling, or a control video. Telephone counselling participants received telephone calls over 24 weeks

Rovniak 2005	12 week email based walking programmes (low versus high fidelity)
Lombard 1995	Frequency of prompting (phone calls once a week versus every 3 weeks) vs. structure of prompting (feedback on frequency, time and distance walked based on weekly walking data, and goal setting for the subsequent week vs. “touching base” with no feedback or goal setting).
Napolitano 2006	Promotional material were distributed for 1 month via flyers, email, website postings, and during bi-weekly information booths
Individual, targeted health information provision to increase walking and cycling	
Mutrie 2002	Booklet with written interactive materials on: choosing routes, maintaining personal safety, shower and safe cycle storage information, and useful contacts. Activity diary / wall chart, a workplace map, distance from local stations, local cycle retailers and outdoor shops, contacts for relevant organisations, local maps, and reflective safety accessories.
Wen 2005	Development of resources with target group involvement, social marketing and individualised marketing strategies
Travelsmart 2005-2011	“Individualised travel marketing” (ITM) which aims to highlight travel choices “people may not know they have” by providing locally relevant information and support to households.

5.2.1. Health information: Walking interventions

Nine studies reported on the targeted, individual provision of health information to increase walking.

<u>Community based campaigns targeting adults:</u>

Three studies reported on targeted, individual provision of health information to increase walking delivered in the community which targeted adults.

Humpel 2004 (RCT++ Aus n=399) reported on a media campaign targeting adults over 40 which consisted of 2 three week interventions. The participants were randomly allocated to receive Print only (participants were mailed self-help brochures weekly for 3 weeks) or Print plus Telephone (participants received the same print program plus three weekly telephone support calls). The intervention material were three brochures ‘‘Walking for Health and Wellbeing’’ designed to draw participants’ attention to explicitly identifying opportunities for walking within their own neighbourhoods and local communities. Brochure 1 suggested looking around the neighbourhood for things to do and places to go that might encourage them to start or increase their amount of walking. It contained information about the benefits of walking, how much walking is needed for health benefits and about barriers they may have to overcome to be more active. Brochure 2 was specifically aimed at helping participants identify and plan opportunities for walking, and how to monitor their walking program. Included with Brochure 2 were maps of local walking paths and trails. Brochure 3 offered ways to keep motivated and suggestions for social support, including contact details for nearby walking clubs. At follow up (8-10 weeks post intervention) there were no significant differences between the two groups on any of the walking measures. Both groups significantly increased time reported walking for exercise per week: Print from 130 to 147 minutes, t (1,277) = -3.50, p<0.001; Print plus telephone from 132 to 150 minutes, t(1,106)= -2.44, p<0.016. Additionally, a trend was shown for the Print plus Telephone contact group to increase the number of minutes walking for pleasure (p<0.06) and to get to and from places (p<0.06). Significantly, more participants in the Print plus Telephone group reported receiving and reading the materials (v2= 20.11, p < 0.001) which may affect the reliability of the result obtained.

Merom 2009 (RCT++ Aus n=369) reported on an individually based intervention to promote walking which consisted of a single mail out of a theoretically based self help walking programme guide. The study population were inactive adults aged 30-65 (mean 49.1). 85% female and 92.9% from English speaking backgrounds. The study had three arms and participants were randomised to receive the walking guide only (WP), the same guide plus a pedometer (WPP), and a no treatment control (C). The guide consisted of information on how to self regulated walking using goal setting, monitoring and recording; and suggested starting with 15 min walks 3 days/week, increase duration of walking in 3 to 4 days, then focus on brisk walking for at least 30 min on most days. The guide included tips on how participants could use their existing environment for their own health benefits, or how to overcome environmental barriers. Those in the pedometer group were also encouraged to set goals and monitor their daily steps. Participants used a “walkability score” to rate their neighbourhood which included 13 characteristics of neighbourhood self rated on a 4 point scale including crime, street lighting, “hilliness” dead end streets, shops, public transport, footpaths, parks, walking/cycling paths, busy roads, traffic, greenery and scenery. Adjusting for baseline walking, walking times at follow up were lower if street lights or aesthetics were perceived to be low (-24% and -22% respectively), compared with high ($p<0.05$). In low conditions the WPP group were significantly more likely than controls to increase total walking time (Exp (b) = 2.53, $p<0.01$), where as in aesthetically pleasing environments, the differences between groups were non-significant. At baseline, study completers walked on average 66 min (SD 79.9) per week with a median of 40. There was no difference between low and high walkability environments. At follow up, the mean walking time was 124 min (SD 135) median 90. Participants with a walkability score above the median reported greater increases in walking time than did their counterparts (77 vs. 33min t=2.56, p=0.011). The effect size was small: Cohen’s d=0.29, 95%CI 0.07-0.51. Of the environmental dimensions, only streetlights were significantly associated with change in walking time (71 vs. 32 min t=2.42, p=0.016, but with a small effect size; Cohen’s d=0.03, 95% CI 0.05=0.53. At follow up 23.9% walked regularly, a mean increase of 16.5% (<0.001). Greatest differences between low and high categorises were observed for nearby destinations (7.6%), perceived safety (6.4%), and streetlights (4.2%). Several variables were independently associated with change in walking time: participants who were young (<55), with no children at home and not married had significantly higher levels of walking at follow up. The study authors suggest that this demonstrates that those interested in changing walking behaviour can do so with no intervention if they have a supportive environment, but a minimum contact intervention (as described), can make a difference if there are environmental barriers.

Prestwich 2010 (RCT++ UK n=149) reported on an intervention designed to test the efficacy in promoting brisk walking of two interventions consisting of forming “implementation intentions” along with text message reminders to achieve walking-related plans or goals. The study had three arms and participants were randomised to receive the intervention (implementation intentions related to walking related outcomes) with text messages focusing on either plan reminders or goal reminders, or to the control. Participants in the plan reminder condition received the same text as the control group. Additionally, they choose situations in which walking would be "easy, convenient, or enjoyable for them", as well as deciding when they would receive text message reminders of these plans. They then formed plans to help them to walk five times per week. Participants in the goal reminder condition were also requested to formulate implementation intentions, but they did not receive reminders of these plans. Instead they receive text message reminders of their brisk walking goals (on the days and times they chose). They could also log into the system to change the content of the text message reminders, the number of text message reminders they would receive, or when these text messages were delivered. The control group received no text messages and was not required to form implementation intentions, but were informed of the current governmental guidelines for physical activity by text. The authors reported a differential change across groups in Brisk or Fast Walking, $F(2,130)= 3.12$, $p=0.048$. Post hoc tests revealed that the implementation intention + plan reminder (vs. control: $p=0.04$, $d=0.49$, 95%CI [0.05, 0.94]) and the implementation intention + goal reminder (vs. control: $p=0.03$, $d=0.45$, 95%CI [0.04, 0.88]) conditions increased the number of days on which they met the physical activity daily guidelines, through brisk and fast walking, significantly more than did the control group. Forty-two percent in the goal reminder condition and 45% in the plan reminder condition benefited by at least an increase of 2 days per week (compared with 22% in the control group). In addition, there were marginal differences in total physical activity across the three conditions, $F(2, 130) = 2.63$, $p=0.076$, and change in weight from Time 1 to Time 2 across the three conditions, $F(2, 136)= 2.42$, $p=0.09$. This suggests that both the interventions increased physical activity compared to the control condition.

<u>Community based campaigns targeting women:</u>

Four studies reported on targeted, individual provision of health information to increase walking delivered in the community which targeted women.

Dunton 2008 (RCT++ USA n=156) reported on an individually tailored Internet plus email physical activity intervention for adult women. The study population were described as healthy women, mean age 42.8 (21-65) yrs and 65% White. Those in the intervention arm of the study received 10 weekly emails containing links to a webpage with an interactive information tailoring tool to promote physical activity. They were required to complete standardized inventory of 29 activities (including walking) on a monthly basis and received $25 after completing all of the surveys. The comparator group did not receive the intervention until after the study (waiting list control) but they were required to complete the monthly inventory. At three month follow up, compared to the control, the intervention group increased walking (+69 vs. +32 min per week) and total moderate to vigorous physical activity (+23 vs. +25 min per week) although the significance of these increases is not given. Across the whole intervention, walking increased at a faster rate in the intervention group than the control group at three months, β=15.04 (SE=8.38), p=0.035 (one-tailed). There was a significant group difference in the rate of change in moderate to vigorous physical activity (MVPA) β=17.02 (SE=10.11), p=0.045 (one-tailed). Between baseline and the three months assessment, minutes per week of MVPA increased to a greater extent in the intervention group (mean increase of 23 min per week) as compared to the control group (mean decrease of 25 min per week). There was no impact on stage of behaviour change or psychosocial variables. The authors suggest that extended exposure to the internet based intervention may be necessary to sufficiently impact behaviour.

Nies 2003 (RCT++ USA n=197) reported on a media based intervention which consisted of telephone counselling and targeted physically sedentary or inactive women. Intervention participants (n= 67) received telephone calls for 24 weeks. Major components of each telephone call were scripted and followed by the research assistant who called the women 16 times over the 24 weeks to assess their physical activity levels and to help them problem solve how to fit adequate walking activity into their week. Participants received calls once a week for the first 8 weeks and then every other week for the remaining 16 weeks. The intervention telephone calls were constructed to provide counselling on exercise benefits, goal setting, exercise efficacy, social support, restructuring plans and relapse prevention. Participants assigned to the attention-control received the same number of telephone calls as the intervention group but none of the intervention components were included. Control participants were asked to report on their physical activity over the past week or two. At six month follow up, between group analysis indicated that women in the intervention group reported more time walked each day than the control women ($F(1,191)=4.10$, $p<0.05$). In addition the intervention group significantly improved reported minutes walked per day ($t(66)=3.20$, $p<0.01$), 1 mile walk test ($t(65)=3.54$, $p<0.01$). VO2 max ($t(65)=2.16$, $p<0.05$), systolic blood pressure ($t(66)=2.8$, $p<0.01$), vigour ($t(66)=3.80$, $p<0.01$) and fatigue ($t(66)=4.16$, $p<0.01$).

In addition **Nies 2006 (RCT++ USA n=313)** reported on a similar media based intervention which consisted of telephone counselling and targeted physically sedentary or inactive women. The study consisted of two intervention arms and participants were randomly assigned to receive telephone calls with or without counselling, or a control video. Telephone counselling participants received telephone calls over 24 weeks from a trained research assistant. Each person in this group received a call every week for 8 weeks and then every other week for the next 16 weeks for a total of 16 calls. The intervention telephone calls were constructed to provide counselling on exercise benefits, goal setting, exercise efficacy, social support, restructuring plans and relapse prevention. Participants assigned to the non counselling telephone call group received the same number of telephone calls as the counselling group. These participants were asked to report on their physical activity over the past week or two, but no counselling was included in the phone call. The video education group (control condition) received no telephone calls. The group watched a 20-minute video at baseline developed by the research team on the importance of walking and completed baseline measures but received no further interaction with the research team until follow up. Assessment was made at baseline, 6 months and 1 year. In all groups participants increased the number of reported minutes walked and decreased the time to walk a mile. A latent growth analysis (LGC) modelling approach was employed to assess the relationship between time and intervention group membership. The best fitting model for minutes walked per week indicated a linear increase from baseline to 6 months with a moderate maintenance from 6 to 12 months. This model held true across all groups (X^2[6]=4.91, p=0.557). The best fitting model for time to walk a mile suggests a linear decrease between baseline to 6 months and maintenance of that level from 6 to 12 months (X^2[6]=1.97, p=0.921). Although all three groups were similar for both parameters, in each case there was significant within group variance.

Rovniak 2005 (RCT++ USA n=50) compared two 12 week email based walking programmes (low versus high fidelity) delivered to sedentary (less than 90 minutes physical activity per week) adult women. The high fidelity programme was designed to more precisely follow social cognitive theory (SCT) recommendations for “operationalizing mastery procedures” than the low fidelity programme, which was designed to simulate mastery procedures in most existing physical activity programmes. Treatment contract and walking prescriptions were controlled across the groups. All participants met individually with project co-ordinator for 30 minutes. They were informed of benefits of walking, given 1 mile walk test, encouraged to plan walking and given a programme manual and walking log. Both groups were instructed to walk 3 times per week for 30 min. The high fidelity group further instructed to walk around 2 miles each session. Both groups were advised to gradually increase walking speed whilst maintaining perceived exertion, and to walk in a variety of settings. In addition, the high fidelity group also received a brief modelling demonstration, more long and short term goals, more precise, immediate self monitoring and more specific feedback about performance. They were given a free wrist watch and a detailed list of 20 local walking routes of around 2 miles. The high fidelity group improved more than twice as much as the low fidelity group on 1 mile walk test time (86 +/-0.50 vs. 32 +/-0.66 seconds p<0.01), goal setting (p<0.05) and positive outcome expectations (p<0.05) and reported greater programme satisfaction (p<0.001). The high fidelity group increased walking by 34.23min +/-81.91 compared to a low fidelity increase of 7.91min +/-47.93; F=3.207, p=0.08. There was a non-significant difference in the mean change in minutes walked per week between baseline and 1 year follow up. The authors suggest that theoretical fidelity might advance the quality and effectiveness of walking and physical activity interventions.

<u>Workplace campaigns:</u>

Two studies reported on targeted, individual provision of health information to increase walking delivered in the workplace which targeted adults.

Lombard 1995 (RCT+ USA n=135) assessed the effect of frequency of prompting (phone calls once a week versus every 3 weeks) and structure of prompting (high versus low structure) in a walking programme designed to meet the American College of Sports Medicine's cardiovascular exercise goals, delivered to staff and faculty members of a large South-Eastern University. Research assistants telephoned half the participants once a week (frequent) and the other half once every three weeks (infrequent) during the initial eight weeks of the intervention. During the last four weeks of the intervention, the research assistants called the participants in the frequent condition once every second week and the participants in the infrequent condition only once to "fade the telephone prompting". The study also compared structured prompting (feedback on frequency, time and distance walked based on weekly walking data, and goal setting for the subsequent week) with unstructured prompting (described as "touching base" with no feedback or goal setting). The study population consisted of 132 women and 3 men of average age 40 years (range 21 – 63 years), and average weight 150lb (range 105lb to 225lb). Survival curves indicated that there was a significant effect for treated (the combined four treatment conditions) versus the control condition, LD=17.661 $p<0.001$, with higher values for the participants in the treated conditions compared to those in the control condition. There was a significant effect for the frequency of prompting (once a week contact versus once every three weeks), LD=17.719, $p<0.001$, with the more frequent prompted participants performing better than those prompted every third week. There was no significant difference between the prompted structure (highly structured conditions, versus touching base conditions), LD=0.007, $p<0.9349$. The authors noted that more women than men joined the program out of a population of more than 5,000 individuals (with about 50% each of men and women). Informal interviews suggested that men did not join because they did not believe they would benefit from a walking exercise program.

Napolitano 2006 (BA+ USA n=6300) reported on a communications based campaign delivered in the workplace to promote awareness of an existing local walking path and to increase walking. The intervention was delivered at two worksites (a hospital and its administrative offices) to male and female employees aged 18-65. Promotional material were distributed for 1 month via flyers, email, website postings, and during bi-weekly information booths, and followed up two weeks post intervention. The promotional ideas were developed from initial focus groups. The authors report borderline statistically significant increases in walking activity from baseline midway through the campaign (p=0.069) and following the campaign (p=0.075). Counts observed during the intervention were almost triple those at baseline and increased in the post intervention phase to approximately three and a half times those at baseline. The authors state that the tripling of walkers from baseline to post campaign may demonstrate a clinically if not statistically significant difference.

EVIDENCE STATEMENT 4A. POPULATION LEVEL CHANGE IN COMMUNITY DELIVERED TARGETED HEALTH INFORMATION INTERVENTIONS TO INCREASE WALKING

No population change data was reported for these interventions. Individual level changes are reported in ES4B.

EVIDENCE STATEMENT 4B. INDIVIDUAL LEVEL CHANGE IN COMMUNITY DELIVERED TARGETED HEALTH INFORMATION INTERVENTIONS TO INCREASE WALKING

Strong evidence from 7 studies suggests that individual, targeted provision of health information (including printed media, telephone support and text messages) delivered in the community are effective in increasing individual levels of walking for leisure or travel in adults up to one year post intervention. Six RCTs showed positive effects on walking. One further RCT (Rovnick 2005) also showed positive effects on walking, but was designed to test intervention fidelity.

Dunton 2008 (RCT [++] USA n=156, 3 months) [*weekly emails containing links to a webpage with an interactive information tailoring tool to promote physical activity*]. Walking increased at a faster rate in the intervention group than the control group: β=15.04 (SE=8.38), p=.035 (one-tailed).
Humpel 2004 (RCT [++] Aus n=399, 10 weeks) [*Print only (participants were mailed self-help brochures weekly for 3 weeks) or Print plus Telephone (participants received the same print program plus three weekly telephone support calls*]. Both intervention groups significantly increased time reported walking for exercise per week: from 130 to 147 minutes: t(1,277)=-3.50, p<0.001; and from 132 to 150 minutes, t(1,106)=-2.44, p=0.016.
Merom 2009 (RCT [++] Aus n=369, 3 months) [*participants were mailed self-help brochures weekly with or without weekly telephone support calls*]. Intervention group were significantly more likely than controls to increase total walking time where street lights or environment aesthetics were perceived to be low: Exp (b) = 2.53, p<0.01 t=2.56, p=0.011.
Nies 2003 (RCT [++] USA n=197, 6 months) [*weekly telephone calls to assess physical activity levels and problem solve how to fit adequate walking activity into their week.*]. Women in the intervention group reported more time walked each day than the control women: F (1,191)=4.10, p<0.05.
Nies 2006 (RCT [++] USA n=313, 12 months) [*telephone calls with or without counselling, or a control video*]. Women in intervention group showed a linear increase in walking from baseline to 6 months (latent growth analysis to assess the relationship between time and intervention group membership).
Prestwich 2010 (RCT [++] UK n=149, 4 weeks) [*Two theory-based interventions consisting of forming "implementation intentions" along with text message reminders to achieve walking-related plans or goals*]. Differential change across groups in brisk walking F(2,130)=3.12, p=0.048 or fast walking F(2,130)= 3.12, p=0.048. 2 intervention groups which differed in having a plan reminder or goal reminder had a 42% and 45% increase in number of days meeting PA daily guidelines respectively, with a 22% increase in the control group
Rovniak 2005 (RCT [++] USA n=50, 12 months) [*two interventions consisting of forming "implementation intentions" along with text message reminders to achieve walking-related plans or goals*]. High fidelity intervention increased walking by 34.23min +/-81.91 compared to a low fidelity increase of 7.91min +/-47.93, F=3.207 p=0.08.

The evidence on community delivered health information interventions is only partially applicable to the UK as most studies were conducted in Australia or the US with only one UK study included. The differing environment in Australia and the US must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 5A. POPULATION LEVEL CHANGE IN WORKPLACE DELIVERED TARGETED HEALTH INFORMATION INTERVENTIONS TO INCREASE WALKING

No population change data was reported for these interventions. Individual level changes are reported in ES5B.

EVIDENCE STATEMENT 5B. INDIVIDUAL LEVEL CHANGE IN WORKPLACE DELIVERED TARGETED HEALTH INFORMATION INTERVENTIONS TO INCREASE WALKING

Moderate evidence from two studies suggests that individual, targeted provision of health information delivered in the workplace (including flyers, email, telephone calls, website postings, and information booths) may be effective in increasing individual levels of walking for leisure or travel in adults up to 4 months post intervention. One RCT study showed a positive effect on walking and one BA study showed a small (borderline significance) positive effect on walking.

Lombard 1995 (RCT [+] USA n=135, 16 weeks) [*phone calls once a week versus every 3 weeks, and structured vs. non structured feedback*]. Survival curves indicated that there was a significant effect on walking for treated (the combined four treatment conditions) versus the control condition, LD= 17.661 $p<0.001$.
Napolitano 2006 (BA [+] USA n=6300, 6 weeks) [*Promotional material distributed via flyers, email, website postings, and during bi-weekly information booths*]. Borderline statistically significant increases in walking activity from baseline midway through the campaign ($p=0.069$) and following the campaign: $p=0.075$ (p values only reported).

The evidence on workplace health information interventions is only partially applicable to the UK as the studies were conducted in the US. The differing environment in the US must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

5.2.2 Health information: Walking and cycling

Three interventions consisted of the provision of individually, targeted health information to increase walking and cycling.

Mutrie 2002 (RCT++ UK n=295) reported on a targeted intervention entitled ‘Walk in to Work Out’ which aimed to encourage active commuting (walking and cycling). The intervention group received a pack contained a booklet with written interactive materials based on the trans theoretical model of behaviour change, educational, and practical information on: choosing routes, maintaining personal safety, shower and safe cycle storage information, and useful contacts. The pack also included an activity diary in the form of a wall chart, a workplace map, distance from local stations, local cycle retailers and outdoor shops, contacts for relevant organisations, local maps, and reflective safety accessories. The control group were told they would receive the pack in six months time; they were not requested to refrain from beginning active commuting. Outcomes were measured at 6 and 12 months. Participants were recruited from three larger public sector workplaces in Glasgow (university, acute hospital trust and health board). Each had a spectrum of socioeconomic groups within the workforce. Over six months, a significantly larger percentage of the intervention group (49%, n=50) progressed to a higher stage of active commuting behaviour change, compared with the control group (31%, n=29). The average difference between the two groups was 18% (95%CI, 5% to 32%). Seven day recall of physical activity data showed a significantly greater average time per week spent walking to work for those in the intervention group compared with controls, among those who had not walked to work at the start of the study (mean of 125 minutes per week for the 14 such persons in the intervention group and 61 minutes per week for the 12 in the control group). There was also a significant increase in the average time spent walking to work per week, in favour of the intervention group among those who already walked to work (mean increase from 52 minutes per week at baseline to 79 minutes per week at six months for the 61 such persons in the intervention group compared with an increase from 50 minutes to 60 minutes per week for the 43 in the control group). Conversely, the intervention was not successful in increasing cycling; only 18 participants reported cycling to work at six months. There was no difference in the reported average weekly minutes of cycling between cyclists in the intervention group (n=9) and control group (n=9).

Wen 2005 (BA+ Aus n=68) reported on a 12 months intervention to promote active transport (walking and cycling) amongst randomly selected health service employees working in a health care facility in inner-city Sydney. The campaign consisted of the development of resources with target group involvement, social marketing and individualised marketing strategies. Three focus groups with different segments of the employees were conducted to develop campaign slogans and to decide on images to be used in the social marketing strategy. Following the intervention there was an decrease in the percentage of those who stated they would be driving to work in the next 6 months (from 76.7% pre-intervention to 63.3% post-intervention), an increase in those who were planning to drive to work less in the next month (from 6.7% to 13.3%) and those who said they had been driving their car to work in the last month (from 6.7% to 13.3%) (p=0.039, marginal homogeneity test). Following the intervention there was also significant increases in those saying 'If I could I would definitely cycle to work, from 39.2% to 51.0% (p= 0.011) and those saying 'If I could I would definitely walk to work' from 80.4% to 92.2% (p=0.031). In addition there were significant increases in all aspects of recall of the intervention; unprompted recall increased from 9.8% to 49.0% (p< 0.05); prompted recall increased from 17.6% to 94.1% (p<0.001); awareness of the term 'active transport' increased from 27.5% to 70.6% (p< 0.001).

EVIDENCE STATEMENT 6A. POPULATION LEVEL CHANGE IN TARGETED HEALTH INFORMATION INTERVENTIONS TO INCREASE WALKING AND CYCLING

No population change data was reported for these interventions. Individual level changes are reported in ES6B.

EVIDENCE STATEMENT 6B: INDIVIDUAL LEVEL CHANGE TARGETED HEALTH INFORMATION INTERVENTIONS TO INCREASE WALKING AND CYCLING

Moderate evidence from two studies suggests that individual, targeted provision of health information (including a booklet of interactive materials, social marketing and individualised marketing strategies) may be effective in increasing individual levels of walking, but not cycling, for travel in adults for up to 12 months post intervention. One RCT and one BA study showed positive effects on walking (or replacing car use) but the effect on cycling was unclear. [See also, Travelsmart, ES7A].

Mutrie 2002 (RCT [++] UK n=295, 6 months) [*interactive materials on: choosing routes, maintaining personal safety, shower and safe cycle storage information, and useful contacts*]. Significant increase in time per week spent walking to work (mean 125 min/week intervention vs. 61 min/week control), but no difference in average weekly minutes of cycling between cyclists in the intervention group (n=9) and control group (n=9).
Wen 2005 (BA [+] Aus n=68, 12 months) [*Development of resources with target group involvement, social marketing and individualised marketing strategies*]. Decrease in those who said they had been driving their car to work in the last month (from 6.7% to 13.3%): p=0.039, marginal homogeneity test.

The evidence on health information intervention to increase walking and cycling is partially applicable to the UK as one study was conducted in the UK with a second the study conducted in Australia. The differing environment in Australia must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

The third intervention reported here is **TravelSmart** which has been conducted at multiple sites in many different countries. Here we report on data from Australia and the UK where most of the TravelSmart projects have been conducted. TravelSmart interventions have also been reported in Germany but English language data was not available. The TravelSmart programs ask people to make voluntary changes in their travel choices, encouraging people to use other ways of getting about rather than driving alone in a car. For example, using buses, trains and ferries, carpooling or by cycling or walking, or by tele-working. It is based on a process known as "individualised travel marketing" (ITM) (in the UK at least) which aims to highlight travel choices "people may not know they have" by providing locally relevant information and support to households. The project aims to motivate people to consider their day to day travel habits and to make small changes to make life "easier and more fun". In practice this means providing times and destinations of local buses, maps of local cycling and walking routes and how these connect to shops, schools, train stations, library, and to work and friends. This includes an element of personal contact, either by phone or on the door step with households in the project area.

TravelSmart 2005 (ER + Aus n=5 regions) summarised data from TravelSmart interventions conducted throughout Australia which brings together many community and government based programs encouraging Australians to use alternatives to travelling in their private car. The evaluations cover three strands of TravelSmart in Australia: households, workplaces and schools, and the projects and evaluations fall into broadly two types: small-scale pilots (typically 20–150 participants, or 1–4 organisations) and larger implementations (600–1600 participants). All the projects reviewed used some variation on community-based marketing principles, rather than mass-media approaches. Household projects routinely showed decreases in car use of 4-15% and rise in use of walking, cycling and public transport. Workplace results were more varied with reductions in car use of 0-60%, public transport increases of up to 50% and modest increases in walking and cycling. There are few figures for School projects, and no general results can be drawn, apart from the general observation that some reduction in family car travel does seem to occur, and there is strong support for Walking School Buses amongst schools, parents and students. Further reports based on individual towns and projects in Australia, and elsewhere are also available, but data reported in these is of a similar quality and this report summaries the effects overall.

TravelSmart 2011 (ER + UK n=19 regions) Up to date information on TravelSmart in the UK is provided by Sustrans, and to date 19 projects have been initiated in the UK (of which data is currently available for 17 (TravelSmart 2011). Reports are available for some of the individual sites as well as a summary report produced in 2009. Table . summaries the outcome data currently available for each UK site. At each site there was an increase in walking for travel which ranged from 11% to 29% annual increases. Cycling for travel increased by between 14% and 69% (from variable baselines). Travel by car decreased at each site by between 10 and 14%, and overall sustainable travel trips increased at each site (between 9% and 29%). It is not immediate clear from the reports which years these changes refer to and whether each measure was taken in the same year. However, it is reported that Travelsmart consistently achieves reductions on car trips of 10% or more, reducing car travel by between 740km and 1,400km per household per year.

Table 7. Changes in trips by main modes (trips per person/year) at UK Travelsmart sites.

Area	Relative change (where reported)			
	Increase in walking	Increase in cycling	Decrease in car trips	Increase in sustainable travel trips
East Inverness			-13%	19%
Cramlington			-11%	17%
Doncaster	29%	14%	-13%	29%
Sheffield			-12%	15%
Nottingham			-12%	20%
Peterborough			-11%	16%
Lowestoft	19%	19%		
Ipswich *				
Broxbourne*				
Watford	20%	33%		
London (Kingston)			-14%	17%
Exeter	18%	33%		

Bristol (Windmill Hill and Southville)			-10%	10%
Bristol (Bishopston)			-11%	9%
Gloucester (Quedgeley)			-12%	18%
Gloucester (Barton, Tredworth and White City)	18%	16%	-13%	17%
Worcester			-10%	12%
Preston and South Ribble	11%	35%	-10%	11%
Lancaster City & Morecambe	18%	69%	-14%	19%

*Data not yet published.

EVIDENCE STATEMENT 7A. POPULATION LEVEL CHANGE IN TRAVEL SMART AS AN INTERVETION TO INCREASE WALKING AND CYCLING

Moderate evidence from a whole series of evaluation reports suggests that Travelsmart is effective in increasing population levels of walking and cycling for travel in adults at least over one year. Travelsmart uses "Individualised travel marketing" (ITM) which aims to highlight travel choices "people may not know they have" by providing locally relevant information and support to households. The evidence is moderate as the reports only present percentage change data and limited methodologies. However the cumulative evidence is compelling. [See also, other multi component intervention, ES6]. The intervention targets individuals, but data is reported at population level.

TravelSmart 2005 (Evaluation report [+] Aus n=5 regions, various). Household projects routinely showed decreases in car use of 4-15% and rise in use of walking, cycling and public transport.
TravelSmart 2011 (Evaluations reports [+] UK n=19 regions). Cycling for travel increased by between 14% and 69%, travel by car decreased at each site by between 10 and 14%, overall sustainable travel trips increased at each site (between 9% and 29%).

The evidence on this interventions to increase walking and cycling is fully applicable to the UK as most of the data reported is from UK sites. However, the differing environment in Australia must be considered in reference to the data collected there. Individual local contexts as well as the setting will also impact on the applicability of data from individual sites.

EVIDENCE STATEMENT 7B. INDIVIDUAL LEVEL CHANGE IN TRAVEL SMART AS AN INTERVENTION TO INCREASE WALKING AND CYCLING

No individual change data was reported for these interventions. Population level changes are reported in ES7A. The intervention targets individuals, but data is reported at population level.

5.3 Multi component interventions

We identified 22 papers reporting on multi component interventions to increase walking and/or cycling. Thirteen reported population change outcomes. Thirteen interventions were to increase walking and cycling, 4 focused on increasing walking only, and 5 on cycling only. Five studies reported that their focus was on active travel and one specifically reported walking for leisure. Other studies did not distinguish between travel or leisure.

Most of the interventions (n=14) were delivered in a community setting, with the addition of seven school based interventions and one delivered in a university setting. Nine interventions targeted the whole community, three interventions targeted adults only, and seven targeted school pupils, and one university students and employees. The final two studies targeted women only and one further restricted it's population to overweight mothers.

There was a wide range of study types identified including only three RCTs (two employing a cluster design). Other study designs were nRCTs (n=6), ITS (n=4), BA (n=12) and one evaluation reports. The sample sizes for the studies varied from 53 to 36,000. Two studies did not clearly report their sample size, or reported only the number of towns or regions covered by the intervention. Six studies were conducted in the USA, eleven in the UK, three in Australia, one in Belgium and one in Sweden. The interventions are summarised in Table 8.

Table 8. Summary of content of multi component interventions.

Community interventions to increase walking	
Brownson 2004/2005	individually tailored newsletters, interpersonal activities that stressed social support, community wide events such as walk-a-thons.
Clarke 2007	physical activity and dietary program included recommendations for physical activity, healthful eating, and behaviour modification, class discussions and 30 minutes of exercise at each class.
Krieger 2009	A community based participatory research developed multiple interventions to promote walking activity including sponsored walking groups, improving walking routes, providing information about walking options, and advocating for pedestrian safety. Interventions included walking groups: community action group identified a 1 mile path around the new central pond as a walking trail and trained 6 staff as group leaders. Five residents also served as walk leaders.
NSW 2002	Park modifications, media campaigns, walking maps
Community interventions to increase cycling	
Cope 2009 Cope 2011 Sloman 2009	Cycling Demonstration Towns. multi component interventions to increase cycling in 6 Passenger Transport Executive regions
Parker 2011	Promotion campaign surrounding bike facilities (shared and exclusive cycle lanes) build in New Orleans on streets submerged by water during hurricanes of 2005.
Rissel 2010	multi component community based intervention including: map titled 'Discover Fairfield and Liverpool by Bike' showing the bicycle paths and useful cycling routes in the area was considered the key resource in raising awareness for non and infrequent cyclists by illustrating the extent of local bike paths; 20,000 maps were produced.
Telfer 2006	The intervention focused on practical skills development and supervised on road or cycle path training. Free courses for beginner and intermediate level cyclists were conducted. The programme was promoted through flyers, posters, media releases, articles and adverts in local news papers and on a popular TV programme
Workplace / University interventions to increase waling and cycling	
Brockman 2011	University transport plan to improve rates of active travel which targeted university employees. limiting the number of available parking spaces and permits, improving changing facilities for walkers and cyclers, installing secure cycle storage, a subsidised cycle purchase scheme, a car share scheme, free bus travel from train and bus stations to the university, and discounted season tickets for public transport.
Bull 2008	Well@Work programmes which were established

	across 9 English regions and targeted all adults. The programmes included a total of 45 initiatives of which physical activity interventions accounted for 40% of initiatives. Overall the programmes consisted of a diverse set of initiatives and actions aimed at promoting and supporting healthy lifestyles.
Community interventions to increase waling and cycling	
De Cocker 2009	Physical activity was promoted in the entire city of Ghent, using the central theme of '10,000 steps/day', with secondary taglines of 'every step counts') and 'every revolution (of bicycle pedals) counts'
Hemmingsson 2009	Physician meetings, physical activity prescriptions, group counselling, and bicycle provision. trans theoretical model of behaviour change to encourage cycling and walking.
Hendricks 2009	Multi component intervention to increase safe physical activity opportunities and encourage walking and biking for short trips.
Sloman 2010	Sustainable travel towns (Darlington, Peterborough and Worcester); which implemented intensive town wide Smarter Choice Programmes to encourage use of non car options; bus use, cycling and walking, and less single occupancy cars
TenBrick 2009	Project U-Turn which aimed to increase active transportation (biking, walking, and transit use) through an integrated approach to Active Living by Design's community action model and Michigan Safe Routes to School model.
School based interventions to increase walking and cycling	
Cairns 2006a	School travel plan group developed walking buses scheme, incentive scheme going for gold included children cycling or scooting. Also cycle training, pedestrian training, assemblies, park and walk schemes, curriculum work and newsletters
Cirignano 2010	Pedometers and a "Fit Bits" programme to implement physical activity breaks in the classroom
McKee 2007	School based active travel project which was undertaken for one school term in one primary school in Scotland. Active travel was integrated into the curriculum, and participants used interactive travel planning resources at home
Rowlands 2003	Multi component travel plan developed by school co-ordinator
Staunton 2003	Safer routes to school identified and promoted.
Wen 2008	Health Promoting Schools Policy which consisted of a two year multi-component programme including classroom activities, pedometer based walking activities (some schools) development of school Travel Access Guides, parent newsletters, and improving environments with local councils.

School based interventions to increase cycling	
Sustrans 2008	Bike It. School travel plans, cycling champions in schools.

5.3.1. Multi component: Walking interventions

Four studies reported on multi component interventions to increase walking delivered in the community.

Brownson 2004 (nRCT++ USA n=2399 – 17,642) reported on changes in walking behaviour in 6 rural communities in Missouri. Interventions were developed with community input and included individually tailored newsletters, interpersonal activities that stressed social support, and community wide events such as walk-a-thons. Academic team worked with local governments to develop walking trails in the communities. Trail lengths varied from 0.13 to 2.38 miles. Two trail heads had electronic counting devices installed and some community members received electronic cards which tracked their trail use using a swipe card reader. Focus groups provided information on perceived benefits of walking and trail use, social factors and other facilitating and inhibiting factors. This information was used to develop tailored newsletters. Printed feedback materials were created for individuals who filled out a brief, one-page questionnaire that assessed their status on theoretical constructs like self-efficacy, social support, perceived benefits and barriers, motivation health-related behaviours, resource availability, and preferences for walking alone or with others. Participants received by mail eight different one-page feedback letters that consisted of a masthead and walking-trail graphic tailored to the participant's community, an announcement of upcoming community events, and two messages tailored to their responses to items on the one-page questionnaire. Walking clubs were formed to build social support for physical activity. The clubs were free of charge, and they often provided participation incentives (e.g., water bottles, t-shirts), and were organized around activities such as walk-a-thons. Amongst trail users (at baseline 16% of population), 32.1% reported increases in physical activity since beginning to use the trail. For the entire population, rates of 7 day walking for any purpose or for exercise declined slightly in the intervention communities compared with the comparison sites (Total walking intervention effect -1.4min (p=0.91). Walking for exercise intervention effect -5.6 (p=0.37). From the community wide samples two subgroups (education high school degree or less, and people living with annual household income <$20.000) indicated a positive net change in rates of 7 day total walking, but results were not significant (no data). The intervention was also reported by **Brownson 2005 (nRCT+ USA n=2470)** where mean rates of walking/week at baseline were 97 minutes in the intervention areas and 103 minutes in the comparison areas. The amount of change in the walking/week at follow-up was higher in intervention (11.7 min) than in comparison participants (6.5 min), although not statistically significant. At baseline, the same percentage of respondents from intervention and comparison areas met the recommendations for walking (18.8% and 19.1% respectively, p= 0.864). At follow-up, the percentage of respondents who met the recommendation for walking was again the same across the intervention and comparison areas (22.2% and 21.6% respectively, p= 0.811).

Clarke 2007 (BA+ USA n=124) reported on an 8 week physical activity and dietary program for low income, overweight and obese mothers. The eight weekly lessons included recommendations for physical activity, healthful eating, and behaviour modification. The physical activity component of the intervention consisted of class discussions and 30 minutes of exercise at each class. The participants shared ideas for establishing exercise goals, reducing barriers, and identifying sources of social support. The instructor led physical activities that mothers could continue on a daily basis, such as walking, resistance training, and video exercise tapes. Mothers were instructed to exercise at least 5 days a week for 45 minutes/session at a moderate intensity, equivalent to a brisk walk. Physical activity for the mothers was assessed by weekly recording of steps and energy expended via pedometers. Exercise intensity was not evaluated. The comparison group were similar to the intervention participants except they were of normal weight. Pedometer steps increased significantly by the end of the program. Only 4.3% (n=4) of subjects averaged fewer than 4,000 steps/day (low), whereas 49.5% (n=46) recorded between 4,000 and 10,000 steps/day (moderate) and 46.2% (n=43) met the 10,000 steps/day criteria for high activity (the intervention group increased their steps from a mean of 5969 ±3123 to a mean of 9757 ±3843). This corresponds to initial levels of 30.1% (n=28; low), 58.1% (n=54; moderate), and 11.8% (n=11; high). Energy expenditure, as calculated by the pedometer, increased by 224 kcal/day (p<0.001). Mean pedometer steps at week 8 were associated positively with submission of self-monitoring pedometer worksheets (r=0.38, p<0.01). Overall, there were significant correlations between exercise self-efficacy and pedometer steps (r=0.30, p<0.01), energy expended (r=0.28, p<0.05), and exercise readiness (r=0.28, p<0.01) at week 8. Intervention participants significantly decreased their body weight (mean -6.6 lb; range -29.6 to 7.4 lb), percent body fat (mean -1.4%; range -7.3% to 5.6%),and waist circumference (mean -1.4 in; range -8.3 to 6.3 in) during the program. Similar increases in pedometer steps were found across the range of weight-loss outcomes (p>0.05). Also, there was further weight loss (mean -0.3 lb; range -15.4 to 16.6 lb) at week 24 for the intervention group that totalled -6.9 lb (range -41 to 10.2 lb) for the entire study period.

Krieger 2009 (BA+ USA n=53) reported on a programme of multiple interventions to increase walking activity. A community based participatory research partnership and community action teams (made up of youths and adults) assessed assets and barriers related to walking and developed multiple interventions to promote walking activity including sponsored walking groups, improving walking routes, providing information about walking options, and advocating for pedestrian safety. Interventions included walking groups: community action group identified a 1 mile path around the new central pond as a walking trail and trained 6 staff as group leaders. Five residents also served as walk leaders. Groups met 5 times per week during weekday, evening and weekend sessions. Groups ranged in size from 10 to 30. Participants received T-shirts, pedometers, and prizes for meeting individual walking goals. At post-test (3 months after walking groups were set up) self reported walking activity increased among walking group participants from 65 to 109 minutes per day (44.1%, 95%CI 28.0-60.2, p=0.001). The proportion that reported being at least moderately active for at least 150 minutes per week increased from 62% to 81% (change 19.2% 95%CI 2.2=36.3, p=0.018). Walking for exercise and errands both increased. There were no significant changes in walking to work or school (p=0.281), or bus stops (p=0.645). It was not possible to distinguish the relative contributions of each strategy to the effects seen, but discussions among participants suggested the walking group was the most potent element.

NSW Health Department 2002 (nRCT [+] Aus m=2 wards, 2 years). The Walk It: Active Local Parks project aimed to increase participation in moderate physical activity in adults aged 25-65 years. Three parks in the intervention ward were selected to receive the park modifications and two parks from the control ward acted as control parks. The focus of the promotion campaign was raising awareness about the benefits of undertaking regular physical activity and using local parks. Activities included running an advertisement in the local newspapers, gaining publicity through feature articles, and the distribution of walking map leaflets to households in the intervention ward. An official project launch was also used to generate publicity. The publicity plan for the project, consisting of feature articles and paid advertisements. The walking maps were a double-sided, colour, A4, gloss-finish leaflet.. One side highlighted the importance of being active (and in particular walking), provided tips for being active, and had a map indicating four parks that have walking trails. These included the three intervention parks and an additional park adjacent to but located outside the intervention ward. The messages promoting physical activity were consistent with NSW Health Department (1995) moderate physical activity recommendations. The reverse side of the leaflet provided more detailed maps of the walking trails in each of the parks. Intervention ward respondents were more likely to have walked in the two weeks prior to the follow-up telephone survey than control ward respondents. A significant ward by gender interaction indicated that males in the intervention ward were 2.8 times more likely to walk than were males in the control ward whereas females in the intervention ward were only 20% more likely to walk than females in the control ward. Income, age and language significantly influenced the odds of walking. There were no significant differences between wards in the proportion of respondents that reported participating in activity at an adequate level at follow-up. There was also no measurable change from baseline to follow-up in levels of adequate activity in either ward. Gender was a significant factor, with the odds of being adequately active 30% lower for females than males. Both telephone survey and direct observation data indicated that there was no change in park use from baseline to follow-up.

EVIDENCE STATEMENT 8A: POPULATION LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE WALKING

Moderate evidence from two studies (reported in three papers) suggests that multi-component interventions may not have a positive effective on increasing population levels of walking for leisure or travel in the long term (up to 2 years). Evidence from 3 nRCT papers reporting one intervention study showed mixed effects.

Brownson 2004 (nRCT [++] USA n=2399 to 7,642, 12 months) [*individually tailored newsletters, interpersonal activities that stressed social support, community wide events such as walk-a-thons*]. Rates of 7 day walking for any purpose or for exercise declined slightly in the intervention communities compared with the comparison sites: -1.4min, p=0.91; and -5.6, p=0.37 respectively.
Brownson 2005 (nRCT [+] USA n=2470, 12 months): [*as above*]. Change in walking was higher in intervention (11.7 minutes) than comparison (6.5 minutes), although not statistically significant. Percentage of respondents who met the recommendation for walking was the same across the intervention and comparison areas: 22.2% and 21.6%, p=0.811.
NSW Health Department 2002 (nRCT [+] Aus n=two wards, 2 years) [*park modifications, media campaign, walking maps*]. Those in the intervention ward were more likely to have walked in the two weeks prior to follow up (no data), but no difference in the number reaching adequate levels of physical activity (health department recommendations.

The population level evidence on multi-component interventions to increase walking is only partially applicable to the UK as studies were conducted in the US and Australia. The differing environment in the US must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 8B: INDIVIDUAL LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE WALKING

Moderate evidence from two studies suggests that multi-component interventions have a positive effective on increasing individual levels of walking for leisure or travel. Evidence from a 2 BA studies show positive effects on walking up to three months post intervention.

Clarke 2007 (BA+ USA n=124, 8 weeks) [*multi physical activity and dietary program*]. Post intervention, 46.2% (n=43) met the 10,000 steps/day criteria for high activity (no further statistics). This increased from 11.8% at baseline.
Krieger 2009 (BA [+] USA n=53, 3 months) [*sponsored walking groups, improving walking routes, providing information about walking options, and advocating for pedestrian* safety]. Self reported walking activity increased from 65 to 109 minutes per day: 44.1%, 95%CI 28.0-60.2, p=0.001.

The individual level evidence on multi-component interventions to increase walking is only partially applicable to the UK as studies were conducted in the US. The differing environment in the US must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

5.3.2 Multi component: Cycling interventions.

We identified five studies (reported in six papers) which looked at multi component interventions to increase cycling, Four which were delivered in the community and one delivered in schools.

Cope 2009 (ITS+ UK n= 6 towns), Cope 2011 (Evaluation report- UK n=6 regions) and Sloman 2009 (BA+ UK n=1500) all reported on Cycling Demonstration Towns. This programme consisted of multi component interventions to increase cycling in 6 towns (Brighton, Darlington, Derby (young people only), Exeter, Aylesbury and "Lancaster and Morecambe). The interventions varied by town, but included increasing cycle access to public transport (secure parking, bike lockers, bikes on buses), and infrastructure (cycle training in all areas, signage, marketing and information, mass participation events). One of the towns, Darlington, was also part of the Government's Sustainable Travel Town programme. More generally, all of the towns implemented a range of wider initiatives with the potential to increase cycling levels, beyond those that were directly funded by the Cycling Demonstration Towns programme. For example, through school travel planning supported by the Travelling to School Initiative; through investment in cycle facilities at new schools built as a result of the reorganisation of delivery of secondary education in Exeter; and through capital investment from the Community Infrastructure Fund for a cycle/pedestrian bridge in Aylesbury. The cycle demonstration towns were compared to cycle rates nationally where the general trend in medium urban areas over the period since 2005 (and indeed since 2002) was either for cycling levels (in terms of average distance cycled per person) to have been broadly stable, or perhaps, if average number of cycle trip stages are examined, to have slightly declined. They were also compared with London (data from Transport for London) where cycling levels, as measured by cycle counts on the strategic road network (the Transport for London Road Network, or TLRN), grew by 107% in the eight years between 2000/01 and 2008/09.

Cope 2009 (ITS+ UK n= 6 towns) reported that automatic counter data indicated an average increase in cycles counted of 27% across all intervention towns between January 2006 and December 2009. The average increase in cycle counts ranged from 2.4% to 56.8%. Individually, the number of cyclists increased in 3 towns, decreased in two and the result was mixed in the final town. Counts of parked bikes increased in two towns (8% and 32% increase) and decreased in a third by 9% (others were not measured). In addition, the proportion of children cycling as the usual mode of travel to school increase in 5 of 6 towns. Pre and post survey data are available for a total of 60 schools engaged in Bike It. The proportion of children 'never' cycling to school calculated from pooled pre-survey data (collected in either September 2006 or September 2007) was 79%, compared to 56% of children in the pooled post-survey data (collected in either July 2007 or July 2008). The proportion of pupils cycling to school at least once a week increased from 12% in the pre-survey to 26% in the post-survey (based on pooled data). The second report **Cope 2011 (Evaluation report- UK n=6 towns)** looked at a range of multi-component interventions including cycle demonstration towns. Overall this indicated a 66% increase in cycling since 2001 with cycling more than doubling in Sustrans "Bike It" schools. Data from automatic cycle counts indicated 12% increase over all cycle routes and up to 60% at specific sites. Regionally, in South Yorkshire, secure parking for 300 bicycles at transport hubs translated to 21,700 intermodal journeys on cycles and public transport. 29% increase in cycles parked at Sheffield station and 44% at all stations. For Sheffield Bike Boost 73% of recipients of cycle training reported that intended to become regular cyclists. In Manchester, cycle and workplace challenge events resulted in 44 new cyclists and increased frequency of cycling amongst established cyclers. No further data or measures of significance are given in the report. **Sloman 2009 (BA+ UK n=1500)** also reported that the mean increase in cycling levels across all six towns was 27%, relative to a 2005 baseline (to March 2009), the annual percentage change in cyclists using data from all the towns is 4%.The proportion of adult residents of the local authorities with Cycling Demonstration Towns cycling for at least 30 minutes once or more per month increased from 11.8% in 2006 to 15.1% in 2008, an increase of 3.3% points or 28%. Meanwhile, the proportion of adult residents of the six towns who cycled regularly (that is, for at least 30 minutes 12 times or more per month) increased from 2.6% in 2006 to 3.5% in 2008, an increase of 0.9%-points or 37%. Using a validated measure of physical activity, EPIC (taking together cycling, other physical exercise, and activity at work), the proportion of adult respondents classed as inactive fell from 26.2% in 2006 to 23.6% in 2009, a fall of 2.6%-points or 10%. Pupil Level Annual School Census: the proportion of children who usually cycled to school increased by 16% or 0.3%-points (from 1.9% to 2.2%) over this 12-month period. 129 schools (46% of all schools) were offered the intensive support of a 'Bike It' officer. The proportion of pupils surveyed who 'never' cycled to school fell by 29% or 22.6%-points (from 78.5% to 55.9%) between the baseline survey at each school (in either September 2006 or September 2007) and the post survey.

EVIDENCE STATEMENT 9A: POPULATION LEVEL CHANGE IN CYCLE DEMONSTRATION TOWNS AS INTERVENTIONS TO INCREASE CYCLING

Moderate evidence from one study (reported in 3 papers) suggests that Cycling Demonstration Towns (CDT) (*multi component interventions to increase cycling in 6 towns*) are effective in increasing population levels of cycling for active travel in the general population up to 10 years post intervention. Moderate evidence from an ER, 1 BA and 1 ITS study showed positive effects on cycling in cycle demonstration towns, although the significance of the effects is not reported. [See also, other multi component intervention, ES10a].

Cope 2009 (ITS [+] UK n= 6 towns, 4 years). Automatic counter data indicated an average increase in cycles counted of 27%. Proportion of pupils cycling to school at least once a week increased from 12% pre-survey to 26% post-survey.
Cope 2011 (Evaluation report- UK n=6 towns, 10 years) [*this report also uses data from other interventions*]. Data from automatic cycle counts indicated 12% increase over all cycle routes and up to 60% at specific sites.
Sloman 2009 (BA [+] UK n=1500, 4 years). Proportion of adult cycling for at least 30 minutes once or more per month increased from 11.8% in 2006 to 15.1% in 2008, an increase of 3.3%-points or 28%.

The evidence on cycle demonstration town is directly applicable as it was conducted in the UK.

EVIDENCE STATEMENT 9B. INDIVIDUAL LEVEL CHANGE IN CYCLE DEMONSTRATION TOWNS AS INTERVENTIONS TO INCREASE CYCLING

No individual change data was reported for these interventions. Population level changes are reported in ES9A.

Sustrans 2008 (BA [+] UK n=52, 1 year). Bike It works directly with schools who want to increase levels of cycling to help schools to make the case for cycling in their school travel plans; supporting cycling champions in schools and demonstrating that cycling is a popular choice amongst children and their parents. The aim is to create a pro-cycling culture in the school which continues long after the Bike It officer has left. Bike It is a partnership project and which works closely with schools, parents and local authorities. Nearly half (47%) of pupils expressed a desire to cycle to school, 3% of them already cycled to school every day and by the summer of 2007, this figure had increased to 10%. The number of pupils cycling at least once a week had increased from 10% to 27%. The number of pupils who never cycle fell from 80% to 55%, representing a marked increase in the number of new cyclists. In the London case study: Over 50 pupils at the school took part and together with staff and parents, they made over 300 cycle journeys during the challenge. The number of pupils cycling every day has trebled from 3% to 9% of school journeys whilst the number of pupils cycling at least once a week increased from 11% to 20%. The number of pupils who never cycle fell from 81% to 68%. A greater number of children owned a bike, up from 70% to 77% of pupils over the course of the year.

EVIDENCE STATEMENT 13A: POPULATION LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE CYCLING IN CHILDREN

Moderate evidence from 1 study suggests that school based multi-component interventions may be effective in increasing school population levels of cycling in children. Evidence from a BA study showed positive effects on walking at the school population level.

Sustrans 2008 (BA [+] UK n=52 schools, 1 year) [*Bike It. School travel plans, cycling champions in schools to demonstrate to parents and pupils that cycling is a popular choice. Aims to create a pro-cycling culture*]. Percentage of school pupils cycling to school every day increased from 3% to 10%. Number of pupils cycling once a week increased from 10% to 27%. Number of pupils who never cycled decreased from 80% to 55%.

The evidence on multi-component interventions to increase cycling in children is applicable in the UK as the study was carried out in the UK.

EVIDENCE STATEMENT 13B. INDIVIDUAL LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE CYCLING IN CHILDREN

No individual change data was reported for these interventions. Population level changes are reported in ES13A.

Parker 2011 (BA+ USA n=NR) reported on an intervention to promote bike facilities (shared and exclusive cycle lanes) build in New Orleans on streets submerged by water during hurricanes of 2005. This provided a 5ft wide striped cycle lane on both sides of the road with a speed limit of 35mph. The observation area was located between 2 neighbourhoods, with African American populations 87% above and 18% below national average with 45% and 19% below the poverty line. Data were collected 6 months before and 6 months after cycle lane was completed. Trained observers used a tally form to record the number of cyclists. Baseline data was collected for 10 days, and follow up data collected for 14 days (daily for 9 hours 8am to 5pm). There was a 57% (SD 18.5) increase in the mean number of riders per day (from 90.9 pre to 142.5 post intervention) ($p<0.001$). There was a 133% increase in mean number of female riders from 12.6-29.4 ($p<0.001$) and a 44% increase in mean number of male riders from 77 to 111.2 ($p<0.001$). In addition, the percentage of cyclist riding in the correct direction increase from 73% to 82% ($p<0.001$) (numbers not reported) but there was no change in numbers riding on the sidewalk (24%) ($p=0.9$) (numbers not reported). The authors point out that New Orleans is flat with temperate climate. A potential confounder is the increasing "gas" (fuel) prices over the intervention period, but prices decreased over the follow up period. As there was no comparison street; increase could be due to the riders being displaced from other streets without cycle lanes, or due to people returning to the area after the hurricanes.

Rissel 2010 (nRCT+ Australia n=1450) reported on a multi component community based intervention which consisted of a range of project resources were produced or purchased and branded with the project name and logo. A map titled 'Discover Fairfield and Liverpool by Bike' showing the bicycle paths and useful cycling routes in the area was considered the key resource in raising awareness for non and infrequent cyclists by illustrating the extent of local bike paths; 20,000 maps were produced. A general information booklet addressing concerns of potential cyclists titled 'Thinking about cycling' was created to complement the map (n=5,000). Water bottles (n=2,000) and reflective slap bands (n = 2,000) were designed with specific project images to serve as cues to engage in cycling. As part of the project, a one-hour presentation was developed and delivered to 351 people attending 24 community or workplace groups between February and September 2008. The objective was to raise awareness of cycling, the benefits of physical activity, the CCC project activities and resources, and to generate discussion of how to progress to riding a bike or to riding a bike more. One of the main interventions in the early stages of the project was the offer of free cycle skills courses. These courses were designed for members of the public who wanted to ride but did not, and focused on basic skills and confidence. At 24 months follow-up, there were no differences between the intervention and comparison areas in the proportion of respondents who had cycled in the past year overall or when the data were stratified by age and sex sub-groups. Despite similar path use at baseline, there was a significantly greater use of the bicycle paths in the intervention area (28.3%) at follow-up compared with the comparison area (16.2%) ($p<0.001$) and path use was significantly associated with an almost ten per cent increase in having cycled in the past year (29.1% in the intervention area compared with 20.6% in the comparison area ($p=0.01$). There was also a significantly greater proportion of respondents in the intervention area who were likely to use the paths in the future (28.6%) compared with the comparison area (17.8%) ($p<0.001$). A greater proportion of respondents (13.5%) in the intervention area had heard of the Cycling Connecting Communities project compared with the comparison area (8.0%) ($p=0.013$). Among those people who had heard of the project, there was a significantly higher proportion of respondents who had ridden in the last year in the intervention area (32.9%) compared with the comparison area (9.7%) ($p=0.014$). In the intervention area, among those that had ridden in the past week there was a slight decrease in the mean minutes cycling for recreation or exercise (169.5 minutes to 152.1 minutes per week), but a large increase in the mean minutes cycling for transport (76.9 minutes to 174.2 minutes per week). In the comparison area there was a much bigger drop in the mean minutes of recreational cycling (190.3 minutes to 121.3 minutes per week) and a large drop in mean minutes of cycling for transport (197.6 minutes to 71.7 minutes per week). There was no statistical difference between the intervention area (48.7%) and the comparison area (53.7%) ($p=0.130$) in the proportion of respondents meeting physical activity guidelines of 150 minutes of moderate intensity physical activity per week. However, of those people who met the physical activity guidelines, 28.1% had cycled in the past year (16.0% in the past month) compared with 16.8% of those not meeting the guidelines having cycled (6.5% in the past month) ($p<0.001$ for both past year and past month comparisons).

Telfer 2006 (BA+ Aus n=113) reported on an intervention offering cycling proficiency classes to adults. The intervention focused on practical skills development and supervised on road or cycle path training. Free courses for beginner and intermediate level cyclists were conducted either on weekdays or weekends with each course comprising of 6 hours of tuition broken into 2 or 3 sessions. The maxim number of participants was 8. The programme was promoted through flyers, posters, media releases, articles and adverts in local news papers and on a popular TV programme. Most participants were aged 25-54 (87%) and 75% were female. Overall, at 2 month follow up, there was no change in participants reported mean frequency or duration of cycle trips based on a 1 week activity recall. However, those not cycling in the month before the course reported an significant increase ($p<0.001$) in their mean duration in minutes of cycling. In addition there was a significant increase ($p<0.001$) in participants mean frequency of moderate intensity physical activity other than cycling. Of the 105 participants interviewed 2 months after the course, more than half of participants (56%) said they cycled more than before the course. There was a 40% increase in participants having cycled in the previous week at follow up among baseline non-cyclists, although this was not statistically significant. There was also a significant increase in weekly participation on other forms of moderate intensity physical activity (no data).

EVIDENCE STATEMENT 10A: POPULATION LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE CYCLING

Moderate evidence from two studies suggests that multi-component interventions are effective in increasing population levels of cycling for active travel in the general population up to 2 years post intervention. Evidence from 1 nRCT and 1 BA studies showed positive effects on cycling from multi component interventions. [See also cycle demonstration towns, ES9].

Parker 2011 (BA [+] USA n=NR, 6 months) [*promotion campaign and bike facilities (shared and exclusive cycle lanes)*]. 57% (SD 18.5) increase in the mean number of riders per day: from 90.9 pre to 142.5 post intervention, p<0.001.
Rissel 2010 (nRCT [+] Aus n=1450, 2 years) [*multi component community based intervention including: map titled 'Discover Fairfield and Liverpool by Bike' showing the bicycle paths and useful cycling routes in the area*]. Significantly greater use of the bicycle paths in the intervention area (28.3%) at follow-up compared with the comparison area (16.2%): p < 0.001, but no self reported increase in residents who said they cycled in the last year.

The population level evidence on multi-component interventions to increase cycling is only partially applicable to the UK as studies were conducted in the US and Australia. In addition the US study (Parker 2011) was conducted in a population of African Americans which is not an ethnic group directly represented in the UK, and therefore it may be less applicable here. The differing environments in Australia and the US must be considered in all studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 10B: INDIVIDUAL LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE CYCLING

Moderate evidence from one study suggests that multi-component interventions may be effective in increasing individual levels of cycling for active travel in the general population up to 2 years post intervention. Evidence from 1 BA study showed positive effects on cycling from a multi component intervention.

Telfer 2006 (BA [+] Aus n=113, 2 months) [*practical skills development and supervised on road or cycle path training. Free courses for beginner and intermediate level cyclists were conducted. Promoted through flyers, posters, media releases, articles and TV and newspaper adverts*]. Non cyclists at baseline reported significant increase (p<0.001) in minutes cycling; 40% cycled at least one in the previous week at 2 month follow up.

The individual level evidence on multi-component interventions to increase cycling is only partially applicable to the UK as the study was conducted in Australia. The differing environment in Australia must be considered in all studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

5.3.3 Multi component: Walking and cycling interventions

5.3.3.1. Adults

We identified 7 multi component interventions to increase walking and cycling in adults delivered in the workplace (n=2) or the community (n=6).

<u>Workplace interventions</u>

Brockman 2011 (ITS+ UK n=2829) reported on a University transport plan to improve rates of active travel which targeted university employees. The intervention included limiting the number of available parking spaces and permits, improving changing facilities for walkers and cyclers, installing secure cycle storage, a subsidised cycle purchase scheme, a car share scheme, free bus travel from train and bus stations to the university, and discounted season tickets for public transport. The travel plan was published in 1999, and the changes were implemented in 2000. Travel to work was recorded by an annual travel survey, although it was not possible to match responses between years. From 1998 and 2007, in contrast to national trends: the percentage of respondents who reported they usually (4-5 times a week) walked to work increased from 19 to 30% ($Z=4.24$, $p<0.001$); and the percentage of regular cyclists increased from 7.0% to 11.8% (not significant). The percentage of respondents who usually commuted by car decreased from 50% to 33% ($p<0.001$). In 2007 regular walkers were more likely to be female, under 35, middle income; regular cyclists were more likely to be male, 36-45, high income. It is important to note that survey response rates were less than 50% (although the responder profile was similar to the total workforce).

Bull 2008 (BA+ UK n=NR) reported on the effect of 11 Well@Work programmes which were established across 9 English regions and targeted all adults. The programmes included a total of 45 initiatives of which physical activity interventions accounted for 40% of initiatives. Overall the programmes consisted of a diverse set of initiatives and actions aimed at promoting and supporting healthy lifestyles. The intervention reported on in detail here included 3 team based pedometer competitions to increase total number of steps/week accumulated. Over the whole project there was a significant increase (9%) in the proportion of employees participating in active travel (walking or cycling), significant increase in employees cycling (4%) or walking (8%) to work, and a non significant increase in meeting physical activity recommendations (4%). Survey response rates were low: 33% pre and 21% post intervention. The report also considers the workplace supporting environment: cycling and walking environments surrounding the workplace scored both low (33% and 18%). Changes to the supportive environment were mainly aimed at supporting physical activity (e.g. the provision of new bicycle storage facilities and pool bicycles) and healthy eating (e.g. provision of healthy eating centres). In terms of the pedometer intervention (n=2240), 10,15 and 9 teams started in the three competitions, but 4, 8 and 4 teams completed (respectively). Average increases in step counts ranged from 77,130-126,519. The average change in step counts from baseline in the completing teams were: 1) (4 teams) 39% (range 3-555); 2) (8 teams) 32% (7-77%); and 3) (4 teams) 48% (16-63%). No long term (post competition) data was available.

Community interventions

De Cocker 2009 (BA+ Belgium n=438) reported on a one year intervention where physical activity was promoted in the entire city of Ghent, using the central theme of '10,000 steps/day', with secondary taglines of 'every step counts') and 'every revolution (of bicycle pedals) counts'). The guidelines, recommending 30 minutes of moderate-intensity physical activity on five days a week, or 20 minutes vigorous-intensity physical activity on three days a week were also promoted. Multiple strategies, based on the social ecological model, were designed to intervene at the individual, social and environmental level. A local media campaign (street signs, press conferences, advertisements), the sale and loan of pedometers, the use of a website, workplace projects, projects for older people and the dissemination of information through health professionals, schools and associations were concurrently implemented. Participants were asked to record the date, steps taken at the end of each day, and the type and duration of non-ambulatory activities (i.e. biking and swimming). For every minute of reported biking and/or swimming, researchers added 150 steps to the daily total number of reported step counts. There were 438 intervention participants (207 male) with a mean age of 49.8 (SD 13.1) years. The majority (n=344, 79.1%) reported good to excellent health. Only 72 (16.4%) of intervention participants used a pedometer during the one-year intervention period. Overall, 209 (47.5%) participants showed an increase in average step counts of 896 steps/day or more at one-year follow-up. Participants with a college or university degree (p=0.046), and those who used a pedometer during the intervention (p=0.014) were more likely to have increased their step counts by 896 steps/day or more, while those with a baseline average step count level of more than 10,000 steps/day were less likely to have increased their step counts by 896 steps/day or more (p <0.001). None of the remaining variables was significantly associated with the step count increase of 896 steps/day or more. The study relies on all self reported measures and recall over one year.

Hemmingsson 2009 (RCT++ Sweden n=120) reported on a moderate intensity intervention programme which consisted of physician meetings, physical activity prescriptions, group counselling, and bicycle provision. The intervention used the trans theoretical model of behaviour change to increase cycling and walking. The control arm of the trial consisted of a low intensity group support programme with pedometers. This involved a 2 hour counselling session at baseline and 6 months, and was designed to encourage walking only. Treatment success was defined as bicycling >=2km/day (primary outcome) or walking 10,000 steps per day. At 18 months follow up the intervention group were more likely to achieve treatment success for cycling than controls (38.7 vs. 8.9%, OR=7.8, 95% CI 4.0-15.0, p<0.001), but there was no difference in compliance with the walking recommendation (45.7 vs. 39.3%, OR 1.2 95% CI 0.7-2.0 p=0.5). The intervention group more likely to comply with at least one treatment goal (cycling or walking) than the controls; 60.8% vs. 41.8% OR= 2.2, 95% CI 1-3-3.8 p=0.003. Commuting by car and public transport were reduced by 34% (p<0.01) and 37% (p<0.001) with no difference between groups, and both groups achieved similar waist reductions (-2.1 and -2.6cm, p=0.72). Therefore, active commuting by bicycle was not at the expense of walking. In contrast, commuting by car and public transport decreased in both groups as cycling and walking increased.

Hendricks 2009 (BA USA n=NR) reported on the evaluation of a multi component intervention to increase safe physical activity opportunities and encourage walking and biking for short trips. The programme was a 3 pronged community intervention utilising the 5P model (Preparation, Promotion, Programs, Physical Projects and Policy) which aims to maximise support for individual behaviour change by integrating traditional health promotion approaches with policy and environmental projects. The focus included work on projects at elementary schools (international walk to school day and safe routes to school to increase daily walking and biking to school), worksites (Active living programmes and city wide smart commute day) and city-wide networks (including development of a multidisciplinary partnership). Modifications were also made to the physical environment including more bike lanes, and large sidewalks and trail sections. The evaluation results show changes in attitudes (over "at least one year") towards active transportation (8% increase in children who thought walking to school was safer post intervention), intentions to try active commuting (43% of Smart Commute Day participants would smart commute more often post event) and increased physical activity (the number of students walking to school more than doubled at 3 of 4 intervention schools and increased at the other (no statistics given). The number of people seen using active transportation increased from 1028 in 2005 to 1953 in 2006 (63% increase).

Sloman 2010 (BA+ UK n=12,000) reported on sustainable travel towns (Darlington, Peterborough and Worcester); which implemented intensive town wide Smarter Choice Programmes to encourage use of non car options; bus use, cycling and walking, and less single occupancy cars. Strategies were similar across the three towns and included: development of brand identity, large scale personal travel planning programmes, cycling and walking promotions, travel awareness campaigns, public transport information and marketing, school travel planning and workplace travel planning. Comparisons were made with national data including data from national travel survey, household survey and national road traffic estimates. The number of cycle trips per head grew substantially in all three towns by 26-30%. In comparison towns cycle trips decreased. The number of walking trips per head grew substantially by 10-13% compared to a national decline in similar towns. There are some disagreement reported between data collected by the household survey in the sustainable travel towns and manual counts. For example, Exeter and Lancaster with Morecambe, showed quite large increases in automatic cycle counts but a small decline in manual counts.

TenBrick 2009 (ITS- USA n=36,000) reported on Project U-Turn which aimed to increase active transportation (biking, walking, and transit use) through an integrated approach to Active Living by Design's community action model and Michigan Safe Routes to School model. The project began as a safe routes initiative in local schools and was expanded to other common destinations such as worksites, churches, parks and shopping centres. Promotional events such Walking School Bus and Smart Commute Day encouraged walking and biking, whilst a task force indentified policies and physical projects. The intervention ran over 5 years in the City of Jackson, which is blue collar city of 36,000. The study population were 20% black, 74% white, 4% Hispanic and 30% <18 yrs. An annual transportation survey was undertaken. The 2005 survey documented a citywide count of 1028 people using active transport, a year later this study showed an increase of 63%. Safe routes data indicated a steady increase in students who walk to school (data not given). Participation in walk to school days increase from 600 in 2003 to 1200 in 2008. Community bike programme increased cyclists using and requesting improvements to bike facilities throughout the city. Approx 60% of 100 participants reported continued use of a bike for transport 1 month after receiving bike training. Participation in "Smart Commute Day" increased steadily from 165 in 2004 to 520 in 2008. The data reporting here is poor and often anecdotal with a lack of numerical information.

EVIDENCE STATEMENT 11A: POPULATION LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE WALKING AND CYCLING IN ADULTS

Inconsistent evidence from 6 studies is unclear as to the effect of multi-component interventions (delivered in the community (n=5) or workplace (n=2) on increasing population levels of walking and cycling for travel and/or leisure up to 9 years post intervention. Evidence from, 4 BA, and 2 ITS, showed mixed, but mostly positive, effects of community interventions to encourage cycling and walking for travel and/or leisure.

De Cocker 2009 (BA [+] Belgium n=438, 1 year) [*Physical activity promoted in the entire city of Ghent. Central theme of '10,000 steps/day', with secondary taglines of 'every step counts') and 'every revolution (of bicycle pedals) counts'*]. 47.5% increased average step counts by 896 steps/day or more at one-year follow-up (no statistical analysis; cycling was "converted" to step counts).
Hendricks 2009 (BA [-] USA n=NR, 12 months) [*Multi component intervention to increase safe physical activity opportunities and encourage walking and biking for short trips*]. The number of people seen using active transportation increased from 1028 in 2005 to 1953 in 2006 (63% increase).
Sloman 2010 (BA [+] UK n=12,000, 30 months) [*Sustainable travel towns which implemented intensive town wide Smarter Choice Programmes to encourage use of non car options; bus use, cycling and walking, and less single occupancy cars*]. Cycle trips per head grew substantially in all three towns by 26-30%. Comparison towns cycle trips decreased. Walking trips per head grew substantially by 10-13% compared to a national decline in similar towns.
TenBrick 2009 (ITS [-] USA n=36,000, 5 years) [*Project U-Turn, active transportation (biking, walking, and transit use) through an integrated approach to Active Living*]. Citywide count of people using active transport, showed an annual increase of 63% (2005-2006).
Brockman 2011 (ITS [+] UK n=2829, 9 years) [*University transport plan: limiting the number of available parking spaces and permits, improving changing, installing secure cycle storage, subsidised cycle purchase scheme, car share scheme, free bus travel, and discounted season tickets*]. Respondents who usually walked to work increased from 19 to 30%: Z=4.24, p<0.001, and regular cyclists increased from 7.0% to 11.8% (not significant).
Bull 2008 (BA [+] UK n=2240, 3 years) [*Well@Work programmes which consisted of a diverse set of initiatives and actions aimed at promoting and supporting healthy lifestyles*.]. Increase of 9% in the proportion of employees participating in active travel (walking or cycling), significant increase in employees cycling (4%) or walking (8%) to work.

The population level evidence on multi-component interventions to increase walking and cycling in adults is partially applicable to the UK as three studies were conducted in the UK. The differing environment in the US and Europe must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 11B: INDIVIDUAL LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE WALKING AND CYCLING IN ADULTS

Inconsistent evidence from 1 study is unclear as to the effect of a multi-component interventions on increasing individual levels of walking and cycling for travel and/or leisure up to 18 months post intervention. Evidence from one RCT study showed a positive effect on cycling only, with no effect on walking.

Hemmingsson 2009 (RCT [++] Sweden n=120, 18 months) [*Physician meetings, physical activity prescriptions, group counselling, and bicycle provision*]. Intervention group were more likely to achieve recommended level of cycling than controls: 38.7 vs. 8.9%, OR=7.8, 95%CI 4.0-15.0, p<0.001, but there was no difference in compliance with the walking recommendation: 45.7 vs. 39.3%, OR 1.2, 95%CI 0.7-2.0, p=0.5.

The individual level evidence on multi-component interventions to increase walking and cycling in adults is only partially applicable to the UK as the study was conducted in the Sweden. The differing environment in Sweden must be considered in reference to this study conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

We also identified 6 school based studies to increase walking and cycling in children.

Cairns 2006a (BA [+] UK n=179, 41 months) In this intervention a school travel plan group developed a walking bus and a walking incentive scheme “going for gold”. Participants have their card is stamped every morning if they walks to school. Children arriving by bike or scooter also receive initiatives. The interventions also included cycle training, pedestrian training, park and walk, parent talks, curriculum work, school assemblies, and newsletters. In April 2000 travel to school was reported to be by the following modes: 62% car, 30% walk, 8% park and walk, 0 cycle. By October 2003 modes of travel to school had changes to 25% car, 58.8% walk, 12.5% park and walk, 4% cycle
Only absolute percentages were reported.

Cirignano 2010 (ITS+ USA n=184) reported on a 6 week in school walking programme which consisted of pedometers and a “Fit Bits” programme to implement physical activity breaks in the classroom throughout the school day with 10-15 minute activities. The students were in grade 4 (n=64), grade 5 (n=68) and grade 6 (n=52) and were mostly White 74% and female 51.6%. Mean steps increased significantly from 19,149 (95% CI 18,224 – 20,073) in week 1 to 21,248 (95% CI 19,730-22,765) at week 6 (p<0.001). The largest increase in steps was found among fourth graders. Six months after the intervention 40% of parents reported that their child continued to use a pedometer. 90% felt the programme was beneficial in promoting physical activity in their child.

McKee 2007 (nRCT+ UK n=60) reported on Travelling Green, a school based active travel project which was undertaken for one school term in one primary school in Scotland. Active travel was integrated into the curriculum, and participants used interactive travel planning resources at home. Curriculum materials included resource guide for teachers, designed by Sustrans which included ideas for making an active travel project informative, interactive, and appropriate. An additional pack of interactive tools for use in the home was provided with the primary aim to provide practical guidance about how to plan an active journey to school. The control school participated in the before and after measures but did not receive the intervention. Participants lived with walking distance of school (3 miles) and were currently driven to school. The pupils had a mean age 9 yrs (range 9-10), 40% were boys (24). The mean distance travelled to school by walking increased in the intervention group from 198m before the intervention, to 772m post intervention (389% increase). The control group mean distance walked increased from 242 to 285m (17%). The difference between the schools was significant (t(38) -4.679, p<0.001 (95% CI -315 to -795m). Car travel to school decreased in the intervention school from 2018 to 933m (57.5%) and increased in the control school from 933 to 947m (1.5%). The difference between schools was significant (t(32) 4.282, p<0.001 (95% CI 445-1255m). More, 71% (20) of the intervention group progressed to a higher “stage of change” on the behaviour change model relating to active commuting (or remained in the action and maintenance groups), compared with 52% (14) of the control group in relation to making an active journey to school.

Rowlands 2003 (RCT [++] UK n=21 schools, 12 months) reported on an intervention in 11 schools (plus controls). Travel plans were developed by a school travel co-ordinator at the intervention schools but not in the controls.

One year post intervention, 9 of 11 interventions schools and none of the 10 control schools had travel plans. The proportions of children walking, cycling, or using public transport on the school journey were not significantly different between the intervention and control schools (school travel plans did not have a significant effect). In interventions schools 70% walked, 24% travelled by car and 6% cycled or used public transport. In control schools 71% walked, 23% travelled by car and 7% cycled or used public transport. Adjusted OR = 0.98 (95% CI 0.61-1.59) for walked, cycled or took public transport.

Staunton 2003 (BA [+] (UK n=52 schools, 1 year) reported on the Safe Routes to School Programme which promotes walking and cycling to school using a multi-pronged approach. The programme identifies and creates safe routes to school and invites community wide involvement. A full time educator is employed to develop the curriculum and oversee classroom education. A traffic engineer assists in identify and creating safe routes. Participating schools reported an increase in school trips made by walking (64%), biking (114%), and carpooling (91%), and a decrease in trips made by private vehicles carrying only one student (39%). Only two schools participated in surveys in both years. However, the authors report that analysis of these two schools only produced similar results to those reported for all schools (but do not report this data).

Wen 2008 (Cluster RCT+ Aus n=2258) reported on a Health Promoting Schools Policy which consisted of a two year multi-component programme including classroom activities, pedometer based walking activities (some schools) development of school Travel Access Guides, parent newsletters, and improving environments with local councils. It was conducted in 24 primary public schools in inner west Sydney. When data was analysed by cluster, there were no statistically significant differences in mean percentages of change in mode of transport to or from school from baseline to follow up between the intervention and control groups. However, the design effect was 2.6, which was larger than the 1.7 anticipated, showing larger variability between than within each school cluster and compromising statistical power.

As such the fact that there were no differences seen should not be considered to have a negative effect on the evidence base due to the study limitations.

EVIDENCE STATEMENT 12A: POPULATION LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE WALKING AND CYCLING IN CHILDREN

Moderate evidence from 4 studies is unclear as to the effect of school based multi-component interventions to increasing levels of walking and cycling for children. Evidence from 2 BA studies showed positive effects on school population level walking in children but evidence from 2 RCTs (1 of cluster design), showed no effect on cycling and walking for travel.

Cairns 2006a (BA [+] UK n=179, 41 months) [*School travel plan group developed a walking bus scheme, incentive scheme "going for gold" included children cycling or scooting to school, also cycle training, pedestrian training, park and walk scheme, curriculum work, school assemblies and newsletters*]. Walking to school increased from 30% to 58.8%, cycling to school increased from 0 to 4%.
Rowlands 2003 (RCT [++] UK n=21 schools, 12 months) [*multi component school travel plans were developed by a school travel co-ordinator*]. The proportion of children walking or cycling to school was not affected by the intervention.
Staunton 2003 (BA [+] UK n=52 schools, 1 year) [*Safe Routes to School. Identified and creates safe routes to school, invites community wide involvement, full time educator employed to develop curriculum*]. Increase in number of school trips made by walking (64%) and biking (114%).
Wen 2008 (Cluster RCT [+] Aus n=2258, 2 months) [*Health Promoting Schools Policy: classroom activities, pedometer based walking activities (some schools) development of school Travel Access Guides, parent newsletters, and improving environments with local councils*]. Cluster analysis showed no statistically significant differences in mean percentages of change in mode of transport to or from school from baseline to follow up between the intervention and control groups (no data given).

The population level evidence on multi-component interventions to increase walking and cycling in children is partially applicable to the UK as three studies were conducted in the UK. The differing environment in Australia must be considered in reference to the study conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 12B: INDIVIDUAL LEVEL CHANGE IN MULTI-COMPONENT INTERVENTIONS TO INCREASE WALKING AND CYCLING IN CHILDREN

Moderate evidence from 2 studies suggest that school based multi-component interventions may be effective in increasing individual levels of walking and cycling for children in the short term (up to 10 weeks). Evidence from an nRCT and an ITS showed positive effects on individual level walking in children

Cirignano 2010 (ITS [+] USA n=184, 6 weeks) [*pedometers and a "Fit Bits" programme to implement physical activity breaks in the classroom*]. Mean steps increased from 19,149 (95%CI 18,224–20,073) week 1 to 21,248 (95%CI 19,730-22,765) week 6: p<0.001.
McKee 2007 (nRCT [+] UK n=60, 10 weeks) [*School based active travel project. Active travel was integrated into the curriculum, and participants used interactive travel planning resources at home*]. Mean distance travelled to school by walking increased significantly more in the intervention (389%) than the control (17%): t(38)=-4.679, p<0.001, 95% CI -315 to -795m.

The individual level evidence on multi-component interventions to increase walking and cycling in children is partially applicable to the UK as one study was conducted in the UK. The differing environment in the US and Australia must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

5.4 Walking sessions

We identified 34 papers reporting on interventions which provided walking session in order to increase walking for leisure or travel. Three of these studies specifically looked at walking for travel, and the others were focused on walking for leisure, although this was generally not explicitly stated.

Most intervention were delivered in the community (n=20) of which 10 studies looked at led walks and 10 studies looked at independent walking. There were also 4 interventions delivered in a workplace setting, and 10 in schools . Three studies were targeted at the whole community and 21 studies targeted adults. Ten studies were conducted with children (including one with girls only).

The studies consisted of RCTs (n=20, 3 with a cluster design), nRCTs (n=5), and BA studies (n=9). The number of study participants ranged 16 to 1493. The studies were conducted in the USA (n=16), the UK (n=10), Australia (n=6), Canada (n=1), and New Zealand (n=1). The content of the interventions are summarised in Table 7.

5.4.1. Walking sessions: Community interventions: led walks

10 studies reported on community based walking group session interventions to increase walking. The interventions are summarised in table 9.

Table 9. Summary of content of community interventions consisting of led walks.

Led walks in the community	
Reger-Nash 2006	10, 20 and then 30 minutes of daily moderately intense walking in led groups.
Estabrooks 2008	Recruit teams of six individuals who would collectively walk the 423 mile distance across Kansas over an 8 week period.
Johnson 2010	Dog walking intervention. The dogs were part of the College of Veterinary Medicine's Pet Assistance Love and Support (PALS) programme.
Lamb 2001	Accompanied walks were provided at several different times in the day and evening, during the week and at weekends, and were led by lay volunteers.
McAuley 1994	Subjects were led in stretching exercises by the exercise

	leader for approximately 10 minutes each session. They then participated in the walking program.
Fisher 2004	Leader-led walking group activity or an information-only control group.
Jancey 2008	Walking groups which met twice a week for 26 weeks. The walk leaders received a prescriptive progressive weekly exercise program that contained written information on the appropriate length for the walking program; stretching exercises; and ball skills, such as side twist leader ball.
McAuley 2000	Exercise classes were conducted by trained exercise specialists and employed brisk walking as the aerobic component.
Avila 1994	One session per week for 8 weeks, which included instruction for diet modification and walking for exercise. All women were lead in 20 minutes of walking per session
Cox 2008	6 month swimming or walking programme consisting of 3 sessions a week with/without an additional behavioural intervention.

Whole community

One study focused on the whole community.

Reger-Nash 2006 (RCT+ USA n= 4 communities) reported on four community wide physical activity interventions to promote walking; Wheeling Walks, Welch Walks, BC Walks and WV Walks. The social ecological approach encouraged 10, 20 and then 30 minutes of daily moderately intense walking in led groups. A mass media campaign targeted insufficiently active residents (not defined) was also ongoing in the area. Interventions communities were based in West Virginia (n=3) and New York State (n=1). No demographic details given. 32% of insufficiently active persons in Wheeling reported meeting the criteria for regular walking immediately post campaign compared to an 18% increase in the comparator community (OR=2.12, 95%CI 1.41-2.24). An increase in reaching regular walking was observed for the most sedentary group in WV walks ($p<0.05$). The intervention community in Welch walks demonstrated a twofold (OR=2.0 95%CI 1.01-3.97) gain in weekly walking by at least 30 minutes versus the comparison community. 41% of the BC walks intervention community increased walking by 30 min/week compared to 30% in the control (OR=1.56 95% CI 1.07-2.28). There were no changes in any community for moderate or vigorous activity. Results were reported inconsistently as p values or odds ratios.

Adults

Four studies focused on adults only.

Estabrooks 2008 (BA+ USA n=1493) reported on a walking intervention titled “Walk Kansas”. Programme manuals were developed and training was offered to 105 counties to facilitate adoption and consistent delivery of the program. The program was marketed to recruit teams of six individuals who would collectively walk the 423 mile distance across Kansas over an 8 week period. Participants could acquire miles through participation in any moderate intensity PA. With the exception of walking and jogging, which were documented as miles covered, 15 minutes of moderate or vigorous intensity PA was defined and reported as 1 mile. The participatory research team developed nine social cognitive theory-driven newsletters that included fun messages, activities to encourage PA, and weekly team mileage updates. Walk Kansas participants from the 15 randomly selected counties increased minutes of moderate and vigorous activity between baseline and 8 weeks. For both moderate and vigorous minutes of activity, there was a significant interaction between time and baseline activity level after accounting for the influence of age, gender, and the clustering of teams within counties [moderate: $F(2,1008)= 59.6$, $p<0.001$; vigorous: $F(2,1008)=12.4$, $p<0.001$]. For minutes of vigorous activity, multiple pairwise comparisons revealed a significant increase between baseline and 8 weeks for individuals classified as inactive ($p=0.005$), insufficiently active ($p<0.001$), and active ($p=0.003$) at baseline. Specifically, previously inactive participants increased from no moderate or vigorous activity to an average of 172.85 (SE=15.0) and 45.49 min (SE=8.7) per week, respectively. Similarly, previously insufficiently active participants increase from 66.3 min (SE=2.0) of moderate and 4.4 min (SE=0.57) of vigorous activity to an average of 171.7 (SE=6.4) and 60.8 min (SE=5.3), respectively. Finally, participants who were active at baseline did not substantially increase their levels of moderate [214.3 minutes (SE=6.0) to

228.3 min (SE=6.2)] or vigorous [94.3 minutes (SE=4.3) to 111.3 (SE=5.0)] minutes activity.

Johnson 2010 (BA+ USA n=26) reported on a dog walking intervention. The dogs were part of the College of Veterinary Medicine's Pet Assistance Love and Support (PALS) programme. 26 participants (living in social housing) were provided with well fitting walking shoes and instructed to begin walking 10 minutes, 3 times per week. Those who could not walk this long began walking as long as they felt they could and were gradually increased to the desired 10 minutes, 3 days per week. The programme ran for 26 weeks. Participants at Site 1 had an adherence rate of 72% and statistically significant weight loss (14.4 pounds, p=0.013). Their pre-test mean weight was 228 pounds (SD 56, range 140-301) and post-test mean weight was 218 pounds (SD 59, range 140-312). BMI for participants at Site 1 decreased significantly (mean−1.9, SD 2.71, p=0.021). The Site 2 group had an adherence rate of 52% and a mean weight loss of 5 pounds (p =0.29). Their pre-test mean weight was 224 pounds (SD 57, range 112-365) and post-test mean weight was 228 pounds (SD 68, range 116-420). By 7 weeks into the program at each site, all participants were able to walk 20 minutes, 5 days per week. At Site 2 (26-week program), BMI increased slightly but this was not significant (mean +0.77, SD 2.69, p=0.91). This finding suggests that a skew resulted in Site 2 data, perhaps because of one participant's weight gain of 8 pounds.

Lamb 2001 (RCT++ UK n=438) reported on a health walks intervention. Participants randomised to the health walks were treated in exactly the same manner as those in the advice only group, but in addition, they were given verbal and written information about the local health walks programme and encouraged to consider this as an option for increasing physical activity. They were referred to the local walk coordinator who telephoned each person to explain the programme in more depth and extend an invitation to join a specified walk. People received a maximum of three telephone calls. The health walks programme ran in two forms. Accompanied walks were provided at several different times in the day and evening, during the week and at weekends, and were led by lay volunteers. Walk packs were available for those who might find it more convenient or preferable to walk independently. The packs included information on routes, calibrated times for each walk, and details of local points of interest. A maximum of three telephone calls was made during the year of the study to encourage people to join the scheme, each person was sent a local walk pack and promotional flyers through the post. Attendance on the walks was free of charge. Walks were designed with crèche facilities, car parking and access to public transport networks. Participants were encouraged to bring along other members or their family or friends. All participants were encouraged to take at least 120 minutes/week of moderate intensity activity per week, and to choose an activity that was enjoyable and convenient. By 12 months the proportion of active people in the advice only group increased by 22.6% (from 4.3% to 26.9%). In the health walks group, the proportion of active people increased by 35.7% (from 3.2% to 38.9%). The difference between the groups was 13% (95% CI 0.003% to 25.9%). Analysis of the continuously scaled physical activity items supported the trend of improvement in activity. People in the health walks arm of the trial increased the frequency of moderate intensity activity more than the advice only group, but there were no statistically significant differences between groups in terms of total amount of activity. Improvements in physical activity levels took some time to occur. At six months there were only small increases in physical activity, but motivation to exercise had improved more quickly in the health walks group (c2=7.71 df3, p=0.05). By 12 months, the advice only group had "caught up" in their motivation level (between group difference c2=1.63 df3, p=0.65). Although there were modest, statistically significant improvements in aerobic capacity in both groups, there was no difference between the groups at 12 months. There were no statistically significant changes in body mass index, cholesterol, or blood pressure in either group. At one year approximately 27% of each group were lost to follow up.

McAuley 1994 (RCT++ USA n=114) reported on a 20 week exercise program designed for middle-aged adults which employed low-impact aerobic exercise (walking). Subjects exercised three times per week, exercising for 10-15 minutes at the beginning and progressing up to 40 minutes by mid-point of the program. Subjects were led in stretching exercises by the exercise leader for approximately 10 minutes each session. They then participated in the walking program. The intervention is described as exercise and provision of efficacy-based information, mastery accomplishments, social modelling, social persuasion and interpretation of physiological states. The intervention began at the end of week 3 of the exercise program and continued into the third month of the program with six 15-minute biweekly meetings prior to exercise. The control group subjects participated in the 20 week exercise program and also met with an investigator biweekly for the 12 week period. Participants included 56 males and 58 females, mean age 54.52 years (SD = 5.79 years). At the end of the 20 week program, subjects in the intervention group exercised more frequently ($p<0.01$), exercised more minutes per month ($p<0.01$) and walked more miles per week ($p<0.05$) than the control group. Only p-values were given. The authors concluded that there was evidence to suggest that a simple information-based intervention program can significantly improve adherence patterns in previous sedentary middle-aged males and females. The dropout rate was not reported, nor did the authors report if all participants completed the 20 week program.

Retired adults

Three studies focused specifically on retired adults.

Fisher 2004 (Cluster RCT++ USA n=582) reported on the effects of a neighbourhood walking program on quality of life among older adults. Neighbourhoods (n=56) were randomly assigned to a 6-month, 3 times per week, leader-led walking group activity (n=28) or an information-only control group (n=28). Walkers were also provided an informational booklet describing the benefits of walking, instruction about what to do before commencing an exercise program, precautionary medical advice, information on proper shoes and clothing, and examples of warm-up and stretching exercises. Each walking session lasted approximately 1 hr and consisted of stretching and warm-up exercises, a 30- to 40-min “leisurely, but purposeful” walk in or near their neighbourhood, and a set of “cool down” exercises. Neighbourhoods in the control condition received a health education and information program, mailed regularly during the 6 month intervention period. These informational materials, were identical to those mailed to walkers in the intervention group. Participants were age 74 +/-6.3 years, and mostly White (82%) and female (74%). Compared to the control neighbourhoods, results from multilevel, longitudinal analyses indicated significant improvements in the primary outcomes of SF–12 Physical ($p<0.05$), SF–12 Mental ($p<0.05$) summary scores, and SWLS ($p<0.05$), over the course of the 6-month intervention. A significant increase was also observed in the secondary outcome of walking activity ($p<0.05$). The results indicated that a significant change occurred in the slope mean for the intervention neighbourhoods (M=0.21, $p<0.001$), showing an increase in neighbourhood walking. There was no observed change in the control (M=0.01, p=0.12). The slope factor intraclass correlation was 8% [0.01/(0.12 + 0.01)]. The effect size for the change in walking activity was 0.20.

Jancey 2008 (BA+ Aus n=260) reported on an intervention consisting of walking groups which met twice a week for 26 weeks. The walk leaders received a prescriptive progressive weekly exercise program that contained written information on the appropriate length for the walking program; illustrations for stretching exercises; and suitable ball skills, such as side twist leader ball. The graduated and standardized physical activity program commenced at a very low level and catered to the previously inactive older adults. The first meeting comprised 10 minutes of walking and two stretching exercises. By the end of 6 months, the group was physically active for one hour, which consisted of walking for 45 minutes plus doing flexibility and ball drills. This range of activities aimed to improve endurance, balance, and flexibility. Participants were aged 65 to 74 years, insufficiently active (defined as not achieving at least 30 min of moderate physical activity on at least five days a week); and healthy to the extent that participation in a low-stress walking program would not place them at risk for or exacerbate any existing health condition. The self-completed International Physical Activity Questionnaire indicated that the baseline mean walking time for recreation was one hour (SD =1.65), increasing to 2.69 hours (SD =2.02) per week by the end of the program. Results of the self-completed postal satisfaction survey showed that the majority of walkers ‘‘felt fitter’’ (81%, n = 143), were ‘‘able to get more done in a day’’ (59%, n = 102), and were ‘‘more aware of health and well-being’’ (77%, n = 136). The participants acknowledged that they generally became more active (68%, n = 121), with some becoming involved in additional physical activities (26%, n = 46). It is important to note that only 65% of walkers completed the whole programme.

McAuley 2000 (RCT++ USA n=174) reported on an intervention consisting of an aerobic exercise group, where exercise classes were conducted by trained exercise specialists and employed brisk walking as the aerobic component. The exercise program was conducted three times a week for six months. This was compared with a stretching and toning group. This comparator group met three times per week for six months under the supervision of an experienced exercise leader in a large gymnasium. The focus of this program was on the provision of an organised program of stretching, limbering, and mild strengthening for the whole body designed specifically for older adults. Participants had a mean age of mean age 66.71 years, (95% CI 56.23 -77.20). There were no significant differences in outcomes between the groups suggesting no differential effect of exercise including walking compared to stretching on outcomes related to quality of life (happiness, satisfaction with life, and loneliness). However, at follow up (12 months) 75% of the stretching/toning participants had continued to exercise at programme levels compared to only 51.3% of the walking condition.

Women

Two studies focused on working age women.

Avila 1994 (RCT++ USA n=44) reported on an intervention consisting of an experimental training group, one session per week for 8 weeks, which included instruction for diet modification and walking for exercise. All women were lead in 20 minutes of walking per session. The women were Latinas, 18 years or older and more than 20% overweight. Control participants attended weekly cancer screening education sessions and were invited to attend weight control classes after the study. Post training measures were taken one week after last class (9 weeks) with further follow up at three months. There were statistically significant decreases ($p<0.05$) in intervention (compared to control) individuals for: BMI ($F(1,37)=12.62$, $p<0.001$), waist/hip ratio ($F(1.37)=1.87$, $p<0.001$) and serum cholesterol ($F(1,35)=6.71$, $p<0.001$). There were also significant increases in fitness $F(1,26)=6.89$, $p<0.05$), exercise rate ($F(1,35)=21.28$, $p<0.001$), and frequency ($F(1,31)=8.95$, $p<0.01$), and diet/exercise knowledge (no data).

Cox 2008 (RCT++ Aus n=116) reported on a supervised 6 month swimming or walking programme consisting of 3 sessions a week with/without an additional behavioural intervention. During first six months each participant attended the same fitness centre free of charge 3 times/week for supervised sessions. In the second six months they were encouraged to maintain the same programme and intensity, unsupervised. The additional behavioural intervention consisted of 12 worksheets including strategies such as goal setting, time management and overcoming barriers, delivered through mini workshops by an exercise facilitator. They also received worksheets to complete at home and received newsletters only during second six months. The control group received “usual care”: in first six months, they were given information sheets about the programme, exercise technique, safety, and fitness reports at 6 months. Nine newsletters provided re-enforcement during the intervention. The study therefore compared two interventions: walking or swimming with/without a behavioural intervention. Participants were sedentary women age 50-70, mean age 55 (+/- 5yrs). Adherence to swimming or walking was similar at 6 months (76.3% 95%CI 69.5-83.1) vs. 74.3% (66.7-80.9) and at 12 months (65.8% (57.9-73.8) vs. 62.2% (54.6-70.0). During the supervised programme both groups exercised at target with no significant difference between groups (swimming 60.9% (58.9-62.8) vs. (walking 59.7% (57.9-61.6). After six months there was a significant difference ($p<0.001$) in the reduction in walk time between the walking and swimming groups (6.5 (7.9-5.4%) vs. 3.8 (4.9-2.8%)). In addition the swimming groups swam significantly further than the walking groups ($p<0.001$). The behavioural intervention did not enhance retention or adherence. At 12 months, 75% of participants were still engaged with the programme.

EVIDENCE STATEMENT 14A. POPULATION LEVEL CHANGE IN COMMUNITY BASED LED WALKING GROUP INTERVENTIONS TO INCREASE WALKING

No population change data was reported for these interventions. Individual level changes are reported in ES14B.

EVIDENCE STATEMENT 14B. INDIVIDUAL LEVEL CHANGE IN COMMUNITY BASED LED WALKING GROUP INTERVENTIONS TO INCREASE WALKING

Strong evidence from 10 studies suggests that community based led walking group interventions to increase walking may be effective in increasing individual walking for leisure or travel up to 18 months post intervention in the whole community (n=1 studies); up to 12 months post intervention in adults, (n=7 studies); and up to 48 weeks post intervention in women (n=2 studies). Evidence from 5 RCTs and 3 BA studies show positive effects on walking, but evidence from a further RCT showed no difference between groups at 12 months.

Avila 1994 (RCT [++] USA n=44, 3 months) [*included instruction for diet modification and walking for exercise, led in 20 minutes of walking per session*]. Significant increases (intervention compared to control) in fitness: $F(1,26)=6.89$, $p<0.05$, exercise rate (primarily walking): $F(1,35)=21.28$, $p<0.001$, and exercise frequency: $F(1,31)=8.95$, $p<0.01$.
Cox 2008 (RCT [++] Aus n=116, 6 months) [*6 month swimming or walking programme consisting of 3 sessions a week with/without an additional behavioural intervention*]. During the supervised programme both groups exercised at target with no significant difference between groups swimming 60.9% (58.9-62.8) vs. walking 59.7% (57.9-61.6).
Estabrooks 2008 (BA [+] USA n=1493, 8 weeks) [*Recruit teams of six individuals who would collectively walk the 423 mile distance across Kansas over an 8 week period*]. Previously inactive participants increased from no moderate activity (walking) to an average of 172.85min/week (SE=15.0) per week.
Fisher 2004 (Cluster RCT [++] USA n=582, 6 months) [*Leader-led walking group activity or an information-only control group*]. Significant increase observed in walking activity: $p<0.05$.
Jancey 2008 (BA [+] Aus n=260, 6 months) [*Walk leaders received a prescriptive progressive weekly exercise program that contained written information on the appropriate length for the walking program; stretching exercises; and ball skills, such as side twist leader ball*]. Baseline mean walking time for recreation was one hour (SD =1.65), increasing to 2.69 hours (SD =2.02) per week by the end of the program
Johnson 2010 (BA [+] USA n=26, 26 weeks): [*Dog walking intervention. The dogs were part of the College of Veterinary Medicine's Pet Assistance Love and Support (PALS) programme*]. BMI decreased significantly: mean= −1.9, SD= 2.71, p=0.021. At 7 weeks, all participants were able to walk 20 minutes, 5 days per week.
Lamb 2001 (RCT [++] UK n=438, 12 months) [*Accompanied walks were provided at several different times in the day and evening, during the week and at weekends, and were led by lay volunteers*]. At 12 months, although both walking and control groups increased activity (by 28.7% and 22.9% respectively), there was no significant difference between them.
McAuley 2000 (RCT [++] USA n=174, 6 months) [*Subjects were led in stretching exercises by the exercise leader for approximately 10 minutes each session. They then participated in the walking program*]. 75% of the stretching/toning participants continued to exercise at programme levels compared to only 51.3% of the walking condition.
McAuley 1994 (RCT [++] USA n=114, 20 weeks) [*Exercise classes were conducted by trained exercise specialists and employed brisk walking as the aerobic component*]. At the end of the 20 week program, subjects in the intervention group walked more miles per week than the control group: $p<0.05$.

Continued

Reger-Nash 2006 (nRCT [+] USA n= 4 communities, 8 weeks) [*10, 20 and then 30 minutes of daily moderately intense walking in led groups*]. 32% of insufficiently active persons in Wheeling reported meeting the criteria for regular walking immediately post campaign compared to an 18% increase in the comparator community (OR=2.12, 95%CI 1.41-2.24). An increase in reaching regular walking was observed for the most sedentary group in WV walks ($p<0.05$). The intervention community in Welch walks demonstrated a twofold (OR=2.0 95%CI 1.01-3.97) gain in weekly walking by at least 30 minutes versus the comparison community. 41% of the BC walks intervention community increased walking by 30 min/week compared to 30% in the control (OR=1.56 95% CI 1.07-2.28).

The evidence on community based walking group sessions to increase walking is only partially applicable to the UK as only one study was conducted in the UK. The differing environment in the US and Australia must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies

5.4.2. Walking sessions: Community interventions: independent walking

We found 10 studies focusing on interventions to increase independent walking in the community. The content of the interventions is summarised in table 10.

Table 10. Summary of content of community interventions to increase independent walking.

Independent walking interventions in the community	
CLES 2011	"Get Walking Keep Walking" Four year project to increase regular independent walking amongst previously inactive and insufficiently active people
Milton 2009	Furness Families Walk4Life" which is a 12 week multi component intervention designed to encourage regular independent walking close to home as part of everyday life.
Darker 2010	Motivational component had 3 stages: participants were shown 10 statements about what would make it easier for them to walk more, asked to complete a scale to show how confident they would be about walking in each situation, and discussed with facilitator and walking plan developed. Pedometers were worn.
Perry 2007	Individual-oriented motivational interviewing (MI) intervention. To assist the women in exploring their mixed feelings toward behaviour change, articulating the pros to change, and developing an action plan to increase
Steele 2007	Delivered as a face to face, internet mediated or internet only intervention. It was based on social cognitive theory and self management skills and consisted of Health eSteps: a variety of topics focusing on lifestyle physical activity, benefits and barriers, goal setting, self monitoring, self talk, self-reinforcement, time and stress management, relapse prevention, social support.
Murphy 2006	During week one, subjects completed a 25 minute walk on two days. During week two, subjects walked for 35 minutes on two days. From week three to week eight, all walkers completed two 45 minute walks per week. Those assigned to the walking group were given a training diary to record their walks and note the day, time of day and duration of the walk
Culos-Reed 2008	8 week "mall walking programme" where participants self selected the pace, time, and frequency of walking. They were encouraged to attend as often as possible between 8am and 10am Monday to Friday, provided with pedometers and checked in with research assistant prior to walking.
Mier 2011	Walking intervention facilitated by community health workers. The programme consisted of 12 weekly sessions and encouraged participants to accumulate at least 30 min of moderate intensity walking on most/all days of the week.

Wilbur 2003	Personal exercise prescription, instructions, and support from a nurse research team member.
Wilbur 2008	12 month intervention trial included: 24 week intensive adoption phase, 24 week maintenance phase. Workshops with 6-10 women lasted for 60 minutes and included benefits of walking, overcoming personal and environmental barriers to walking, anticipating and handling barriers. Each workshop included 10 min motivational video plus 50 minute discussion

<u>Whole community</u>

Two studies targeted the whole community.

CLES 2011 (nRCT++ UK n=7883) reported on "Get Walking Keep Walking" (GWKW) which is the Rambler's flagship everyday walking programme. It is a four year project to increase regular independent walking amongst previously inactive and insufficiently active people. GWKW comprises six projects – five local projects in Birmingham, East London, South London, Manchester, and Sheffield, and one project specifically to provide 'Get Walking packs' to inactive people across the rest of England. It is funded by the Big Lottery Fund and the Ramblers Holiday Charitable Trust with additional in kind funding. Each adult programme involves five sessions that incorporate bespoke, led walks developed specifically for the session. The sessions occur on Weeks 1, 2, 3, 4 and 12. Between Weeks 4 and 12 participants are encouraged to undertake independent walking and are given an independent walking pack, identical to the Get Walking pack. At Week 12, there is a closing session to celebrate participants' walking progress. At Week 4 or 12, there is also signposting to other walking opportunities to encourage people to carry on walking. In addition, there is at least one interim contact during the seven weeks of independent walking, either from GWKW staff or volunteers. By the end of March 2011, 7,953 people had been involved in GWKW through the local programmes. Taster events are also organised and run by local GWKW staff. These occur either when it is impractical to run a full programme, or to cater for people who would like to find out more before committing to the 12 week programme. The taster events involve a one-off led walk and are often tied into a specific event, such as a local fun day. In Birmingham, walks were run as part of the City's Arts Fest, and in Sheffield the GWKW team organise the Sheffield Walking Festival. In addition, GWKW delivers five and six week programmes for schools, which involve 5-6 weeks of continuous sessions designed to fit into the school timetable and link to the curriculum. The programmes also involve bespoke, led walks and sessions aimed at encouraging children and young people to walk. Also walking routes are developed and publicised, walking packs are distributed nationally, and online resources available. A control group survey was implemented to assist with exploring changing activity levels and walking in the wider population, and to assess the extent to which increases in physical activity and walking amongst beneficiaries can be attributed to participation in GWKW. By the end of 2010, GWKW staff and volunteers had delivered 1,740 led walks. Two thirds (67%) of beneficiaries increased the amount of exercise they did each week, one in five (18%) saw no change, and a slightly smaller proportion (16%) reported a decrease. A large majority (83%) of the most inactive group increased the number of days a week on which they undertook a minimum of 30 minutes exercise; only around one in eight (12%) saw no change; and a very small minority (4%) a decrease. For those categorised as 'insufficiently active' at registration (people not undertaking a minimum of 30 minutes exercise for 3-4 days a week) over half (56%) increased their rate of exercise, and around a fifth (22%) stayed the same. For beneficiaries who (at registration) were already meeting the government's recommendation on exercise (5 x 30 minutes), around one fifth (22%) increased this still further by participating in GWKW. In general, there was an increase in walking amongst beneficiaries between registration and follow up. In terms of walking from place to place, there was an increase of 1.1 days per week; and in terms of walking for leisure, the increase was 1 day per week. Programme beneficiaries saw a small change in the amount they walked from place to place each week (from 4.9 to 5.1 days a week); however, other beneficiaries experienced a greater change. After being involved in GWKW all beneficiaries walked more than the control group. GWKW has had a substantial impact on those who walked the least. Those classified as 'inactive' at registration increased the days on which they walked from place to place by 1.6, and the days they walked for leisure by 1.4 per week. Whilst there was an increase in the number of days on which beneficiaries walked from place to place of 1.1 days per week, it was greater for those living in the top 20% most deprived areas of England, at 1.4 days per week.

Milton 2009 (nRCT+ UK n=34) reported on "Furness Families Walk4Life" which is a 12 week multi component intervention designed to encourage regular independent walking close to home as part of everyday life not only health and leisure walks but every day trips to the shops, school or work. The project involves delivery of a number of intervention programmes consisting of several key components: four week period of led walks, resource pack, seven week period of independent walking, and a celebration event. Week one involved an informal workshop focused on the benefits of regular walking, as well as the barriers to walking and how to overcome them, which was followed by a short walk. Each programme involved three further weekly walks which started and finished at the same centre. Each walk took a different route and was designed to be safe and easy for children, while also incorporating places of interest. The 40 minute themed walks were entitled: walking is healthy, walking is fun, walking is green, walking for adventure, walking with friends and family, and walking safely. One 'Trail Tales' resource pack was provided to each child, and contained a log book and stickers for children to record the amount of walking they undertook and a set of story books tailored to match the needs and interests of the child(ren); ages 2-4, 4-7, 7-11. It was intended that families would continue to meet at the Centre and undertake group walks independently, without the leadership of the Project Officer. Phone calls were made to the families at week five and week seven. Ten programmes were run across five Action for Children Centres between May and August 2009. 119 people participated in the programme, which included 41 adults (including five Action for Children workers), 10 young people and 68 children. The control group didn't participate in the programme. Survey data were available for 34 adults who took part in the programme. Participants were typically female (9 males), aged between 16 and 44 years, and all were classified as White British. Participants collectively walked 220 times over the four week led walk period, with each individual participant generally attending one (n=52, 44%) or two (n=39, 33%) led walks. Four participants attended all four led walks, which included a family (one adult, two children) and one young person. One participant attended five led walks which was achieved by taking part in two programmes. 34 participants supplied data at both baseline and week 12; 21 in the intervention group and 13 in the control group. Responses to items from the Brookes Questionnaire and the IPAQ were used to calculate mean minutes of walking per week, and comparisons were made between reported walking levels at baseline and week 12. No consistent patterns of increased walking were found between groups but the amount of change (increase in self reported walking for purpose) was greater in the intervention group than the control group. The authors also observed a greater increase in the number of days reporting at least 30 minutes of physical activity in the intervention group than the control group. Neither of these increases are statistically significantly due of the small sample size within the study.

Adults

Three study targeted adults only.

Darker 2010 (RCT++ UK n=130) reported on a laboratory based behavioural change intervention aimed to alter perceived behavioural control (PBC) concerning walking and to develop plans to “enact intentions to walk” (using theory of planned behaviour). The motivational component had 3 stages: participants were shown 10 statements about what would make it easier for them to walk more, asked to complete a scale to show how confident they would be about walking in each situation, and discussed with facilitator and walking plan developed (including goal setting, action planning and coping planning). Follow up was undertaken at one week (t2), two weeks (t3) and one month (t4). The control group received the intervention at t2. Participants were aged 16-65 (mean age 40.60 (SD 10.84), and not walking more than 90 minutes/day. Most were female (70.8%). The intervention increased objectively (pedometer) measured walking from 20 to 32 minutes per day. At 6 weeks, participants maintained their increases in walking. There was a significant difference in number of minutes spent walking (pedometers) in the week up to t2 between the control group (M=138.7, SD=93.3) and the intervention group (M=22.5 SD=100.3). The increase in walking was from a mean of 19.8min to 32.2min per day (increase of over 60%). There was also a significant increase in number of minutes spent walking per week for intervention group t1-t4 (mean 287.3, SD=129.4) [t(46)=8.12, p<0.001). This was significant also for t1-t2, t1-t3 (mean 305.0, p<0.001) but not t2-t3. The control group demonstrated a significant increase in minutes spent walking t2-t3 (mean 293.7, p<0.001) and t2-t4 (mean 259.0, p<0.001) but a decrease t2-t4. Therefore the intervention resulted in a large increase in the number of minutes spent walking. Although the level was not maintained fully at t4 it was still significantly above baseline. Overall 39 of the 130 participants dropped out throughout the course of the study.

Murphy 2006 (RCT++ UK n=37) reported on a progressive, 8 week walking programme. Subjects were allowed to choose their own walking speed. During week one, subjects completed a 25 minute walk on two days. During week two, subjects walked for 35 minutes on two days. From week three to week eight, all walkers completed two 45 minute walks per week. All walking sessions were performed outdoors. Those assigned to the walking group were given a training diary to record their walks and note the day, time of day and duration of the walk. Subjects were also required to rate their perceived exertion during the walk on the Borg 15 grade scale. The control group received no training support. Participants were age aged 41.5 (± 9.3 years) and 24 were female. There was no significant difference in the week 0 step counts between groups (p>0.05). Walkers took significantly more steps on Walk-days compared to Rest-days (p<0.001). Walkers undertook more voluntary steps (steps per day not including any accrued from prescribed walking) on Rest-days (5803 ± 2749) than on Walk-days (4567 ± 2639) (p<0.05). During the intervention, mean step counts for the control group averaged 6470 ± 1709. There were significant differences in the change in systolic BP and body fat percentage between groups from pre- to post-intervention as identified by the group-by-time interaction (p<0.05). Systolic BP for the walking group decreased from 120.4 ± 19.7 mm Hg at baseline to 115.4 ± 17.7 mm Hg at post intervention. Body fat percentage of the walking group was 28.0 ± 5.8 and 27.9 ± 5.6 at pre and post-intervention respectively.

No significant changes were observed in body mass, waist and hip circumference, diastolic BP or lipid variables.

Steele 2007 (RCT++ Aus n=192) reported on the effectiveness of delivery modes for a behaviour change program targeting physical activity. The intervention was delivered as a face to face, internet mediated or internet only intervention. It was based on social cognitive theory and self management skills and consisted of Health eSteps: a variety of topics focusing on lifestyle physical activity, benefits and barriers, goal setting, self monitoring, self talk, self-reinforcement, time and stress management, relapse prevention, social support. The Face to Face arms consisted of 1 hour weekly groups based sessions on relevant behavioural and self management strategies. Participants received log book to record step counts and were encouraged to attend. The Internet-mediated arm consisted of access to an intervention website with weekly module, weekly emails. Participants also received two face to face sessions (weeks 5 and 9). An online log to record steps and email support was available. The internet only arm had access to the intervention website only and received no support. Participants were inactive adults who were White females (83%) age 38.7 (+/-12 yrs) with BMI 32.1 (+/-3.4). At 5 month follow up, there was no group x time interaction for physical activity ($F(6,567)=1.64$, $p>0.05$) and no main effect for group ($F(2.189)=1.58$, $p>0.05$). However a main effect for time ($F(3,567=75.7$, $p<0.01$) was observed for each group. Therefore the results provide support for internet delivery of physical activity interventions but show no difference between mediated an unmediated delivery. However, retention at 5 months varied from 80% in the Face to face group to 72% in the Internet mediated group which may have affected the power of the study.

<u>Retired adults</u>

One study focused specifically on retired adults.

Culos-Reed 2008 (BA+ Canada n=52) reported on an 8 week “mall walking programme” where participants self selected the pace, time, and frequency of walking. They were encouraged to attend as often as possible between 8am and 10am Monday to Friday, provided with pedometers and checked in with research assistant prior to walking. Participants were encouraged to increase their speed and distance over the 8 weeks. Participants had mean age 66.4 (46-83) and were mostly White (96.2%), female (80.8%) and retired (76.5%). The intervention resulted in significant improvement in physical activity behaviour and most fitness indices, but not quality of life. Leisure time questionnaire score increase from 20.6 (SD 10.8) to 28.1 (SD 11.9) ($p<0.005$), average daily mall walk steps increased from 5055 (SD 1374) to 5969 (SD 1543) ($p<0.002$), average daily mall walk time increased from 42.9 (SD 10.6) min to 50.4 (SD 13.5) min ($p<0.002$), BMI decreased from 29.1 (SD 4.6) to 28.5 (SD 4.4) ($p<0.001$), walk test distance increased from 549.9 (78.5)m to 612 (88.1)m ($p<0.001$), and post walk test rate of perceived exertion increased from 5.6 (2.0) to 6.7 (1.9) ($p<0.001$).

Women

Four studies targeted women.

Mier 2011 (BA+ USA n=16) reported on a home based, culturally sensitive, theoretically driven walking intervention facilitated by community health workers. The programme consisted of 12 weekly sessions and encouraged participants to accumulate at least 30 min of moderate intensity walking on most/all days of the week. Researchers and community workers developed a Spanish physical activities workbook. The women were aged over 18 (mean age 32.44 +/-9.7) and were Mexican Americans living in economically disadvantaged poorly urbanised areas on the border with Mexico. The majority were born in Mexico (93.8%), unemployed (56.3%), low education (56.3%), and obese (62.5%). After exposure to the programme, participants reported a significant increase in walking (915.8min/week, $p=0.002$) lower depression ($p=0.055$) and stress ($p=0.017$) scores. However, this study has a very small sample size, a lack of control group and relies upon self reported outcomes.

Perry 2007 (RCT++ USA n=46) reported on an individual-oriented motivational interviewing (MI) intervention. The main goal of the MI counselling was to assist the women in exploring their mixed feelings toward behaviour change, articulating the pros to change, and developing an action plan to increase Physical activity (PA). An advanced practice nurse (APN) conducted a private, in-person, 30-minute MI session at the beginning of the 12 weeks, followed by weekly, 10-minute MI booster session telephone calls. Additional strategies aimed at enhancing self-efficacy included women establishing individualized and realistic goals and monitoring their progress with heart rate monitors and logbooks. The main aspect of the group-based component was a 1 hour, weekly group walk using strategies to promote social support and self-efficacy. During the group walk, women walked together around a track for 30 minutes and were encouraged to walk with women who had similar walking paces. The APN moved back and forth across the track to provide encouragement and positive reinforcement to each woman during the walk. In addition, the APN led a weekly 15 to 20 minute discussion guided by the philosophy of MI before the start of the group walk at the track. In concert with MI, the women in the group, rather than the APN, identified salient topics to discuss and provided ideas on how to overcome challenges. They validated their experiences with each other regarding exercising in the past week and progress toward reaching their goals. The women put together a telephone contact list and were encouraged to telephone each other to discuss progress and provide support and reinforcement. Women also were encouraged to continue the weekly walks as the intervention came to an end. Women randomised to the comparison group received a brief 10 minute individual and private advice session and a monthly 5 minute reinforcement telephone call. In addition, they received an individualized exercise prescription following the American College of Sports Medicine guidelines and a logbook to record their walking. At 12 weeks, women in intervention group had a greater improvement in cardio-respiratory fitness (p=0.057) and in social support (p =0 .004) compared with women in the comparison group. Neither group of women experienced a change in exercise self-efficacy (p=0 .814). No direct measures of walking were reported.

Wilbur 2003 (nRCT+ USA n=153) reported on an intervention which consisted of a personal exercise prescription, instructions, and support from a nurse research team member. At the start of the intervention phase of the 24 week home-based walking program, all women were given an exercise prescription that was standard to mode (walking), frequency (four times per week), and duration (increasing within the first four weeks from 20 to 30 minutes of continuous walking). A research nurse met with each woman every two weeks to provide emotional support and reinforcement in the form of feedback on her progress, offer praise and encouragement. After completion of each pre-intervention and post-intervention data collection, each participant received $25 to compensate them for their time and travel. Participants were healthy, employed, aged between 45 and 65 years, and sedentary in their leisure time. 103 were White and 50 were African American. Adherence to frequency was 66.5% of the expected walks (range 6% to 104%). Adherence to both duration and intensity was greater than 90%, indicating that once the women walked, they walked at the appropriate duration and intensity. The women had moderately high self-efficacy for overcoming barriers to exercise (M=71.76 of a possible 100). There was no direct outcome for walking.

Wilbur 2008 (nRCT+ USA n=281) reported on a home based walking intervention enhanced by behavioural strategies. Orientation included tailored walking prescription, health information, problem solving and goal setting. Participants received heart rate monitors to wear during walking, log books for self monitoring, waist packs with programme logo, magnets imprinted with programme phone number, and discount coupons to buy walking shoes. A $50 incentive was given at each data collection. The Enhanced treatment (ET) group had four workshops followed by weekly tailored phone calls over 24 weeks. The 12 month intervention trial included: 24 week intensive adoption phase, 24 week maintenance phase. Workshops with 6-10 women lasted for 60 minutes and included benefits of walking, overcoming personal and environmental barriers to walking, anticipating and handling barriers. Each workshop included 10 min motivational video plus 50 minute discussion. This was followed by tailored phone calls weekly for 3 weeks (week 5 to 7), then every other week for 14 weeks and monthly during the maintenance phase.

The minimal treatment (MT) comparator received the same orientation. Participants were followed up at 24 and 48 weeks. The study population consisted of African American Women who were sedentary (reported no participation in regular moderate or vigorous exercise) and aged 40-65. Adherence was significantly higher in the ET than the MT group and was related to the number of workshops attended ($r=0.58$ $p<0.001$) and tailored calls ($r=0.25$ $p=0.004$) received (relationships not significant in the MT group). There was significant post intervention improvement in waist circumference and fitness in the ET group, however these were not significantly different between the groups. There was also no significant difference in walking intensity between the groups (data not given). Intention to treat analysis showed a significant increase in fitness ($p=0.024$), decrease in waist circumference ($p<0.001$), and no change in body mass index ($p=0.53$) in both treatments. There was a significant negative time effect on adherence. Overall walking adherence declined between 24 and 48 weeks. (from 67.2% to 42.7% $p<0.001$).

EVIDENCE STATEMENT 15A. POPULATION LEVEL CHANGE IN INTERVENTIONS TO INCREASE INDEPENDENT COMMUNITY BASED WALKING

No population change data was reported for these interventions. Individual level changes are reported in ES15B.

EVIDENCE STATEMENT 15B. INDIVIDUAL LEVEL CHANGE IN INTERVENTIONS TO INCREASE INDEPENDENT COMMUNITY BASED WALKING

Strong evidence from 10 studies suggests that interventions to increase independent community based walking may be effective in increasing individual walking for leisure or travel up to 12 weeks post intervention, but not in the longer term (to 48 weeks). Evidence from 4 RCT, 2 nRCT, and 2 BA studies show positive effects on walking up to 12 weeks in adults or the whole community, but mixed evidence from 2 nRCT and 1 RCT is unclear as to the effect on walking in women, and suggests there may not be a positive effect.

CLES 2011 (nRCT [++] UK n=7883, 12 weeks) *["Get walking, keep walking": Bespoke, led walks and sessions aimed at encouraging children and young people to walk*]. 67% of participants increased the amount of exercise they did each week. Walking from "place to place" increased by 1.1 day/week and walking for leisure by 1 day/week.

Culos-Reed 2008 (BA [+] Canada n=52, 8 weeks) ["*mall walking programme". Participants self selected the pace, time, and frequency of walking. Encouraged to attend as often as possible between 8am and 10am Monday to Friday*]. Average daily mall walk steps increased from 5055 (SD 1374) to 5969 (SD 1543): p<0.002, and average daily mall walk time increased from 42.9 (SD 10.6) min to 50.4 (SD 13.5) min: p<0.002.

Darker 2010 (RCT [++] UK n=130, 4 weeks) [*Motivational component had 3 stages: participants were shown 10 statements about what would make it easier for them to walk more, asked to complete a scale to show how confident they would be about walking in each situation, and discussed with facilitator and walking plan developed. Pedometers were worn*]. Significant difference in number of minutes spent walking to week 2 between the control group (M=138.7, SD=93.3) and the intervention group (M=22.5 SD=100.3), from a mean of 19.8min to 32.2min per day (increase of over 60%). Also a significant increase in number of minutes spent walking per week for intervention group week 1- week 4 (mean 287.3, SD=129.4) [t(46)=8.12, p<0.001).

Mier 2011 (BA [+] USA n=16, 12 weeks) [*Walking intervention facilitated by community health workers. Weekly sessions encouraged participants to accumulate at least 30 min of moderate intensity walking on most/all days of the week*.]. Exposure to the programme resulted in significant increase in walking: 915.8min/week, p=0.002.

Continued

Milton 2009 (nRCT [+] UK n=34, 12 weeks) [“*Furness Families Walk4Life” which is a 12 week multi component intervention designed to encourage regular independent walking close to home as part of everyday life*.]. Increase in self reported walking for purpose was greater in the intervention group than the control group (not significant, no data)
Murphy 2006 (RCT [++] UK n=37, 8 weeks) [*Week one, 25 minute walk on two days. Week two, walked for 35 minutes on two days. From week three to week eight, all walkers completed two 45 minute walks per week].* Walkers took significantly more steps on Walk-days compared to Rest-days: $p < 0.001$
Perry 2007 (RCT [++] USA n=46, 12 weeks) [*Individual-oriented motivational interviewing (MI) intervention. To assist the women in exploring their mixed feelings toward behaviour change, articulating the pros to change, and developing an action plan to increase*]. Women in intervention group had a greater improvement in cardio-respiratory fitness (p=0.057) and in social support (p =0 .004) compared with women in the comparison group.
Steele 2007 (RCT [++] Aus n=192, 12 weeks) [*Delivered as a face to face, internet mediated or internet only intervention. It was based on social cognitive theory and self management skills and consisted of Health eSteps: a variety of topics focusing on lifestyle physical activity, benefits and barriers, goal setting, self monitoring, self talk, self-reinforcement, time and stress management, relapse prevention, social support*]. There was no group x time interaction for physical activity (F(6,567)=1.64, p>0.05) and no main effect for group (F(2.189)=1.58, p>0.05). However a main effect for time (F(3,567=75.7, p<0.01) was observed for each group. Therefore the results provide support for internet delivery of physical activity interventions but show no difference between mediated an unmediated delivery.
Wilbur 2003 (nRCT [+] USA n=153, 24 weeks) [*Personal exercise prescription, instructions, and support from a nurse research team member*]. Adherence to both duration and intensity walking outcomes was greater than 90%, indicating that once the women walked, they walked at the appropriate duration and intensity (no further data).
Wilbur 2008 (nRCT [+] USA n=281, 48 weeks) [*24 week intensive adoption phase, 24 week maintenance phase. Workshops on benefits of walking, overcoming personal and environmental barriers to walking, anticipating and handling barriers*]. No difference in walking intensity between the groups (data not given), but a significant increase in fitness: p=0.024. Walking adherence declined between 24 and 48 weeks from 67.2% to 42.7% p<0.001.

The evidence on interventions to increase independent community based walking is partially applicable to the UK as four studies were conducted in the UK. The differing environment in the US, Australia and Canada must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

5.4.3. Walking sessions: School based interventions

Ten papers reported on 9 school based interventions to increase independent walking. The content of the interventions is summarised in table 11.

Table 11. Summary of content of school based walking session interventions.

School based walking interventions to increase walking	
Bickerstaff 20000 Carins 2006b	Three walking buses and additional interventions such as walk to school days and park away days, street lighting along walking bus routes.
Cairns 2006c	Walking buses (n=3), also walk to school days and park ways days, street lighting along walking bus routes.
Hawthorne 2011	Grand Canyon Trekkers (GCT); a 16 week school based lunchtime walking programme, 3 times per week in 10 elementary schools. A ¼ mile walking trail was marked out with large orange traffic cones and bright red paint and a parent orientation night offered.
Johnston 2006	Walking School Bus (WSB). The school implemented three routes staffed by parent volunteers, and were compared to two nearby schools without a WSB.
Kong 2010	Walking School Bus (WSB) run by a part time co-ordinator and parent volunteers. Participants walked a designated route with pick up and drop off points approved for safety by the police
Mendoza 2009	Walking School Bus (WSB) run by a part time co-ordinator and parent volunteers. The intervention included three routes which ranged from 0.3 to 1.5 miles and took 15-40 minutes. The WSB operated once or twice a week.
Schofield 2005	This intervention compared effectiveness of daily step counts with time based prescription for increasing the health related physical activity of low active adolescent girls and consisted of 12 weeks of a physical activity self monitoring and educative programme. The PED group set daily step targets, and the MIN group set daily time based activity goals.
TAPESTRY 2003	Interventions in school linked to national Walk to School Week. Included leaflets on benefits of walking, banners, stickers, certificates, and campaign website. Education packs are also provided. In addition classroom planners provide assistance with monitoring activity.
Zaccari 2003	Classroom activities and weekly newsletters during term 1. Involvement of local press and a school assembly on Walk to School. Police enforcement to prevent pavement parking.

Bickerstaff 20000 (BA [+] UK n=309, 14 months) reported on an intervention consisting of three walking buses and additional interventions such as walk to school days and park away days, street lighting along walking bus routes. Over 14 months walking increased from 60% to 68.3% in 14 months (no further statistics) and 25% of all walking was with walking buses. The intervention was also reported in **Carins 2006c.** The same data was reported here.

Cairns 2006b (BA [+] UK n= 585, 48 months) reported on Walk on Tuesday and Thursdays (WOTT) and Commitment to Walk which included incentive such as certificates, stickers and trophy incentives. Commitment to walk focused on continuing to walk in inclement weather. On WOTT days record cards were signed by parents to confirm walking. In March 1999 travel to school was reported as: car 36.5%, walk 53.3%, park and walk 9%, bus 1.4%.In March 2003 travel to school was reported as: car 26.6%, walk 58.7%, park and walk 14%. Only percentages reported and walking to school increased from 53.3% to 58.7%.

Hawthorne 2011 (BA+ USA n=1074, 16 weeks) reported on Grand Canyon Trekkers (GCT); a 16 week school based lunchtime walking programme, 3 times per week in 10 elementary schools. A ¼ mile walking trail was marked out with large orange traffic cones and bright red paint and a parent orientation night offered. The entire staff and student body encouraged to walk, not just study participants. Each child received index sized mileage cards marked off with stickers and additional incentives and prizes were provided. There was no comparator group. Of those who took part were 51% boys, 55% healthy weight, 19.2% overweight and 25.8% obese, and the ethnicity of only 54% is known (51,5% Latino, 39.4% White, 9.1% Other). No significant change in BMI or waist circumference ($p<0.05$). Cardio-respiratory fitness increased by 37.1% over baseline ($p<0.01$) (number values not given). There was no direct measure of the impact on walking rates outside the intervention.

Johnston 2006 (BA+ USA n=3 primary schools) reported on a Walking School Bus (WSB). The school implemented three routes staffed by parent volunteers, and were compared to two nearby schools without a WSB. The study population were 47% African American, 23% Asian, and 22% Latino. 93% were eligible for free school meals. The number of children who walked to school increased from baseline to follow up by 25% (no further data given). A decrease in children arriving by private vehicle was also documented (no data). There were also small improvements in observed street crossing safety.

Kong 2010 (BA+ USA n=28) also reported on a Walking School Bus (WSB) run by a part time co-ordinator and parent volunteers. Students were recruited through classroom presentations by a School-Based Health Centre physician to two walking school buses which ran sequentially from March to May 2006 for 10 weeks. Chaperones were parents or relatives of student participants. Participants walked a designated route with pick up and drop off points approved for safety by the police. Four health themes were emphasised during the walks: get up and play, turn off your TV, eat 5 fruit/veg per day, reduce soda/juice intake. Prizes e.g. jump ropes, pedometers, Frisbees and water bottles were distributed every other week. There was no comparator in this study. The study population were Kindergarten to 5th grade students residing within 1 mile of school. They were Hispanic (56% with Spanish first language), age 5-11, and 64% were female. BMI percentile remained stable among overweight and not overweight participants: 50.8 (SD 7.9) before vs. 49.3 (SD 8.1) after intervention, mean difference -1.4 (0.8) p=0.10. Physical activity increased from mean 4.3 days/week (SD 0.49) to 5.3 days/week (SD 0.43), mean difference 1.0 (0.55) p=0.08. In addition, fruit consumption nearly doubled from 0.83 (0.13) to 1.59 (0.24) servings per day, mean difference 0.76 (0.28) p=0.01. There was no further follow up subsequent to the intervention.

Mendoza 2009 (nRCT+ USA n=653) reported on a Walking School Bus (WSB) run by a part time co-ordinator and parent volunteers. The intervention included three routes which ranged from 0.3 to 1.5 miles and took 15-40 minutes. The WSB operated once or twice a week. The intervention was delivered in public elementary schools (1 intervention, 2 controls) in Seattle to ethnically diverse (no detail) students age 5-11. At baseline the proportion of students walking in the intervention (20% +/-2%) or control schools (15% +/-2%) did not differ (p=0.39). At 12 months, higher proportions of students (n=643 p<0.001) walked to the intervention (25% +/- 2%) verses the control schools (7% +/-1%). There were no difference in the proportion of students riding in a car or talking the bus at 12 months (all p<0.05). The authors comment that the result may underestimate the change in proportion of students who walked to school since they reflect days without scheduled WSB.

Schofield 2005 (Cluster RCT + NZ n=85) reported on the" Girls stepping out" programme. This intervention compared effectiveness of daily step counts with time based prescription for increasing the health related physical activity of low active adolescent girls and consisted of 12 weeks of a physical activity self monitoring and educative programme. The PED group set daily step targets, and the MIN group set daily time based activity goals. No information is given on the control condition CON. Participants completed a personal log book which included a 12 week log and information on how to be more active, overcoming barriers, injury prevention. The PED group were encouraged to increase daily activity by 1-2000 steps each week until they reached at least 10,000 steps per day. The MIN group were encouraged to increase their daily activity by 10-15 minutes to daily average of 30-60 min. The PED group had significant increase in steps between baseline and week 12 and between week 6 (p<0.001), and week 12 (p<0.001), but not baseline and week 6 (p=0.11). The MIN group had significant increase in steps between baseline and week 12 (p<0.01), and between week 6 and week 12 (p<0.001), but not baseline and week 6 (p=0.06). There were no significant differences between time points for CON (p=0.23 to 0.79). Therefore in this population daily step counts resulted in greater increases in accumulated physical activity than time base prescription.

TAPESTRY 2003 (nRCT [+] UK n=13 schools, 4 weeks) reported on an intervention "Targeting the environmentally aware". The TAPESTRY initiative is a three year EU sponsored project aiming to increase the knowledge and understanding of how effective communication programmes or campaigns can be developed to support and encourage sustainable travel behaviour. Interventions in school were linked to national Walk to School Week and included leaflets on benefits of walking, banners, stickers, certificates, and campaign website. Education packs were also provided and in addition classroom planners provided assistance with monitoring activity. The proportion of children walking to work at least once was not significantly different between intervention and control schools. Walking increased from 75% to 76% in interventions schools and decreased from 78% to 77% in control schools.

Zaccari 2003 (BA [+] Aus n=243, 12 months) reported on an intervention in which pupils were given a 4 week travel diary to complete. The intervention consisted of classroom activities and weekly newsletters during term 1 as well as the involvement of the local press and a school assembly on Walk to School. Police enforcement prevented pavement parking throughout the intervention. The percentage of car trips decreased by 3.4% and the percentage of walking trips increased by 3.4%. Journey to school comparisons between the 1st and 4th week indicated an overall increase of 6% in the number of children walking to school.

EVIDENCE STATEMENT 16A. POPULATION LEVEL CHANGE IN SCHOOL BASED WALKING SESSION INTERVENTIONS TO INCREASE WALKING

Moderate evidence from 10 studies (reported in 11 papers) suggests that school based walking session interventions may be effective in increasing levels of walking at the school population level for children up to 48 months post intervention. Evidence from 1 nRCT, 1 cluster RCT and 6 BA study showed positive effects on school population walking and a further BA studies showed positive (but non-significant) effects on physical activity (primarily walking). One nRCT showed no effect on walking (TAPESTRY 2003).

Bickerstaff 2000 (BA [+] UK n=309, 14 months) [*walking school buses supported by environmental interventions such as street lighting on walking routes*]. Participants walking increased from 60% to 68.3%, 25% of that was due to walking buses. Also reported in **Cairns 2006c** (BA [+])
Cairns 2006b (BA [+] UK n=585, 48 months) ["*Walk on Tuesday and Thursday WOTT, encouraged walking to school, included incentives*]. Walking to school increased from 53.3% to 58.7% (percentages only reported).
Hawthorne 2011 (BA [+] USA n=1074, 16 weeks) [*Grand Canyon Trekkers, lunchtime walking programme, 3 times per week in elementary schools*]. Cardio-respiratory fitness increased by 37.1% over baseline p<0.01 (number values not given). There was no direct measure of the impact on walking rates outside the intervention.
Johnston 2006 (BA [+] USA n=3 primary schools, follow up unclear) [*Walking School Bus (WSB). The school implemented three routes staffed by parent volunteers, and were compared to two nearby schools without a WSB*]. The number of children who walked to school increased from baseline to follow up by 25% (no further data given).
Kong 2010 (BA [+] USA n=28, 10 weeks) [*Walking School Bus (WSB) run by a part time co-ordinator and parent volunteers. Participants walked a designated route with pick up and drop off points approved for safety by the police*]. Physical activity increased from mean 4.3 days/week (SD 0.49) to 5.3 days/week (SD 0.43), mean difference 1.0 (0.55), p=0.08.
Mackett 2005 (BA [+] UK n=101, 18-30 months) [*Walking buses at 5 schools. Information sent home to parents to encourage participation*]. *Around 62% of those using the walking bus had previously travelled by car, but participation in the walking buses declined over time.*
Mendoza 2009 (nRCT [+] USA n=653, 12 months) [*Walking School Bus (WSB) run by a part time co-ordinator and parent volunteers. The intervention included three routes which ranged from 0.3 to 1.5 miles and took 15-40 minutes. The WSB operated once or twice a week.*]. Higher proportions of students walked to the intervention (25% +/- 2%) verses the control schools (7% +/-1%): p<0.001. Increase in intervention school from 20% (+/-2%) at baseline.
Schofield 2005 (Cluster RCT [+] NZ n=85, 12 weeks) [*physical activity self monitoring and educative programme. The PED group set daily step targets, and the MIN group set daily time based activity goals*]. Both intervention groups had significant increase in steps between baseline and week 12: p<0.001, no significant differences between time points for the control group: p=0.23.

Continued

TAPESTRY 2003 (nRCT [+] UK n=13 schools, 4 weeks) [*Interventions linked to national walk to school week*]. No difference between intervention and control schools in walking before or after the intervention.
Zaccari 2003 (BA [+] Aus n=243, 12 months) [Classroom activities *supported by a weekly newsletter to encourage walking to school*]. Percentage of walking trips increased by 3.4% and car trips decreased by 3.4%.

The evidence on school based walking sessions to increase walking is partially applicable to the UK as 4 studies were conducted in the UK. The differing environments US and New Zealand and Australia must be considered in reference to the studies conducted there. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

EVIDENCE STATEMENT 16B. INDIVIDUAL LEVEL CHANGE IN SCHOOL BASED WALKING SESSION INTERVENTIONS TO INCREASE WALKING

No individual change data was reported for these interventions. Population level changes are reported in ES16A.

5.4.4. Walking sessions: workplace interventions

Four studies reported on workplace interventions to increase independent walking. The content of the interventions is summarised in table 12.

Table 12. Summary of content of university based walking session interventions.

University based interventions to increase walking	
Coleman 2009	The three walking conditions were 30 continuous minutes, three 10-minute bouts, and 30 minutes in any combination of bouts as long as each bout was at least 5 minutes.
Eastep 2004	Two eight week walking for fitness classes
Gilson 2006	The two interventions were; Walking Routes which employed prescribed walks around campus with participants asked to complete at least 15min continuous brisk walking every day and Walking in Task which encouraged the accumulation of step counts through the working day.
Gilson 2009	Participants in the first intervention group were directed to achieve this through brisk, sustained, route-based walking during work breaks. The second intervention group was asked to engage in incidental walking and accumulate step counts during working tasks

Coleman 2009 (RCT++ USA n=32) reported on an intervention which consisted of three groups of brisk walking 6 days per week. The three walking conditions were 30 continuous minutes, three 10-minute bouts, and 30 minutes in any combination of bouts as long as each bout was at least 5 minutes. Participants were recruited from the University of Buffalo through university publications, mass mailings of recruitment flyers, and program posters. All participants were University at Buffalo employees aged 18 to 45 who were sedentary at baseline. Objective activity patterns were assessed at baseline, at the end of the 16-week program, and at the 32-week follow-up using the TriTrac accelerometer. Self-reported walking for all groups significantly increased throughout the program ($F(6, 186) = 26.16$; $p < 0.001$), with increases above 3 & 4 beginning in weeks 11 & 12 (average walking of 173 ± 46 minutes/week) continuing through weeks 13 & 14 (average walking of 170 ± 58 minutes/week) and weeks 15 & 16 (average walking of 158 ± 66 minutes/week) when compared to weeks 11 & 12. There were no group differences in self-reported walking of the program, nor was there a significant interaction of group with weeks of walking.

Eastep 2004 (RCT++ USA n=26) reported on an intervention consisting of two eight week walking for fitness classes. The RCT had a crossover design: group one wore pedometer for 3 weeks (feedback condition) then sealed disguised pedometer for 3 weeks (no feedback condition. This was reversed for group two. One class met at lunch time and another late afternoon (6pm) for 50min twice a week during one semester. The classes were delivered by a certified physical activity specialist. Classes were designed to provide a safe walking environment and educated safety and enjoyably. Information was provided on how to increase physical activity through walking. Participants were encouraged to walk outside the class. Group 1 (n=14) were 38.0 +/- 12 yrs old, and overweight (BMI= 24.7 +/- 5.0). Group 2 (n=12) were 40.5 +/- 13 yrs, and overweight (BMI= 27.5 +/- 3.8). All participants were students or employees at a large university. Neither group increased their walking time or number of steps significantly over time and interactions between groups were not significant at week 3 or 6. Group 1 attended 86% of the walking for fitness classes where as group 2 attended 74%.

Gilson 2006 (RCT++ UK n=61) reported on the effect of two walking interventions on the work day step counts and health of UK academic and administrative university employees. The two interventions were; Walking Routes which employed prescribed walks around campus with participants asked to complete at least 15min continuous brisk walking every day and Walking in Task which encouraged the accumulation of step counts through the working day. Rather than prescribed routes, the office, lectures and seminars were targeted as contexts where tasks were completed standing and walking rather than sitting. The comparator group maintained normal behaviour (no intervention). The study population consisted of 58 women age 42 +/-10 years, and 3 men age 40 +/-11 years. A significant intervention effect ($p<0.002$) was found for step counts with mean differences indicating a decrease in steps for the control group (-767 steps/day) and increases in walking routes (+926 steps/day) and walking in tasks (+997 steps/day); control vs. walking routes $p<0.008$, control vs. walking in tasks $p<0.005$. There were also small non significant changes in body fat, waist circumference and blood pressure (data not reported).

Gilson 2009 (RCT++ UK n=64) also reported on a similar intervention where intervention workday step counts and block stratification were used to randomly and equally assign participants at each site to a waiting list control or one of two intervention groups. Intervention participants were asked to increase their step counts. Controls were asked to maintain their usual behaviour. Participants in the first intervention group were directed to achieve this through brisk, sustained, route-based walking during work breaks. The second intervention group was asked to engage in incidental walking and accumulate step counts during working tasks – this strategy targeted walking and talking to colleagues, rather than sending emails or making telephone calls, and standing and walking in meetings, instead of sitting at desks. Importantly, participants in all groups were instructed not to engage in additional physical activities beyond those usually undertaken and – for route and incidental groups – the walking strategies encouraged in the workplace as part of intervention. Participants were asked to report additional activities or unusual workdays in their diaries. Participants were white-collar university staff from the UK (n=64; age=41.4 ± 10.4 years; 58 women), Australia (n=70; age=43.1 ± 10.8 years; 54 women) and Spain (n= 80; age 39.1 ± 9.7 years; 58 women). A significant interactive effect (F= 3.5; p<0.003) was found between group and timeline for step counts; follow-up simple effects analyses showed significant differences for routes (pre-intervention vs. week one: t=4.7; p <0.001) and incidental (pre-intervention vs. week one: t=2.1; p<0.038) groups. An overall comparison of pre- against intervention average step count data showed a non-significant decrease in the control group (-391 steps/day t= 1.76; p<0.08) and significant increases in both the routes (968 steps/day; t= 3.9; p<0.001) and the incidental (699 steps/day; t = 2.5; p<0.014) group. Data viewed across step count classifications, showed that the magnitude of step count change progressively increased relative to pre-intervention step count classifications. "Inactive" (<5000 daily steps) routes and incidental participants demonstrated the largest change in workday walking; comparisons with "highly active" [>12,500 daily steps] participants evidencing mean differences of 2,312 and 2,166 steps/day respectively.

EVIDENCE STATEMENT 17A. POPULATION LEVEL CHANGE IN WORKPLACE BASED INTERVENTIONS TO INCREASE INDEPENDENT WALKING

No population change data was reported for these interventions. Individual level changes are reported in ES17B.

EVIDENCE STATEMENT 17B. INDIVIDUAL LEVEL CHANGE IN WORKPLACE BASED INTERVENTIONS TO INCREASE INDEPENDENT WALKING

Strong evidence from 4 studies suggests that workplace walking session interventions (conducted in universities) may be effective in increasing individual levels of walking for staff and/or student participants up to 12 months post intervention. Evidence from 3 RCTs showed positive effects on walking. However, evidence from one further RCT study (Eastep 2004) showed no effect on walking.

Coleman 1999 (RCT [++] USA n=32, 32 weeks) [*The three walking conditions were 30 continuous minutes, three 10-minute bouts, and 30 minutes in any combination of bouts as long as each bout was at least 5 minutes*.]. Self-reported walking for all intervention groups significantly increased throughout the program: F(6, 186)= 26.16; p<0.001.
Gilson 2006 (RCT [++] UK n=61, 10 weeks) [*Walking Routes which employed prescribed walks around campus with participants asked to complete at least 15min continuous brisk walking every day and Walking in Task which encouraged the accumulation of step counts through the working day*]. Decrease in steps for the control group (-767 steps/day) and increases in intervention groups for walking routes (+926 steps/day) and walking in tasks (+997 steps/day). Control vs. walking routes p<0.008, control vs. walking in tasks p<0.005.
Gilson 2009 (RCT [++] UK n=64, 7 months) [*Participants in the first intervention group were directed to achieve this through brisk, sustained, route-based walking during work breaks. The second intervention group was asked to engage in incidental walking and accumulate step counts during working tasks*]. Average step count data decrease in the control group: -391 steps/day t=1.76; p <0.08, and significant increases in both the routes: 968 steps/day; t=3.9; p<0.001, and the incidental 699 steps/day; t=2.5; p<0.014 group.
Eastep 2004 (RCT [++] USA n=26, 6 weeks) [*Two eight week walking for fitness classes*]. Neither group increased walking time or number of steps significantly over time.

The evidence on workplace (university) based walking sessions to increase walking is partially applicable to the UK as two studies were conducted in the UK. The differing environments must be considered in reference to the studies conducted in the US. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

5.5 Pedometer interventions

We identified 18 papers reporting on interventions providing pedometers to encourage walking. Interventions (n=9) were delivered in a community setting, with the addition of 6 work place interventions and 3 delivered in a university setting. Authors generally did not distinguish between walking for travel or leisure, with the exception of Koizumi (2009). Twelve studies targeted adults including one study which specifically targeted retired adults; seven studies targeted women including one which targeted female college students; the final study targeted college students (male and female). The number of study participants ranged from 24 to 2600. The studies were conducted in the USA (n=6), Canada (n=3), Australia (n=4), Japan (n=2) and the UK (n=3). There were 8 RCT studies and one nRCT, 3 ITS and 5 BA . There was also one CS study.

5.5.1 Pedometer interventions: Community based studies

We identified 8 pedometer interventions delivered in the community. The content of the interventions is summarised in table 13.

Table 13. Summary of content of community based pedometer interventions.

Community based pedometer interventions	
Baker 2008a Baker 2011	The intervention consisted of a four week walking programme with goals set in steps using an open pedometer for feedback.
Baker 2008b	The sessions were based on the Transtheoretical Model of exercise behaviour change. Strategies used included enhancing motivation, overcoming barriers and developing appropriate walking plans. Followed a 12-week pedometer-based walking program.
Merom 2007	Self-help booklet, plus six weekly diaries printed on reply-paid postcards, and pedometer. Three incremental stages, starting with short walks (<15 minutes) three days a week, typically by incidental walking, gradually increasing the duration of walks to three to four days, then (continuously) walking briskly for 30 minutes.
Miyazaki 2011	Subjects were given a pedometer and instructed to walk at least 7,500 steps each day. They were also given additional monthly advice on healthy diet and lifestyle provided in a newsletter.

Ryder 2009	Lending pedometers to patrons of 5 public. The pedometers were loaned for maximum of 9 weeks. Education packages were handed out with pedometer including: info on pedometer use, physical activity/walking recommendations, maps of local trails, and a Walking Challenge Questionnaire.
Dinger 2005	Women who were designated as insufficiently active were given brochures and pedometers and were sent emails. Participants received a pedometer, 6 weeks of step log sheets, self addressed envelopes, and three commercial brochures describing strategies for increasing physical activity and the risks and benefits of physical activity.
Koizumi 2009	Feedback based on accelerometer daily physical activity, number of daily steps and time spent performing daily moderate physical activity (MPA) which was provided to each participant every two weeks. Participants were recommended to accumulate 9000 steps and 30 minutes of MPA per day
Moreau 2001	Given pedometer and initially, all women were prescribed a distance of 1.4 km/day above their baseline. Distance was then increased by 0.5 km/day until the desired walking distance was met. The women were instructed to walk at a self-selected, comfortable pace, and were allowed to accumulate their steps in whatever pattern best fit their lifestyle.
Pal 2009	Participants in the pedometer group were told to record their pedometer steps on a daily basis for 12 weeks; those in the control group were asked to wear a sealed pedometer for 12 weeks with weekly recording. The pedometer group was also encouraged to reach a daily step goal of 10,000 steps/day.

<u>Adults</u>

Five studies included adults.

Baker 2008a (RCT++ UK n=50) reported on a 52 week intervention with 7 male and 43 female participants, average age 40.16 (SD 8.81). The intervention and control participants wore sealed pedometers for one week to record baseline rate of walking. In addition, at 16 and 52 week follow up, all participants wore sealed pedometers for seven days. The intervention consisted of a four week walking programme with goals set in steps using an open pedometer for feedback. The walking goals were as follows: Week 1 goal 1,500 steps above baseline 3 days of week, increased to 5 days for week 2. Week 3 goal: 3,000 steps above baseline 3 days of week, increased to 5 days for week 4. Step counts were recorded at baseline, 1,2,3,4 weeks, 16 weeks and follow up at 52 weeks. The control group received and equivalent four week programme with goals set in minutes. Pedometers were sealed throughout the intervention so no feedback was provided. The control goals were as follows: Week one goal 15 minutes above baseline, increased to 5 days for week 2. Week 3 goal: 30 min above baseline 3 days of week, increased to 5 days for week 4. Both groups significantly increased step counts from baseline to week 4 with no significant difference between groups. Significantly greater number of participants in the intervention (77%) compared with the control (54%) achieved their week 4 goals (X^2= 4.752, p=0.03). There was no significant change in step counts from week 4 to 16 and a significant decrease from week 16 to 52. The authors suggest that additional support may be needed to sustain increases in walking. This intervention was also reported by **Baker 2011.** Here, PI increased walking from baseline to week four (3,006 steps/day, p < .001) but decreased between week four and 12 months (1,799 steps/day, p = .044). Neither MI nor C altered steps over time. There was no difference in steps between ES and NS at 12 months.

Baker 2008b (RCT++ UK n=63) reported on Walking for Well-being (WWW). All participants completed a baseline week wearing a pedometer, sealed with tape, for seven days with instructions not to alter their daily routine. Participants assigned to the intervention group received a physical activity consultation and then followed a 12-week pedometer-based walking program. The sessions were based on the Transtheoretical Model of exercise behaviour change. Strategies used included enhancing motivation, overcoming barriers and developing appropriate walking plans which were tailored to the individual. The sessions also included discussion of the three mediators of the TTM that have been shown to be important to behaviour change. These are self-efficacy (confidence in ability to change), decisional balance (pros and cons of change) and processes of change (strategies and techniques used to change, e.g., social support). The first six weeks consisted of graduated bi-monthly goals with an aim for the increased walking behaviour to be maintained for the remaining six weeks. The overall goal of the walking program was for participants to increase their mean daily step-count by 3,000 accumulated steps above their baseline value on five days of the week. Participants assigned to the control group were asked to maintain their normal walking levels between baseline and week 12. Control participants wore a sealed pedometer during week 12 to gain a record of their step-counts. The study population included 63 women and 16 men (49.2 years ± 8.8) from a West of Scotland University who were independently ambulatory, English speaking and between the ages of 18–65 years. A significant interaction was identified between group (intervention, control) and time (baseline, week 12) in terms of the recorded step-counts, ($F(1,77)=25.18$, $p<0.001$, partial η2 0.25). A paired t-test found a significant increase in steps/day for the intervention group between baseline (M= 6802, SD 3212) and week 12 (M=9977, SD 4669, t(38)= -6.06, p<0.001, d=0.79, 95%CI 2,115– 4236). No significant difference was observed in the control group between baseline (M 6924, SD 3201) and week 12 (M 7078, SD 2911, t(39) -0.50, p= 0.618, 95%CI -463–770). The mean difference in change between the two groups was 3,022 steps/day and was statistically significant (t(77) 5.02, p<0.001, d=1.96). X^2 analysis determined that a significantly greater percentage ($X^2=24.88$, $p<0.001$) of participants in the intervention group (25/39, 64%) achieved an increase of 15,000 steps per week, equivalent to physical activity guidelines of the accumulation of 150 minutes of moderate physical activity, compared with the control group (4/40, 10%). At week 12 the intervention group recalled a significant increase in the number of leisure minutes walked (Z= 2.32, p=0.02, r=0.37, median [Mdn] difference 100 minutes per week) and a significant decrease in weekday sitting (Z=2.94, p=0.003, r= 0.47, Mdn difference = 1200 minutes per week), weekend sitting (Z=3.41, p 0.001, r =0.55, Mdn difference 360 minutes per week) and total sitting (Z = 3.38, p = 0.001, r = 0.54, Mdn difference = 1680 minutes per week) from baseline. At week 12 the control group recalled a significantly greater number of vigorous leisure minutes of physical activity (Z= 2.02, p=0.043, r= 0.32, Mdn difference 0 minutes) than at baseline. This result was due to five individuals in the control group increasing their vigorous leisure minutes recalled. As the majority of participants (34 of 40) report zero minutes at both time points the median difference equals zero despite the group reporting a significant increase. Mann Whitney U tests revealed that at week 12 the intervention group recalled a significantly greater number of leisure minutes walked (U=513.00, p=0.008, r=0.30, Mdn difference 83.8 minutes), number of occupational minutes walked (U=602.00, p=0.045, r=0.23, Mdn difference 0 minutes) and total number of minutes walked (U=560.50, p=0.03, r=0.24, Mdn difference 57.5 minutes) than the control group. The intervention group also recalled significantly less total time spent sitting (U=546.00, p=0.022, r=0.26, Mdn difference -420 minutes) due to significantly less time spent sitting at the weekend (U=474.50, p=0.003, r=0.34, Mdn difference -240 minutes). Fifteen participants withdrew from the study by week 12 which may have had an impact on the power of the study.

Merom 2007 (RCT++ Aus n=369) reported on a 43 month intervention which consisted of a self-help booklet, plus six weekly diaries printed on reply-paid postcards, which, along with a pedometer was mailed to participants in the Walking Program with Pedometer group. The study population were inactive adults aged 30 to 65 years. The intervention program consisted of three incremental stages, starting with short walks (<15 minutes) three days a week, typically by incidental walking, gradually increasing the duration of walks to three to four days, then (continuously) walking briskly for 30 minutes, typically for exercise to improve fitness, on most days each week. The comparator group received the same intervention but without a pedometer. There was also a control group who received no intervention. The study population consisted of inactive adults aged 30 to 65 years, living in urban or rural regions of New South Wales, Australia, who were English proficient and with no physical limitations. For the last week of the intervention, all purpose walking minutes, the change was twice as great in the intervention group (30 minutes) as in the comparison group and control groups. For the previous three month leisure time walking session, mean changes in intervention and comparison groups were significantly greater than in the control group; control 1.2 sessions/week (0.6-1.8) t=3.97 (p<0.001); comparisons 1.3 sessions/week (0.5-2.0) t=3.32 (p<0.001); intervention 2.3 sessions/week (1.6-3.1) t=6.30 (p<0.001), X^2=7.41 (p<0.021). Intention to treat analysis indicated significant within group increases in all purpose walking and leisure time walking, but mean and median session and minutes were greatest in the pedometer group. The pedometer group also significantly increased participation in other sports and were more likely to meet physical activity recommendations by leisure time physical activity (OR=2.40, 95%CI 1.17-4.93), all purpose walking (OR=1.75, 95%CI 0.92-3.34) and all physical activity (OR=1.59, 95%CI 0.92-2.79) in the last week.

Miyazaki 2011 (BA+ Japan n=56) reported on a 4 month intervention where subjects were given a pedometer and instructed to walk at least 7,500 steps each day. They were also given additional monthly advice on healthy diet and lifestyle provided in a newsletter. The researches met the subjects at pre and post test only. Participants were aged 65 or over (mean age 71.32 +/-3.67) with an average BMI of 24 (+/-8.8). After the intervention mean body mass and waist circumference decreased slightly from 59.11kg to 57.37kg ($p<0.05$) and from 87.6cm to 85.71cm $p<0.01$) and mean steps per day increased significantly from 9389 to 11846 ($p<0.01$). Among those whose steps increased by more than 1000, HDL-c increased significantly ($p<0.05$). Increased number of steps was correlated with increased HDL-c (r=0.2751) and was calculated at 0.7mg/dl for every 1000 extra steps ($p<0.05$).

Ryder 2009 (CS- Canada n=41) reported on an intervention which consisted of lending pedometers to patrons of 5 public libraries to increase walking; 90 pedometers made available for 6 months. The pedometers were loaned for maximum of 9 weeks. Education packages were handed out with pedometer including: info on pedometer use, physical activity/walking recommendations, maps of local trails, and a Walking Challenge Questionnaire. The self selected participants were 33 women and 8 men age 18-65. In 6 months more than 330 pedometer loans were made. The authors found significant association between change in walking and motivation to walk more (X^2=8.73 $p<0.05$), change in walking and goal setting (X^2=9.39, $p<0.05$) and motivation to walk more and goal setting (X^2=12.54, $p<0.001$). The majority of borrowers reported wearing the pedometer on a daily basis (79.5%). Of 38 respondents who reported their walking status, 39.5% indicated they walked more since borrowing the pedometer and 60.5% reported walking about the same. None reported walking less. 92.1% indicated that the pedometer acted as a motivational tool and 78.9% indicated that the pedometer succeeded in motivating them to set a walking goal. In is important to note that those maintaining walking levels may have had satisfactory levels at baseline and the study did not take baseline measurements.

Women

Four studies included women only.

Dinger 2005 (BA+ USA n=43) reported on a 6 week minimum contact intervention on walking behaviour. Women who were designated as insufficiently active were given brochures and pedometers and were sent emails that contained messages designed to positively affect trans theoretical behavioural change constructs. At the end of the orientation session participants received a pedometer, 6 weeks of step log sheets, self addressed envelopes, and three commercial brochures describing strategies for increasing physical activity and the risks and benefits of physical activity. They were told to use the first week of the study to assess their normal number of steps and afterward to set weekly goals to increase steps based on past performance. The women were; 88.9% White, 69.4% college educated, 33.3% overweight, 44.4% obese and age 27-52 (41.7 +/-6.8) There was no control group. Participants significantly increased their total walking minutes from baseline (median 55) to post intervention (median 245, Z=4.03, p=0.001). The calculated effect size (d) was 0.82. Participants significantly increase the number of minutes they spent walking whilst at work (Z=2.79, p=0.005, d=0.63), for transport (Z=2.86, p=0.004, d=0.60) and during leisure time (Z=3.54, p=0.001, d=0.81). In addition, participants significantly increased their use of counter conditioning, dramatic relief, reinforcement management, self-liberation, stimulus control and social liberation (p<0.05).

Koizumi 2009 (RCT++ Japan n=68) reported on a lifestyle physical activity intervention; “LIFE” which consisted of feedback based on accelerometer daily physical activity, number of daily steps and time spent performing daily moderate physical activity (MPA) which was provided to each participant every two weeks. Participants were recommended to accumulate 9000 steps and 30 minutes of MPA per day. During the 12 weeks, the only contact made with the participants was when they attended the local community centre to download their accelerometer data. The control group received no feedback and wore a locked pedometer. Participants were women (age 60-78 years). Significant group interactions were observed for steps (f=10.53, p<0.01), MPA (f=11.76, p<0.01), and cardio-respiratory endurance (f=9,28, p<0.01). The intervention group increased their steps by 16% (7811 +/-3268 to 9046 +/-2620 steps), and MPA by 53% (17.83 +/-13.3 to 27.23 +/-14.71 min). There were no significant changes in the control group. The intervention group also increased their average distance walked by 10% compared to 3% in the control group (significance level not given).

Moreau 2001 (RCT++ USA n=24) reported on an intervention where subjects were given a pedometer to wear throughout the day for a 1 to 2 week period before beginning a 24 week walking program in order to document pre-intervention daily lifestyle walking activity. Women in this group were provided with a target number of steps that would lead to a 3 km increase daily. The target steps were added onto their baseline step value in order to prevent a decline in their current daily lifestyle activity. Initially, all women were prescribed a distance of 1.4 km/day above their baseline walking during week 1. The distance was then increased by 0.5 km/day until the desired walking distance was achieved by the third week. The women were instructed to walk at a self-selected, comfortable pace, and were allowed to accumulate their steps in whatever pattern best fit their lifestyle. Other than walking, subjects were asked not to make any changes in their current lifestyle activities. Women in the control group were asked not to change daily activity and subsequently wore a pedometer 1 week each month to document their walking. Testing procedures were performed at baseline, 12 week, and 24 week. The participants were postmenopausal women (mean age 54 ± 1 year) with borderline to stage 1 hypertension. Women in the intervention group increased their daily walking by 4300 steps (2.9 ± 0.2 km/day); which was significantly different from baseline and from the control group, (p<0.05), and averaged a total of 9700 ± 400 steps/day (including baseline steps) across the 24 week walking program (significantly different from the control group). The women in the control group did not significantly change their walking activity over 24 wk (-0.3 ± 0.3 km/day). Body mass was reduced by 0.9 ± 0.3 kg after 12 wk (p<0.05) and was reduced by an additional 0.3 kg at 24 weeks of walking in the intervention group (p<0.005), but remained constant in the control group.

Pal 2009 (RCT++ Aus n=26) reported on an intervention in which overweight and obese middle-aged women were randomised into two groups. Participants in the pedometer group were told to record their pedometer steps on a daily basis for 12 weeks; those in the control group were asked to wear a sealed pedometer for 12 weeks with weekly recording. At baseline, both groups were given the National Australian Physical Activity Guidelines. The pedometer group was also encouraged to reach a daily step goal of 10,000 steps/day. No step goals were set for the control group. At baseline, participants from both groups were encouraged to initially set small achievable goals like 10 minute walks and then to gradually increase the goal each week to at least 30 min/day. The pedometer group significantly increased their steps/day by 36% at the end of the 12 weeks, whereas the control group's physical activity levels remained unchanged. There were no significant difference in the number of steps at baseline between the two groups. However, there was a significant increase in the number of steps with the pedometer group versus the control group at 6 and 12 weeks intervention (p = 0.04 and p = 0.03, respectively). At 12 weeks, the pedometer group had a 32% higher number of steps/day than the control group. The control group remained unchanged in the number of steps during the 12-week intervention. For the pedometer group, the daily average number of steps at weeks six (8321 ± 884 steps per day) and twelve (9703 ± 921 steps per day) were significantly higher than the baseline daily average of 6242 ± 541 steps per day (p=0.046 and p=0.035, respectively). At week twelve, the pedometer group was taking an average of 3461 steps per day more (36% increase) than at baseline. There was no significant differences within groups or between groups in waist, BMI, waist/hip ratio, or % body fat at 12 weeks.

EVIDENCE STATEMENT 18A: POPULATION LEVEL CHANGE IN COMMUNITY BASED PEDOMETER INTERVENTIONS TO INCREASE WALKING

No population change data was reported for these interventions. Individual level changes are reported in ES18B.

EVIDENCE STATEMENT 18B: INDIVIDUAL LEVEL CHANGE IN COMMUNITY BASED PEDOMETER INTERVENTIONS TO INCREASE WALKING

Strong evidence from 9 studies (reported in 10 papers) suggests that pedometer based interventions delivered in the community are effective in adults (or women only) to increase individual levels of walking for leisure or travel, up to 6 months post intervention. Evidence from 3 RCT and 1 BA study shows positive effects on walking for leisure and/or travel in adults. This is supported by data from a CS study. Evidence from 3 RCT and 1 BA study shows substantial positive effects on walking for leisure and/or travel in women.

Baker 2008a (RCT [++] UK n=50, 52 weeks) [*walking programme with goals set in steps using an open pedometer for feedback*]. Both groups significantly increased step counts from baseline to week 4. Significantly greater number of participants in the intervention (77%) compared with the control (54%) achieved their week 4 goals (X2= 4.752, p=0.03). There was no significant change in step counts from week 4 to 16 and a significant decrease from week 16 to 52.
The intervention was also reported by **Baker 2011** (RCT [++] UK n=61. 52 weeks) [*walking programme with goals set in minutes, or steps or using a pedometer*]. Pedometer group increased walking at 4 weeks (p<0.001), but decreased between 4 weeks and 12 months. No change in minutes or control groups.
Baker 2008b (RCT [++] UK n=63, 12 weeks) [*The sessions were based on the Transtheoretical Model of exercise behaviour change. Strategies used included enhancing motivation, overcoming barriers and developing appropriate walking plans. Followed a 12-week pedometer-based walking program*]. Significant increase in steps/day for the intervention group between baseline (M=6802, SD=3212) and week 12 (M=9977, SD=4669, t(38)=-6.06, p<0.001, d=0.79, CI 2,115–4236). No significant difference was observed in the control group (t(39)= -0.50, p=0.618, CI -463–770).
Dinger 2005 (BA [+] USA n=43, 6 weeks) [*Women who were designated as insufficiently active were given brochures and pedometers and were sent emails. Participants received a pedometer, 6 weeks of step log sheets, self addressed envelopes, and three commercial brochures describing strategies for increasing physical activity and the risks and benefits of physical activity*]. Participants significantly increased their total walking minutes from baseline (median 55) to post intervention (median 245): Z=4.03, p=0.001; including walking whilst at work (Z=2.79, p=0.005, d=0.63), for transport (Z=2.86, p=0.004, d=0.60) and during leisure time (Z=3.54, p=0.001, d=0.81).
Koizumi 2009 (RCT [++] Japan n=68, not reported) [*Feedback based on accelerometer daily physical activity, number of daily steps and time spent performing daily moderate physical activity (MPA) which was provided to each participant every two weeks. Participants were recommended to accumulate 9000 steps and 30 minutes of MPA per day*]. Significant group interaction was observed for steps: f=10.53, p<0.01. The intervention group increased their steps by 16% (7811 +/-3268 to 9046 +/-2620 steps). There was no significant change in the control group.

Continued

Merom 2007 (RCT [++] Aus n=369, 3 months) [*Self-help booklet, plus six weekly diaries printed on reply-paid postcards, and pedometer. Three incremental stages, starting with short walks (<15 minutes) three days a week, typically by incidental walking, gradually increasing the duration of walks to three to four days, then (continuously) walking briskly for 30 minutes*]. Mean changes in total sessions walking/week significantly greater in intervention and comparison than control group: control 1.2 sessions/week (0.6-1.8), t=3.97, $p<0.001$. Comparisons 1.3 sessions/week (0.5-2.0), t=3.32, $p<0.001$. Intervention 2.3 sessions/week (1.6-3.1), t=6.30, (<0.001. $X^2 = 7.41$; $p<0.021$.
Miyazaki 2011 (BA [+] Japan n=56, 4 months) [*Subjects were given a pedometer and instructed to walk at least 7,500 steps each day. They were also given additional monthly advice on healthy diet and lifestyle provided in a newsletter*]. Mean steps per day increased significantly from 9389 to 11846: $p<0.01$.
Moreau 2001 (RCT [++] USA n=24, 24 weeks) [*Given pedometer and initially, all women were prescribed a distance of 1.4 km/day above their baseline. Distance was then increased by 0.5 km/day until the desired walking distance was met*]. Intervention group increased their daily walking by 4300 steps (2.9 ± 0.2 km/day); significantly different from baseline and from the control group: both $p<0.05$.
Pal 2009 (RCT [++] Aus n=26, 12 weeks) [*Participants in the pedometer group were told to record their pedometer steps on a daily basis for 12 weeks; those in the control group were asked to wear a sealed pedometer for 12 weeks with weekly recording. The pedometer group was also encouraged to reach a daily step goal of 10,000 steps/day*]. Pedometer group daily average number of steps at weeks 6 (8321 ± 884 steps/day) and 12 (9703 ± 921 steps/day) were significantly higher than the baseline daily average of 6242 ± 541 steps/day: $p=0.046$ and $p=0.035$, respectively.
Ryder 2009 (CS [-] Canada n=41, 6 months) [*Lending pedometers to patrons of 5 public. The pedometers were loaned for maximum of 9 weeks. Education packages were handed out with pedometer including: info on pedometer use, physical activity/walking recommendations, maps of local trails, and a Walking Challenge Questionnaire*]. 39.5% indicated they walked more since borrowing the pedometer and 60.5% reported walking about the same.

The evidence on community pedometer interventions to increase walking is only partially applicable to the UK. Only one study were conducted in the UK, with the majority in the US, Australian, Canada, and Japan The differing environments must be considered in reference to the studies, particular for those conducted in Japan. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

5.5.2 Pedometer interventions: Workplace studies

We identified 9 pedometer interventions conducted in workplaces. A summary of the content of these interventions is given in table 14.

Table 14. Summary of content of workplace pedometer interventions.

Workplace pedometer interventions	
Borg 2010	Staff define as inactive received three month walking programme and pedometer plus four maintenance newsletters over nine months to assist them to maintain their new activity levels. Control received pedometer and programme but no maintenance.
Behrens 2007	Competition based employer sponsored physical activity programme using pedometers. Employees formed groups of 10 to undertake the challenge of attaining 10,000 steps per day.
Chan 2004	Adoption phase: participants met in workplace-based groups with a facilitator for 30–60 minutes each week during a lunch break. Set individual steps per day goals and self-monitored their progress using a pedometer to record daily accumulated steps taken. Then adherence measured for 8 weeks.
Dinger 2007	The intervention group received a pedometer and step logs. Set a daily step goal based on the previous week's step counts. They received weekly email reminders to wear the pedometer and return that week's log. Also received three commercial brochures.
Faghri 2008	Each day participants put on pedometers upon arriving at work, prior to getting out of their cars. To increase motivation, participants were encouraged to develop teams, and each team chose a team leader. Weekly motivational emails were sent to participants.
Jackson 2008	Participants wore a pedometer 5 days per week for 12 weeks and completed questionnaires assessing demographic information. After baseline they were given suggested number of steps to meet recommendations, instructions for goal setting and other behaviour change strategies to gradually increase number of daily steps.
Tully 2007	Given a pedometer and a diary and asked to record the number of steps taken, duration of walk, level of breathlessness, and any comments or difficulties. One group 3 days a week and other group 5 days a week.
Spence 2009	Intervention group pedometer was worn for one week for all waking hours to encourage walking. Control (non-pedometer) participants were informed they could wear a pedometer the following week.

Borg 2010 (nRCT+ Aus n=322) reported on “Step by Step“ a self help walking programme plus pedometer. Staff define as inactive received three month walking programme and pedometer plus four maintenance newsletters over nine months to assist them to maintain their new activity levels at 4,5,9 and 11 months (standard + maintenance). All participants received a diary cards for recording weekly activity (including baseline). The comparator condition was a three month walking programme and pedometer (standard). Participants were aged 18 and above (23-39: 26%, 40-59: 37%, 50+: 37%) 88% female, with BMI: normal 33%, overweight 34% or obese: 33%. Both groups significantly increased minutes walking (p=0.01), but there were no between group differences in walking minutes (Wilcoxon=0.23, p=0.82). Change in moderate-vigorous physical activity minutes was significantly higher in the standard + maintenance group compared with the standard group (118min vs. 69min p=0.029) but there were no significant difference between groups for total observed physical activity (116min vs. 117min p=0.187). Wearing the pedometer at 12 month follow up and considering the pedometer to be very useful increased the likelihood of meeting public health recommendations (2.7 (95%CI 1.2-6.3) and 2.5 (95%CI 1.5-5.6) adjusting for other co-variances. The standard programme resulted in long term increases in physical activity but the maintenance strategy had no significant additional benefit (ITT and completer analysis). The loss of 127 participants throughout the course of the study reduced its statistical power.

Behrens 2007 (ITS+ USA n=2600) reported on a competition based employer sponsored physical activity programme using pedometers which had the 12 week goal of attaining 10,000 steps per day. Updates on progress of all teams were given weekly. Employees formed groups of 10 to undertake the challenge. There were significant difference in team steps by week of programme, with post hoc comparisons indicating significant differences from baseline step counts during weeks 6-8 (F=71.15, p<0.001) but not at the end of the programme. The overall programme did not result in significant increases in steps (week 1 to week 12). Variation in number of steps in weeks 11 and 12 was high due to drop outs. The authors suggest that from week 8, participants who felt they couldn't win became bored with the unchanging routine of the programme or simply dropped out.

Chan 2004 (ITS+ Canada n=106) reported on an intervention which consisted of two phases, an ''adoption'' phase of 4 weeks and an ''adherence'' phase of 8 weeks. During the adoption phase, participants met in workplace-based groups with a facilitator for 30–60 minutes each week during a lunch break. In three work sites, the facilitators were hired specifically for the program and were registered nurses. In 2 work sites, the facilitators were coordinators of workplace ''wellness'' programs. All received 6 hours of training on group facilitation and curriculum. Briefly, the role of the facilitators was to lead the participants through a curriculum in which the program objectives were explained and cognitive, psychomotor, and affective learning tasks were presented (e.g. knowing the benefits of becoming more active, learning to initiate behaviours to achieve new activity goals, learning strategies for overcoming relapse). Each week of the adoption phase, participants set individual steps per day goals and self-monitored their progress using a pedometer to record daily accumulated steps taken. Participants wore their pedometers during waking hours and recorded the daily totals on a personal calendar and/or on an Internet Web site designed specifically for the program, the participants, assisted by the facilitator, reflected on their progress and applied what they had learned during the week to aid in setting new goals. During the adherence phase (weeks 5–12), participants continued to self-monitor their progress and reset goals as necessary. The facilitator had limited and informal contact during the adherence phase, mainly via electronic mail and primarily to communicate assessment schedules. Participant's average age was 43 ± 9 years and the average BMI was 29.5 ± 6.2 kg/m2. At baseline, the steps per day for women (n=92) were 6,981 ± 3,140 and for men (n=14) were 7,661 ± 2,474 ($p>0.05$). There was a negative correlation between the increase in steps per day and baseline steps per day ($r= -0.368$, $p<0.001$). A small number of participants (n=7) recorded decreases in activity relative to their baseline steps per day, ranging from -2.4% to -20.6% (12.0% ± 7.6%). The baseline steps per day of the individuals becoming less active were 11,389 ± 4,570 and the initial BMI was 29.5 ± 7.2 kg/m^2. To determine if baseline BMI affected the ability of participants to increase their physical activity, the change in steps per day was correlated with baseline BMI. No significant correlation was found (p=0.4850). The programme suffered from high drop out with 25% of participants not providing data at 8 weeks.

Dinger 2007 (BA+ Aus n=NR) reported on a 6 week intervention delivered to women in university community (staff and students). The intervention group received a pedometer and step logs. They were instructed on pedometer placement and told to wear it during all waking hours (except when in water) for the next 6 weeks. They were to record daily steps nightly on the log and to reset the pedometer each morning. Beginning the second week, they were to set a daily step goal based on the previous week's step counts and to record the new goal on the log. They received weekly email reminders to wear the pedometer and return that week's log in a self-addressed stamped envelope provided. This group also received three commercial brochures at the pre-intervention assessment, and their weekly emails contained trans theoretical model based strategies. The comparator group also received a pedometer and step logs and were instructed on pedometer placement and told to wear it during all waking hours (except when in water) for the next 6 weeks, they did not receive any other intervention. participants were aged 25 to 54 years, participating in less than 150 minutes/week of moderate intensity physical activities and less than 60 minutes/week of vigorous physical activities. The two groups did not differ on any outcome variable post-intervention (p<0.05), indicating that the additional intervention components did not impact the outcomes. Consequently, the groups were combined to test whether an email-delivered, pedometer based intervention can increase scores on outcomes pre- to post-intervention. Comparator and intervention participants together increased their weekly walking minutes (p=0.002) and moved forward at least one stage (p<0.001). Pre-intervention, 1.8% of participants were pre-contemplators; 94.6% were contemplators; and 3.6% were preparers. In addition, 53.6% moved forward at least one stage, 5.4% regressed one stage, and 41.1% maintained their stage. All other transtheoretical model variables also changed (p<0.001) except self-efficacy (p=0.25). These results were supported by also finding that daily steps increased significantly from 6419 ± 2386 during week 1 to 7984 ± 2742 during week 6 ($p<0.001$) for both groups combined and increases did not differ between groups.

Faghri 2008 (ITS+ USA n=206) reported on a pedometer based walking program which lasted for 10 weeks. Participants were allowed to choose their own walking speed and increase their speed and time walked based on level of comfort. Each day participants put on pedometers upon arriving at work, prior to getting out of their cars. Almost all of the participants drove to work or used public transportation. They then recorded the number of steps taken and minutes walked before they left work each day on individualized walking logs distributed to each participant before the study. To increase motivation, participants were encouraged to develop teams, and each team chose a team leader. The team leader was responsible for collecting the walking logs and delivering the logs to the investigators on a weekly basis. Weekly motivational emails were sent to participants and were posted on the website encouraging them to continue their walking as well as instructing them on how to set goals and overcome barriers. Participants were recruited from employees of two large state agencies with 1100 employees, where most jobs were sedentary, 50% were age over 45, 80% were female, 59% were white and the majority was overweight with BMI of 27.3 ± 0.47 (Mean ± SD). Analysis of weekly logs showed that there was a significant increase in the number of steps per week for weeks 2, 3, 4, 5, 6 and 8 in comparison to baseline ($p=0.001$ for weeks 2, 3, 4, 6 and 8; $p=0.029$ for week 5). There was a significant drop in the number of steps taken in week 7 compared to the other weeks, perhaps due to the Thanksgiving holiday. The group reached a plateau in week 8; however, 10% of the participants did not reach a plateau by the time the program ended. The average steps per person per week were 23,803 ± 1,720 steps. The average steps per day during the working hours at baseline were 4,185 ± 174 steps. At plateau, the average steps per day during the working hours were 5,300 ± 356 steps, resulting in an increase of 27%. There was a significant increase in the physical activity reported by the participants ($p=0.044$). With respect to self-reported physical activity level, there was a significant increase in the percentage of participants who reported that they were active at post assessment. More than one third or 40% of the participants who reported themselves as ‘not active’ moved to ‘active’. Overall, there was a 33% increase in the number of participants who reported being active at post assessment. T-test analysis showed that there was a significant reduction in systolic blood pressure (p=0.011). There was no significant difference in body weight, but 33% of the participants lost at least 0.5% of their body weight and another 23% maintained their weight. Furthermore, body weight, BMI and BP did not affect the number of steps taken per week. It is important to note that only just over half (56%) of participants completed the entire 10 week programme.

Jackson 2008 (BA+ USA n=290) reported on an intervention with college students where participants wore a pedometer 5 days per week for 12 weeks and completed questionnaires assessing demographic information. The intervention was delivered through the fitness for living programme (FLP) which is a required health and fitness course taken in the first year of college. At baseline, students were not given information on recommended number of steps. After baseline they were given suggested number of steps to meet recommendations, instructions for goal setting and other behaviour change strategies to gradually increase number of daily steps. Participants were age 24.3 +/-7.8 years, 70% female, and 22% ethnic minority. The average number of steps increased from week 1 to week 6 (p<0.001) and week 12 (p=0.002). Underweight participants reported the fewest steps at each time point but this was not significantly different to normal weight participants (p=0.03). The time by group interaction was not significant (p=0.55) indicating no difference in the pattern of increase across time for the 3 groups. 65% were sedentary or low active at the start of the intervention (less than 5000 steps per day). By week 12 only 25% were sedentary or low active.

Spence 2009 (RCT++ Canada n=63) reported on an intervention conducted with female university students (95% age under 30) where the intervention group pedometer was worn for one week for all waking hours to encourage walking. Control (non-pedometer) participants were informed they could wear a pedometer the following week. No significant interaction was observed for either walking intention F=0.61, p=0.44, or self reported walking F=0.13, p=0.72. The effect of pedometers on walking was significant F=12.04, p=0.001. After using the pedometers for one week, those in the pedometer group formed weaker intentions (M=3.19) than those in the control group (M=3.90) to walk 12,500 steps/day in the next week. No main effect of pedometers was observed for self reported walking F=0.81, p=0.37. In comparison to the no pedometer group, the pedometer group reported more walking, F=5.22, p=0.03. However, no significant effects of the pedometer were observed for either task self efficiency or scheduling self efficiency F=0.00, p=0.98. Around 75% (n=25) returned the log sheets of their steps. This data showed no significant difference was observed in the average number of steps per day between those users who were pretested (M=10,307) and those who were not (M=10.276, T(23)=0.04, p=0.98).

Tully 2007 (RCT++ UK n=106) reported on a pedometer based walking programme consisting of intervention on three or five days per week. The three day group participants were asked to walk briskly (at a pace faster than normal;, which lead to mild shortness of breath) during three days a week for 30 minutes a day. They were given a pedometer and a diary and asked to record the number of steps taken, the duration of the walk, the level of breathlessness, and any comments or difficulties during each bout of walking (n=44). Five day group participants did the same as the three day group, but for five days a week (n=42). Participants in the comparison group were asked to maintain their current lifestyle for 12 weeks, given a diary, and asked to record any exercise taken above what they would normally do. After 12 weeks of the study they were given pedometers and invited to begin their own walking programme). Participants were healthy, sedentary 40 to 61 year old adults in Northern Ireland Civil Service departments. Adherence was similar within the three day (89%) and the five day (83%) groups. In both groups similar numbers of steps were recorded for each day’s 30 minute programme (approximately 3500) and measures of breathlessness were similar. The mean walking time recorded each day was 2.6 minutes longer in the three day group than in the five day group. Within the three day group, weight, BMI, waist circumference, hip circumference, total cholesterol to HDL ratio, and systolic blood pressure decreased significantly, and functional capacity and triglycerides (log transformed) increased (no data). In the five day group, waist circumference, hip circumference, and systolic and diastolic blood pressure decreased significantly, and functional capacity increased. No significant changes were observed within the control group. To determine whether the significant changes in weight and BMI observed in the three day group but not in the five day group were a result of a sex imbalance between the groups, subsequent subgroup analysis comparing the response of men and women in each of these groups was carried out by independent t test. No significant differences were found between the responses of men and women within each group with respect to their change in weight (three day group: men, mean (SD) 20.97 (1.9) kg; women, 21.1 (3.00)kg, p=0.78; five day group: men, 20.79 (2.08) kg; women, 0.05 (2.73)kg, p=0.28), or BMI (three day group: men, 20.29 (0.63) kg/m^2; women, 20.42 (1.10)kg/m^2, p=0.79; five day group: men, 20.27 (0.78) kg/m^2; women, 20.20 (0.93) kg/m^2, p=0.26). ANOVA analysis of distance walked in the 10 meter shuttle walk test (F=2.96, df=2, p<0.05) and subsequent post hoc analysis showed no significant differences between the three day and the five day group (Gabriel's post hoc test p=0.81) but the three day group had a significantly greater increase in functional capacity than the control group (Gabriel's post hoc test p=0.03).

Warren 2010 (BA+ USA n=188) reported on "Small steps are easier together" which is described as an ecologically based intervention to increase walking by women delivered at 10 work sites in rural NY state. Participants were provided with pedometers and given personalised daily and weekly step goals over the 10 week intervention. Local strategies available to the participants included walking groups, marked walking circuits and posted walking maps. The women had a mean age of 45 and were 96.8% White. Intention to treat analysis revealed a mean increase of 1503 steps (38% increase over baseline). Mean weekly step counts values for all intervention weeks were significantly higher than baseline (p<0.01). Participants reaching weekly step goals was 53% on average and gradually increased from 37% to 65% at the end of the intervention. Movement to a higher step zone over baseline was found for 52% of sedentary (n=80), 29% of low active (n=65), 13% of somewhat active (n=28) and 18% of active (n=10). This placed 36% at somewhat active or higher, compared to 23% at baseline ($p<0.005$). Sedentary participants decreased from 42% at baseline to 26% at week 10 ($p<0.001$). Participants who were somewhat active or higher increased from 23% at baseline to 36% at week 10 ($p<0.01$). The mean retention (reporting) rate was 60.7%, but drop outs did not differ from completers.

EVIDENCE STATEMENT 19A: POPULATION LEVEL CHANGE IN WORKPLACE PEDOMETER INTERVENTIONS TO INCREASE WALKING

No population change data was reported for these interventions. Individual level changes are reported in ES19B.

EVIDENCE STATEMENT 19B: INDIVIDUAL LEVEL CHANGE IN WORKPLACE PEDOMETER INTERVENTIONS TO INCREASE WALKING

Moderate evidence from 9 studies suggests that pedometer based interventions delivered in the workplace may be effective in increasing individual levels of walking for leisure or travel, up to 12 months post intervention. Evidence from, 1 RCT, 1 nRCT and 3 BA and 2 ITS study shows positive effects on walking for leisure and/or travel (although one study saw the effect decline over 12 weeks), but evidence from 1 RCT showed no effect on walking and evidence from 1 ITS showed a small negative effect on walking.

Borg 2010 (nRCT [+] Aus n=322, 12 months) [*Staff define as inactive received three month walking programme and pedometer plus four maintenance newsletters over nine months to assist them to maintain their new activity levels. Control received pedometer and programme but no maintenance*]. Both intervention groups significantly increased minutes walking ($p=0.01$).

Behrens 2007 (ITS [+] USA n=2600, 12 weeks) [*Competition based employer sponsored physical activity programme using pedometers. Employees formed groups of 10 to undertake the challenge of attaining 10,000 steps per day*]. Significant difference in team steps, with post hoc comparisons indicating significant differences from baseline step counts during weeks 6-8: $F=71.15$, $p<0.001$, but not at the end of the programme.

Chan 2004 (ITS [+] Canada n=106, 12 weeks) [*Adoption phase: participants met in workplace-based groups with a facilitator for 30–60 minutes each week during a lunch break. Set individual steps per day goals and self-monitored their progress using a pedometer to record daily accumulated steps taken. Then adherence measured for 8 weeks*]. Some decreases in activity relative to baseline steps per day, ranging from -2.4% to -20.6% (12.0% ± 7.6%).

Continued

Dinger 2007 (BA [+] Aus n=NR, 6 weeks) [*The intervention group received a pedometer and step logs. Set a daily step goal based on the previous week's step counts. They received weekly email reminders to wear the pedometer and return that week's log. Also received three commercial brochures*]. Daily steps increased significantly from 6419 ± 2386 during week 1 to 7984 ± 2742 during week 6: p<0.001 for both groups combined. Increases did not differ between groups.
Faghri 2008 (ITS [+] USA n=206, 10 weeks) [*Each day participants put on pedometers upon arriving at work, prior to getting out of their cars. To increase motivation, participants were encouraged to develop teams, and each team chose a team leader. Weekly motivational emails were sent to participants*]. Significant increase in the number of steps per week for weeks 2, 3, 4, 6 and 8 compared to baseline: p=0.001.
Jackson 2008 (BA [+] USA n=290, 12 weeks) [*Participants wore a pedometer 5 days per week for 12 weeks and completed questionnaires assessing demographic information. After baseline they were given suggested number of steps to meet recommendations, instructions for goal setting and other behaviour change strategies to gradually increase number of daily steps*]. Average number of steps increased from week 1 to week 6: p<0.001; and week 12: p=0.002
Spence 2009 (RCT [++] Canada n=63, 1 week) [*Intervention group pedometer was worn for one week for all waking hours to encourage walking. Control (non-pedometer) participants were informed they could wear a pedometer the following week*]. Compared to the no pedometer group, the pedometer group reported more walking: F=5.22, p=0.03
Tully 2007 (RCT [++] UK n=106, 12 weeks) [*Given a pedometer and a diary and asked to record the number of steps taken, duration of walk, level of breathlessness, and any comments or difficulties. One group 3 days a week and other group 5 days a week*]. Distance walked in the 10 meter shuttle walk test showed no significant differences between the three day and the five day group: p=0.81.

Warren 2010 (BA [+] USA n=188, 10 weeks) [*Participants were provided with pedometers and given personalised daily and weekly step goals over the 10 week intervention. Local strategies available to the participants included walking groups, marked walking circuits and posted walking maps*]. Mean increase of 1503 steps (38% increase over baseline). Mean weekly step counts values for all intervention weeks were significantly higher than baseline: p<0.01.

The evidence on workplace pedometer interventions to increase walking is only partially applicable to the UK. One study was conducted in the UK but most studies were conducted in US, Australian, and Canada which may limit the applicability in some cases. The differing environments must be considered in reference to the studies. Individual local contexts as well as the setting will also impact on the applicability of individual studies.

6. DISCUSSION

6.1. Summary of identified research

In total, 118 papers were selected for inclusion in the review. 70 effectiveness papers were identified through the initial database searches, 2 through citation searches and one through additional targeting searching, with 25 additional papers identified through scrutinising reference lists and 20 identified by the stakeholders group (additional papers not already identified through searching). In addition, many studies were identified which may be appropriate to include in subsequent qualitative and economic reviews.

The majority of studies identified were interventions to encourage walking (n=75) with fewer studies focusing on cycling (n=9) or walking and cycling (n=34). Most studies did not distinguish between walking and/or cycling for leisure or transport and so have been reported as addressing both. The two main exceptions to this were interventions which consisted of walking for leisure (n=16), or walking and/or cycling for active travel, mostly to reach school or the workplace (n=47; 4 cycling papers, 12 walking papers, and 31 walking and cycling papers).

6.2 Research questions for which no evidence was identified

Considerably fewer cycling rather than walking papers were identified. As discussed above, there were initial concerns over the cycling search terms, but considerable efforts were made to ensure that relevant cycling papers were not overlooked (section 3.1). We excluded a number of papers reporting on cycling interventions (including substantial numbers of references submitted by stakeholders) which reported only on the content of the intervention and did not report effectiveness data. Therefore they were out of the scope of this review but may be appropriate to inform the guidance either through our subsequent reviews or additional means (expert testimonies etc).

6.3 Evaluating the impact of different approaches

Some of the studies identified relied on self reported outcome measures. These types of measures are at greater risk of being exposed to bias than more directly measures outcomes. Therefore this must be taken into consideration when considering the evidence. However, self reported measures are often the best available measure where there is a lack of other appropriate, validated measures. A lack of process evaluations or measurement of "intervention fidelity" (did they actual deliver what they were supposed to?) along with limited follow up in some cases should also be taken into consideration when making recommendations. In addition many studies which demonstrated a positive effect do not refer to the current state of infrastructure or ongoing works/culture etc as either being a factor or acknowledged as a factor. Our review of qualitative studies (to follow) will address these and other factors influencing effectiveness of interventions further.

6.4 Adverse or unexpected outcomes

None of the papers included in this review reported adverse outcomes for the intervention groups in their study.

6.5 Applicability in the UK context

We identified 46 papers reported on studies conducted in the UK (although 18 of these reported on the Travelsmart intervention), with the largest other groups being conducted in the USA (n=39) and Australia (n=22). Further papers reported studies conducted in Canada (n=4); Japan (n=2); Belgium (n=1); Sweden (n=1); and New Zealand (n=1). Each study population varied but in general studies conducted in Australia or New Zealand and the USA and Canada, as well as the European studies are likely to be applicable in the UK to a reasonable extent, although some will be more applicable than others depending on the exact population studied. In particular several studies conducted in the US were in Latino or Mexican populations (Mier 2011, Avila 1994, Hawthorne 2011, Kong 2010), or African Americans (Parker 2011, Wilbur 2003 and 2008) which are ethnic groups not directly represented in the UK, and so the applicability of the results of these studies to the UK population may be questioned. In addition particular care should be taken when considering the likely applicability of the results of the few studies conducted in Japan and Korea. In addition the importance of intervention context to the applicability of interventions (for example community versus school, university or workplace settings) must be considered, and may have greater impact than the country of origin of each study.

6.6 Implications of the review findings

Whilst interpretation of this evidence is to an extent subjective and must be left to the PDG in terms of developing its guidance, an attempt is made here to develop a high-level summary and synthesis. We consider the evidence first by the volume of literature by main outcome measure (increases in walking, cycling, or walking and cycling), and then by the overall effectiveness of each intervention type: provision of health promotion information (either through mass media or interventions targeted at individuals), large multi component programmes, and walking sessions (led or independent, with or without a pedometer).

6.6.1. Literature by main outcome

Walking: The literature which provides evidence for the effectiveness of interventions to increase walking for travel and/or leisure is well developed including large multi-component interventions and provision of health information, along with smaller scale interventions such as walking groups, the provision of pedometers or motivational interventions. The vast majority of the evidence reported positive effects on walking although one mass media intervention failed to show an effect on walking, 2 multi component interventions showed mixed effects, one work place based walking session intervention showed no effect, as did two workplace pedometer interventions. This evidence will be supported by qualitative and economic data in subsequent reviews for this programme of evidence. The evidence is summarised in table 15. It is not clear from the evidence whether effects persist in the longer term (after completion of an intervention), nor whether there are particular aspects of certain interventions which made them particularly successful.

Table 15. Summary of walking literature on walking interventions

Intervention	Evidence	Number/type studies	Direction of effect
Mass media	Moderate	2 nRCTs, 2 CS	Positive effects on walking. 2 studies reported population level change
		1 BA	No effect on walking.
Targeted health information	Strong	7 RCTs	Positive effects on walking (community) No studies reported population level change
	Moderate	1 RCT, 1 BA	Positive effects on walking (workplace) No studies reported population level change
Multi component	Strong	2 BA 2 nRCT	Positive effects on walking (up to three months) Mixed effects on walking (longer term) 3 studies reported population level change
Walking sessions	Strong	6 RCT, 1 nRCT, 3 BA	Positive effects on walking (led walks)
	Strong	4 RCT, 2 nRCT, 2 BA 2 nRCT and 1 RCT	Positive effects on independent walking to 12 weeks. Effect unclear longer term. No studies reported population level change
	Moderate	2 nRCT, 7 BA, 1 cluster RCT	Positive effects on walking (school) Studies reported (school) population level change
	Strong	3 RCT 1 RCT	Positive effects on walking (workplace) No effect on walking (workplace) No studies reported population level change
Pedometer	Strong	6 RCT, 2 BA, 1 CS	Positive effects on walking (community) No studies reported population level change
	Moderate	2 RCT, 1 nRCT, 4 BA, 3 ITS. 1 RCT, 1 ITS	Positive effects on walking (workplace) Negative effect on walking (workplace) No studies reported population level change

Cycling: The literature which provides evidence for the effectiveness of interventions to increase cycling for travel and/or leisure is more limited, although all the studies we identified reported on large multi component interventions or the provision of health information through mass media campaigns (no targeted health information interventions were identified) which are likely to have greater impact compared to the smaller interventions (such as those identified to increase walking). All the evidence identified showed positive effects on cycling and studies were followed up to show that effects persisted post intervention (for several years in some cases). It is not clear what particular aspects of these interventions had the most effect on their positive outcomes. This evidence will be supported by qualitative and economic data in subsequent reviews for this programme of evidence. The evidence is summarised in table 16.

Table 16. Summary of literature on interventions to increase cycling

Intervention	Evidence	Number/type studies	Direction of effect
Mass media	Moderate	2 BA	Increasing cycling or increase awareness of a cycle trail and recall of intervention messages. 1 study reported population level change
Targeted health information	No evidence		
Multi component	Moderate	1 ER, 1 BA and 1 ITS 1 nRCT, 2 BA 1 BA (children)	Positive effect on cycling (cycle demonstration towns) Positive effect on cycling (other interventions) 4 studies reported population level change.

Walking and cycling: The interventions which aimed to increase both walking and cycling was also limited, but consisted of multi component interventions or the provision of health information (in multi-media or targeted interventions) which may be likely to have the greatest impact. Most of the evidence identified showed positive effects on walking, but the effect of targeted health information interventions on cycling was unclear. Mixed effects on both walking and cycling were seen for the multi-component interventions but the quality of the evidence was mixed. Studies were followed up to show that effects persisted post intervention (for several years in some cases). It is not clear what particular aspects of these interventions had the most effect on their positive outcomes. This evidence will be supported by qualitative and economic data in subsequent reviews for this programme of evidence. The evidence is summarised in table 17 .

Table 19. Summary of literature on interventions to increase walking and cycling

Intervention	Evidence	Number/type studies	Direction of effect
Mass media	Moderate	2BA	Positive effect on walking and cycling. Studies reported population level change
Targeted health information	Moderate	1RCT, 1BA	Positive effects on walking Effect on cycling unclear No reported population level change
		Set of evaluation reports	Positive effect on walking and cycling (Travelsmart) Studies reported population level change
Multi component	Inconsistent	1 RCT, 4 BA, 2 ITS	Mixed, but mostly positive effects on walking and cycling.
		2BA, 2 RCT (children)	Mixed effects, more positive for walking. 10 studies reported population level change

The evidence on interventions to increase walking and cycling should be considered independently of that to increase just walking or just cycling as the sum of each intervention may be greater than its constituent walking and cycling parts.

6.6.2. Effectiveness by type of intervention

We can also briefly consider the overall effectiveness of interventions groups by type:

The provision of health promotion information: Over all, mass media interventions seem to be effective at increasing walking, but targeted messages seem to be still more effective in a variety of settings. Evidence is less clear about the effectiveness in respect of increasing cycling or where the aim is to increase both walking and cycling.

Large multi component programmes: Multi-component interventions are generally effective at increasing walking and cycling. It is, however, hard to "dissect" which specific components of these interventions are most important – and indeed it may be that the whole is greater than the sum of the parts.

Walking Sessions: These can be broadly divided into those that are not specifically pedometer-based, and those in which the use of a pedometer is a key part of the intervention. Those without a pedometer a broadly effective at increasing walking, but the effectiveness seems to vary by setting (community, workplace, school etc.) Those using a pedometer are more universally effective in all settings, but a key question (not answered by this literature) is how much using a pedometer adds to the basic walking session interventions.

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8. APPENDICES

8.1 Appendix 1: Evidence table for included effectiveness studies

Key

Study designs:

RCT: randomised controlled trial (both before and after intervention and with concurrent control group: random allocation)

nRCT: non-randomised controlled trial (both before and after intervention and with concurrent control group: non random allocation)

BA: before and after study (before and after intervention without a concurrent control group)

ITS: interrupted time series (data taken at multiple time points before and after intervention without a concurrent control group)

CS: cross-sectional study (data collected at one time point only).

Study quality

[++]: All or most of the criteria have been fulfilled. Where they have not been fulfilled the conclusions of the study or review are thought very unlikely to alter

[+]: Some of the criteria have been fulfilled. Those criteria that have not been fulfilled or not adequately described are through unlikely to affect conclusions

[-]:Few or no criteria fulfilled. The conclusions of the study are thought likely or very likely to alter

First author and date Country Walking/ cycling	Study design Quality (++/+/-)	Population Sample size (n) Intervention/ Comparator size	Outcome measures	Intervention details Comparator details Duration and length of follow up	Methods and analysis	Main findings [Ideally report: Absolute effect intervention Absolute effect control Absolute difference (and CI)].	Recommendations/ limitations Other comments
Andersen 2008 USA Walking	ITS [-]	16,978 observations. 64% men	Stair use	**Intervention details** Promoted stair use among people attending and international sports medicine conference. All participants observed for 3 days (7:30am to 5pm) and choice of activity to get to 2nd floor recorded. On day 2 a prominent sign: "Be a role model, use the stairs!" was displayed to encourage stair use over escalator. This was removed on day 3 **Comparator** None **Duration/length of follow up** 3 days.	Observation	Stair use increased from 22% (95%CI 20.8-23.1%) on day 1 to 29.3% (95%CI 28.1-30.4%) on day 2 and 26.8% (95%CI 25.7-27.9) on day 3 (p<0.001). Active choices (stairs or walking up escalator) increased from 28.3% (95%CI 26.6-30.0%) day 1, to 40.1% (95%CI 38.0-42.2%) day 2, and 40.2% (95%CI 38.2-42.2) on day 3. At each phase women used the stairs considerably more than men (p<0.01). The study produced an absolute effect size of a 7% increase in the proportion of attendees who used the stairs in response to a motivational sign, or a 12% increase if stair climbers and escalator walkers were considered.	Analysis was not affected by adjustment for gender, estimated age, and race. Those with physical disabilities or carrying large items were not counted. Authors note a smaller effect size than anticipated in the socially reinforcing context of a sports science meeting. Maybe due to high rates of physical activity in this population which may have limited perception of need for additional stair climbing activity.
Avila 1994 USA	RCT (+ +)	N=22 intervention (mean age 44) N=22 control	BMI, waist/hip ratio, and serum cholesterol, fitness, exercise	**Intervention details** Experimental training group. One session per week for 8 weeks included instruction for diet modification and	Pre/post test questionnaires. Self completed except where	Statistically significant decrease (p<0.05) in intervention (compared to control) individuals for : BMI (F(1,37)=12.62, p<0.001), waist/hip ratio (F(1.37)=1.87, p<0.001) and serum	At follow up control n=18 and intervention n=21.

Walking		(mean age 40). Latinas 18 years or older, more than 20% overweight. 74% married.	rate and frequency, and diet/exercise knowledge.	walking for exercise. All women were lead in 20 minutes of walking per session. **Comparator** Control participants attended weekly cancer screening education sessions. Invited to attend weight control classes after the study. **Duration/length of follow up** Post training measures one week after last class (9 weeks). Follow up at three months.	reading problems.	cholesterol ($F(1,35)=6.71$, $p<0.001$) . Significant increases in fitness $F(1, 26) = 6.89$, $p<0.05$), exercise rate ($F(1, 35) = 21.28$, $p<0.001$), and frequency ($F(1, 31) = 8.95$, $p<0.01$), and diet/exercise knowledge (no data). Associations wrt BMI, waist/hip ratio and cholesterol reduced at 3 months follow up (no data)	
Baker 2008a UK Walking	RCT [++]	50 participants (7 male, 43 female) Age 40.16 (SD 8.81) At week 16 N=30 At week 52 N=28	Steps taken Walking (minutes) Seven day recall of physical activity.	**Intervention details** Baseline (both groups); participants wore sealed pedometers for one week to record baseline rate of walking. At 16 and 52 week follow up, all participants wore sealed pedometers for seven days. Four week walking programme with goals set in steps using an open pedometer for feedback. Week 1 goal: 1,500 steps above baseline 3 days of week. Increased to 5 days for week 2. Week 3 goal: 3,000 steps above baseline 3 days of week, increased to 5 days for week 4. Step counts recorded at baseline, 1,2,3,4 weeks, 16 weeks and follow up at 52 weeks **Comparator details** Equivalent four week programme with goals set in minutes. Pedometers were	Sample size of 52 was calculated to give power of 0.8.	Both groups significantly increased step counts from baseline to week 4 with no significant difference between groups. Significantly greater number of participants in the intervention (77%) compared with the control (54%) achieved their week 4 goals ($X^2 = 4.752$, $p=0.03$). There was no significant change in step counts from week 4 to 16 and a significant decrease from week 16 to 52.	Additional support may be needed to sustain increases in walking.

				sealed so no feedback was provided. Week one goal: 15 minutes above baseline. Increased to 5 days for week 2. Week 3 goal: 30 min above baseline 3 days of week, increased to 5 days for week 4. **Duration/length of follow up** 52 weeks.			
Baker 2008b UK Walking	RCT [++]	N=63 women and 16 men (49.2 years ± 8.8) West of Scotland university. Independentl y ambulatory, English speaking and between the ages of 18–65 years. Self-classified as not meeting current physical activity recommenda tions,	Physical Activity Steps/day and 7-day recall of physical (IPAQ). Health Related Outcomes Affect (an individual's feelings and emotions) was assessed using the Positive and Negative Affect Schedule (PANAS) EQ-5D instrument. (BMI) Waist-to-hip ratio Percentage body fat Blood pressure	**Intervention** The Walking for Well-being (WWW) All participants completed a baseline week wearing a pedometer, sealed with tape, for seven days with instructions not to alter their daily routine. Participants assigned to the intervention group received a physical activity consultation and then followed a 12-week pedometer-based walking program. The sessions were based on the Transtheoretical Model of exercise behaviour change (TTM Strategies used included enhancing motivation, overcoming barriers and developing appropriate walking plans which were tailored to the individual. The sessions also included discussion of the three mediators of the TTM that have been shown to be important to behaviour change. These are self-efficacy (confidence in ability to change), decisional balance (pros	Data were analyzed using SPSS v.14.0. All results reported were analysed by the main intervention groups. The analyses were performed on an intention to treat basis. Missing week 12 data (due to participant drop-out) were substituted with the participants' baseline value. Baseline differences between the intervention and control group were examined using	A significant interaction was identified between group (intervention, control) and time (baseline, week 12) in terms of the recorded step-counts, ($F_{(1,77)}$ = 25.18, p < .001, partial η2 0.25). A paired t-test found a significant increase in steps/day for the intervention group between baseline (M = 6802, SD = 3212) and week 12 (M = 9977, SD = 4669, t (38) = -6.06, p < .001, d = 0.79, confidence intervals 2,115 – 4236). No significant difference was observed in the control group between baseline (M = 6924, SD = 3201) and week 12 (M = 7078, SD 2911, t (39) = -0.50, p = 0.618, CI -463 – 770). The mean difference in change between the two groups was 3,022 steps/day and was statistically significant (t (77) = 5.02, p < .001, d = 1.96). Chi-square analysis determined that a significantly greater percentage (χ2 = 24.88, p < .001) of participants in the intervention group (25/39, 64%) achieved an increase of 15,000 steps per week, equivalent to physical activity guidelines of the accumulation of 150 minutes of moderate physical activity, compared with the control group (4/40, 10%). Wilcoxon's signed-rank tests revealed that at	Recruitment was targeted specifically at individuals in the lowest socio-economic groups. Recruitment was targeted at data zones within 1.5 km of the university campus that were ranked within the top 15% of the Scottish Index of Multiple Deprivation (SIMD) (i.e. the most deprived zones). The results were presented on an intention to treat basis where all participants were considered. From 169 initial enquiries to the study, 91 individuals

		The intervention group (n = 39) consisted of 31 females and 8 males and the control group (n = 40) consisted of 32 females and eight males. Overall, 55 of 79 participants (70%) were below the randomisation stratification variable of 8,000 steps at baseline: this consisted of 28 of 39 (72%) of participants in the intervention group and 27 of 40 (68%)		and cons of change) and processes of change (strategies and techniques used to change, e.g., social support). The first six weeks consisted of graduated bi-monthly goals with an aim for the increased walking behaviour to be maintained for the remaining six weeks. The overall goal of the walking program was for participants to increase their mean daily step-count by 3,000 accumulated steps above their baseline value on five days of the week. **Comparator** Participants assigned to the control group were asked to maintain their normal walking levels between baseline and week 12. At the end of week 11 these participants collected an individually calibrated pedometer from the research centre and wore this sealed during week 12 to gain a record of their step-counts. **Duration/length of follow up** There were six time points in the study (baseline, 12, 24, 36, 48 and 60 week). There were 15 participants who withdrew from the study between baseline and week 12.	independent t-tests. Steps/day and health related outcome data were analysed using two-way mixed factorial analyses of variance (ANOVA). Missing weekday step-count data were replaced by inputting the mean of the remaining weekdays and missing weekend step-count data were replaced by inputting the alternate weekend day. Exploratory analysis revealed that data from several sub-sections of the IPAQ were non-normally distributed. Non-parametric	week 12 the intervention group recalled a significant increase in the number of leisure minutes walked (Z = 2.32, p = 0.02, r = 0.37, median [Mdn] difference = 100 minutes per week) and a significant decrease in weekday sitting (Z = 2.94, p = 0.003, r = 0.47, Mdn difference = 1200 minutes per week), weekend sitting (Z = 3.41, p = 0.001, r = 0.55, Mdn difference 360 minutes per week) and total sitting (Z = 3.38, p = 0.001, r = 0.54, Mdn difference = 1680 minutes per week) from baseline. At week 12 the control group recalled a significantly greater number of vigorous leisure minutes of physical activity (Z = 2.02, p = 0.043, r = 0.32, Mdn difference = 0 minutes) than at baseline. This result was due to five individuals in the control group increasing their vigorous leisure minutes recalled. As the majority of participants (34 of 40) report zero minutes at both time points the median difference equals zero despite the group reporting a significant increase. Mann Whitney U tests revealed that at week 12 the intervention group recalled a significantly greater number of leisure minutes walked (U = 513.00, p = 0.008, r = 0.30, Mdn difference 83.8 minutes), number of occupational minutes walked (U = 602.00, p = 0.045, r = 0.23, Mdn difference 0 minutes) and total number of minutes walked (U = 560.50, p = 0.03, r = 0.24, Mdn difference = 57.5 minutes) than the control group. The intervention group also recalled significantly less total time spent sitting (U = 546.00, p = 0.022, r = 0.26, Mdn difference = -420 minutes) due to significantly less time spent sitting at the weekend	met the inclusion criteria and provided informed consent at an initial meeting.

		of participants in the control group.			analyses were therefore used to analyze these data. Mann Whitney U tests were used to examine between group differences and Wilcoxon's signed-rank tests were used to examine within group differences over time. Due to the number of variables available from the IPAQ. Statistical significance was defined as p < 0.05 for all tests with data presented as mean (SD).	(U = 474.50, p = 0.003, r = 0.34, Mdn difference = -240 minutes). Health related outcomes- A significant interaction was identified between group (intervention, control) and time (baseline, week 12) in terms of the positive affect scores, (F(1,77) = 4.26, p = .042, partial η2 0.05). A paired t-test found a significant increase in positive affect for the intervention group between baseline (M = 31.2, SD = 6.7) and week 12 (M = 33.5, SD = 7.4, t (38) = 2.29, p = .027, d = 0.33, CI .27 – 4.39). No significant difference was observed in the control group between baseline (M = 31.7, SD = 6.9) and week 12 (M = 31.3, SD 7.6, t (39) = -0.524, p = 0.604, -2.31 – 1.36). There was no significant interaction or main effect found for the negative affect scores or for any of the other health related outcomes measured in the study	
Baker 2011 UK Walking	RCT [++]	N=61 44 women, 17 men, mean age 42.1 ± 10.6 years	Walking steps/minutes	**Intervention details** The effect of providing supportive email prompts, based on components of the Transtheoretical Model of Exercise Behaviour Change, on maintaining walking at a 12 month follow-up was also investigated. Individualized 4-week goal-setting programme based on: steps using a	Scottish Physical Activity Questionnaire	PI increased walking from baseline to week four (3,006 steps/day, p < .001) but decreased between week four and 12 months (1,799 steps/day, p = .044). Neither MI nor C altered steps over time. There was no difference in steps between ES and NS at 12 months.	Same intervention as Baker 2008a

				pedometer (PI, n = 21); overall goal to accumulate 3,000 additional steps above baseline levels, minutes (MI, n = 21); overall goal to accumulate 30 additional minutes above baseline levels or acted as a control (C, n = 19); maintain baseline levels for four weeks. Participants either received email support (ES, n = 28); based on the processes of consciousness raising and self re-evaluation or no support (NS, n = 33) between 8 and 12 months. **Comparator** **Duration/length of follow up** 4 weeks, 12 month FU			
Behrens 2007 USA Walking	ITS [+]	N=2600 city employees formed groups of 10 (N=640). Blue and white collar workers. Missing data; N=52 (81%) completion rate	Step count	**Intervention details** Competition based employer sponsored physical activity programme using pedometers. Designed by city planning committee. 12 week goal of attaining 10,000 steps per day. Updates on progress of all teams given weekly. **Comparator** No direct comparator **Duration/length of follow up** 12 weeks.	Mean, standard deviation and 95% CI of step counts calculated.	Significant difference in team steps by week of programme, with post hoc comparisons indicating significant differences from baseline step counts during weeks 6-8 ($F=71.15$, $p<0.001$) but not at the end of the programme. However, the overall programme did not result in significant increases in steps (week 1 to week 12). Variation in number of steps in weeks 11 and 12 was high due to drop outs.	Authors suggest that from week 8, participants who felt they couldn't win became bored with the unchanging routine of the programme or simply dropped out.
Bickerstaff 2000 UK Walking	BA [+]	309 pupils 1 primary/nursery school	Percent walking	**Intervention details** Three walking buses and additional interventions such as walk to school days and park away days, street lighting along walking bus routes.	Classroom surveys. Methods unclear.	Walking increased from 60% to 68.3% in 14 months (no further statistics). 25% of all walking was with walking buses.	Taken from NICE physical activity in children report Same intervention as

				Comparator None **Duration/length of follow up** 14 months			Cairns 2006c?
Borg 2010 Australia Walking	nRCT [+]	332 inactive staff (<3 sessions a week of walking or MVPA in previous week). Aged 18 and above: 23-39: 26% 40-59: 37% 50+: 37% Female: 88% BMI Normal: 33% Overweight: 34% Obese: 33% N=206 at 12 months (62%).	Self reported minutes walking. Minutes of moderate-vigorous physical activity (MVPA) Total physical activity in past week. Proportion meeting public health recommendations by walking and total PA. Health related behaviours.	**Intervention details** Step by Step self help walking programme plus pedometer. Staff define as inactive received three month walking programme and pedometer plus four maintenance newsletters over nine months to assist them to maintain their new PA levels at 4,5,9 and 11 months (standard + maintenance). All participants received a diary cards for recording weekly activity (including baseline). **Comparator** Three month walking programme and pedometer (standard) **Duration/length of follow up** Follow up at 12 months.	Previously motivated a community sample of adults to be active for up to three months. This study evaluates the effect of an enhance programme in the work place for an additional 9 months. 20min phone interview at baseline and 12 month follow up. Active Australia questionnaire.	Baseline = 68 min of walking (Z=1.05, p=0.29) and 56 min MVPA (Z=0.04, p=0.96). ITT analysis: Both groups significantly increased minutes walking (p=0.01). No between group differences in walking minutes (Wilcoxon = 0.23, p=0.82). Change in MVPA minutes was significantly higher in the standard + maintenance group compared with the standard group (118min vs. 69min p=0.029). No significant difference between groups for total observed PA (116 min vs. 117 min p=0.187). Wearing the pedometer at 12 month follow up and considering the pedometer to be very useful increased the likelihood of meeting public health recommendations (AOR=2.7 (95%CI 1.2-6.3) and 2.5 (95%CI 1.5-5.6) adjusting for other co-variances. The standard programme resulted in long term increases in PA but the maintenance strategy had no significant benefit (ITT and completer analysis).	No significant differences between completers and drop outs except, higher proportion of women dropped out (p=0.02). Authors report potential contamination, with control group participants asking to receive the newsletter. Loss of 127 participants reduced statistical power. Reliance on self reported measures.
Bowles 2006 Australia Cycling	BA [+]	Men and women age 16 years and older n=918 Male = 72% 83% competent or regular	Cycling	**Intervention details** Participants in a mass cycling intervention reported cycling ability and number of times cycled one month before and after the event. Event was part of an annual scenic ride across Sydney organised by cycling NGOs. Participants have the option of	Self reported online questionnaire	13% reported themselves as low ability in the pre event survey. Half of the survey respondents (51.1%) who reported their cycling ability as low before the event subsequently rated themselves as high after the event. Respondents with low pre-event self reported cycling ability reported an average of 4 sessions of cycling in	

		cyclists.		cycling 20 or 50km. **Comparator** None **Duration/length of follow up** 2 months (1 month before and 1 month after event).		the month before the event and an average of 6.8 session in the month after the event (t=5.25, p<0.001).	
Brockman 2011 UK Walking/Cycling	ITS [+] Bi-annual travel survey 1998-2007	N=2829 in 2007 Previous years; 1998 n=2202, 2001 n=2332, 2003 n=1950, 2005 n=2647. Not possible to match responses between years. In 2007: Male 43.3% Age <25 5.1% 26-45 59.8% 46-66 21.2% >56 13.9%	Mode of transport to work (self reported). (Also work site location and distance commuted).	**Intervention** University transport plan. Included: limited parking spaces and permits, improved changing facilities for walkers/cyclers, secure cycle storage, subsidised cycle purchase scheme, car share scheme, free bus from train and bus stations, discounted season tickets for public transport. Published in 1999, changes implemented in 2000. **Comparator** No direct control group. **Duration/length of follow up** 1998-2007.	Self administered postal questionnaire. Trends analysis. Results given as % only.	Between 1998 and 2007, in contrast to national trends: The percentage of respondents who reported they usually (4-5 times a week) walked to work increased from 19 to 30% (Z=4.24, p<0.001). The percentage of regular cyclists increased from 7.0% to 11.8% (n.s). In 2007 regular walkers were more likely to be female, under 35, middle income; regular cyclists were more likely to be male, 36-45, high income. The percentage of respondents who usually commuted by car decreased from 50% to 33% (p<0.001).	Transport plans aimed at reducing car usage can be a feasible and effective strategy for increasing walking and cycling. Improving health/increasing physical activity were not objectives of the travel plan. QUAL: Walking to work is a viable strategy for increasing activity in women, may be additional barriers to cycling for women. Cannot determine change for individuals. Survey response rates were less than 50% (although responder profile was similar to total workforce). Cannot determine the effect of individual strategies within the

							plan.
Brownson 2004 USA Walking	nRCT [++]	Adults aged >18. Community populations ranged from 2399 – 17,642. Female 76.6 intervention, 74.0 control. Age: 18–29 14.4%/18.3% 30–44 28.0%/27.1% 45–64 33.7%/32.6% +65 23.4%/21.7%	Rates of walking trail use. Total number of minutes walked/week. Total minutes walked for exercise.	**Intervention details** Changes in walking behaviour in 6 rural communities in Missouri. Interventions were developed with community input and included individually tailored newsletters, interpersonal activities that stressed social support, and community wide events such as walk-a-thons. Academic team worked with local governments to develop walking trails in the communities. Trail lengths varied from 0.13 to 2.38 miles. Two trail heads had electronic counting devices installed. Some community members received electronic cards which tracked their trail use using a swipe card reader. Focus groups provided information on perceived benefits of walking and trail use, social factors and other facilitating and inhibiting factors. Information was used to develop tailored newsletters. Printed feedback materials were created for individuals who filled out a brief, one-page questionnaire that assessed their status on theoretical constructs like self-efficacy, social support, perceived benefits and barriers, motivation health-related behaviours, resource availability, and preferences for walking alone or with others. Provided positive reinforcement to those who walked regularly and motivational information and supportive resources for those who did not walk regularly.	Using random-digit dialing,33 cross-sectional samples were selected of non-institutionalized adults in the six intervention communities in Missouri and six comparison communities.	Amongst trail users (at baseline 16% of population), 32.1% reported increases in physical activity since beginning to use the trail. For the entire population, rates of 7 day walking for any purpose or for exercise declined slightly in the intervention communities compared with the comparison sites: Total walking intervention effect -1.4min (p=0.91). Walking for exercise intervention effect -5.6 (p=0.37) From the community wide samples two subgroups (education high school degree or less, and people living with annual household income <$20.000) indicated a positive net change in rates of 7 day total walking, but results were not significant.	Author recommendations: Allow sufficient time for intervention development. Understand the benefits and challenges of new technologies. Understand needs and build skills among academic and community partners. Measure impact of social and physical environments.

				Participants received by mail eight different one-page feedback letters that consisted of a masthead and walking-trail graphic tailored to the participant's community, an announcement of upcoming community events, and two messages tailored to their responses to items on the one-page questionnaire. Walking clubs were formed to build social support for physical activity. The clubs were free of charge, and they often provided participation incentives (e.g., water bottles, t-shirts), and were organized around activities such as walk-a-thons. **Comparator details** 6 comparator communities. No intervention. **Duration and length of follow up** Timeframe unclear.			
Brownson 2005 USA Walking	nRCT [+]	Six communities in the Missouri region of the US were the intervention and six communities from Arkansas and Tennessee were the comparison.	Two special risk factor surveys were conducted. The survey was administrated by trained interviewers from July through to September 2003 (n=2470) and from July through to September 2004 (n=1531). The primary endpoint for the	**Intervention** Interventions were developed with community input and included individually tailored newsletters; interpersonal activities that stressed social support and health provider counselling; walking clubs and community-wide events such as fun walks. **Comparator** N/A **Follow-up**	Analyses were completed after stratifying the data by gender and for those individuals who reported having high versus low access to physical activity facilities.	Mean rates of walking/week at baseline were 97 minutes in the intervention areas and 103 minutes in the comparison areas. The amount of change in the walking/week at follow-up was higher in intervention (11.7 minutes) than in comparison participants (6.5 minutes), although not statistically significant. At baseline, the same percentage of respondents from intervention and comparison areas met the recommendations for walking (18.8% and 19.1% respectively, p= 0.864). At follow-up, the percentage of respondents who met the recommendation for walking was again the same across the intervention and comparison areas (22.2% and 21.6% respectively, p= 0.811).	The study relied on self-reported telephone survey data.

			study was the rate of meeting recommendation for walking.	The survey was administrated by trained interviewers from July through to September 2003 (n=2470) and from July through to September 2004 (n=1531).			
Bull 2008 UK Walking/ Cycling	BA [+]	One pedometer project reported. N=2240 hospital employees. 28% male Mean age 41 35% White.	Step count Walking Cycling Active travel (Programme: Physical activity Smoking Nutrition)	**Intervention details** 11 Well@Work programmes were established across 9 English regions (total of 45 initiatives). Physical activity accounted for 40% of initiatives. Diverse set of initiatives and actions aimed at promoting and supporting healthy lifestyles. Reported intervention included 3 team based pedometer competitions to increase total number of steps/week accumulated. **Comparator details** None **Duration and length of follow up** 3 years, average project length 22 months. Pedometer competition = 4 weeks.	Employee questionnaire conducted before/after project (20-22 months). Workplace site assessment (environmental).	10,15and 9 teams started in the three competition, but 4, 8 and 4 teams completed (respectively). Average increases in step counts ranged from 77,130-126,519. The average change in step counts from baseline in the completing teams were: 1. (4 teams) 39% (range 3-555) 2. (8 teams) 32% (7-77%) 3. (4 teams) 48% (16-63%). No long term (post competition) data available. Over the whole project: A significant increase (9%) in the proportion of employees participating in active travel (walking or cycling). Significant increase in employees cycling (4%) or walking (8%) to work. Non significant increase in meeting physical activity recommendations (4%). Workplace supporting environment: Cycling and walking environments surrounding the workplace scored low (33% and 18%). Changes to the supportive environment were mainly aimed at supporting physical activity (e.g. the provision of new bicycle storage facilities and pool bicycles) and healthy eating (e.g. provision of healthy eating centres).	Survey response rate 33% pre and 21% post intervention. Four new tools developed to capture information: log of activities, workplace champion survey, event summary form and participant satisfaction form.
Cairns 2006a UK Walking/	BA [+]	N=179 pupils Age 4-7. One primary	Walking to school Travel to school	**Intervention details** School travel plan group developed a walking bus. Walking incentive scheme "going for gold". Card is stamped every	Unclear	April 2000 travel to school: 62% car, 30% walk, 8% park and walk, 0 cycle. October 2003 travel to school:	Not clear how study data was collected. Taken from NICE

cycling		school		morning if child walks to school. Children arriving by bike or scooter also receive initiatives. Also: cycle training, pedestrian training, park and walk, parent talks, curriculum work, school assemblies, newsletters. **Comparator** None **Duration/length of follow up** 41 months		25% car, 58.8% walk, 12.5% park and walk, 4% cycle Only percentages reported.	physical activity in children report.
Cairns 2006b UK Walking	BA [+]	N=585 primary school pupils. Age 4-11.	Walking rates Travel to school	**Intervention details** Walk on Tuesday and Thursdays (WOTT) and Commitment to Walk incentive included certificates, stickers and trophy incentives. Commitment to walk focused on continuing to walk in inclement weather. On WOTT days record cards signed by parents to confirm walking. **Comparator** None **Duration/length of follow up** 48 months	Unclear	March 1999 travel to school: Car 36.5%, walk 53.3%, park and walk 9%, bus 1.4%. March 2003 travel to school: Car 26.6%, walk 58.7%, park and walk 14%. Only percentages reported.	Not clear how study data was collected. Taken from NICE physical activity in children report.
Cairns 2006c UK Walking	BA [+]	N=309 primary school pupils. 1 school.	Walking rates Travel to school	**Intervention details:** Walking buses (n=3), also walk to school days and park ways days, street lighting along walking bus routes. **Comparator** None **Duration/length of follow up** 14 months	Classroom surveys. Methods unclear.	Walking increased from 60% to 68.3% in 14 months (no further statistics). 25% of all walking was with walking buses.	Taken from NICE physical activity in children report. Same intervention as Bickerstaff 2000?

Chan 2004 Canada Walking	ITS [+]	Participants (n = 106) from five workplaces - federal or provincial government-funded departments or agencies. A majority of the job types were sedentary in nature, such as clerical, administrative, or data processing age 43 ± 9 years (±SD) BMI was 29.5 ± 6.2 kg/m^2. At baseline, the steps per day for women (n = 92) were 6,981 ± 3,140 and for men (n = 14) were 7,661 ± 2,474 (P > 0.05).	Ambulatory activity (pedometer-determined steps per day) Body weight (in light clothing and without shoes), height, and waist girth (taken at the level of the last rib, standing). Heart rate and blood pressure	**Intervention** PEI-FSP was divided into two phases, an ''adoption'' phase of 4 weeks and an ''adherence'' phase of 8 weeks. During the adoption phase, participants met in workplace-based groups with a facilitator for 30–60 minutes each week during a lunch break. All received 6 hours of training on group facilitation and PEI-FSP curriculum. Each week of the adoption phase, participants set individual steps per day goals and self-monitored their progress using a pedometer to record daily accumulated steps taken. **Comparator** N/A **Length/Follow-up** 12 weeks	Scheduled assessments were arranged at each workplace for the collection of anthropometric and health indicator data before the adoption phase (baseline) and following the adherence phase (post program) of PEI-FSP.	At baseline, the steps per day for women (n=92) were 6,981 ± 3,140 and for men (n=14) were 7,661 ± 2,474 (p>0.05). There was a negative correlation between the increase in steps per day and baseline steps per day (r = -0.368, P <0.0001). A small number of participants (n = 7) recorded decreases in activity relative to their baseline steps per day, ranging from -2.4% to -20.6% (12.0% ± 7.6%). The baseline steps per day of the individuals becoming less active were 11,389 ± 4,570 and the initial BMI was 29.5 ± 7.2 kg/m^2. To determine if baseline BMI affected the ability of participants to increase their physical activity, the change in steps per day was correlated with baseline BMI. No significant correlation was found (P = 0.4850). Heart rate decreased significantly (P <0.05) but there were no significant changes in systolic or diastolic blood pressure. The waist girth decreased with increasing change in steps per day (p =0.0073) or with a larger initial waist girth (P = 0.002) but was not related to the baseline steps per day (p > 0.05).	. Program completers (n =106, 59.8%) recorded eight or more weeks of pedometer data and also attended the final scheduled assessment. Partial completers (n = 26, 14.7%) recorded 8 weeks or more of pedometer data or attended the final scheduled assessment, but not both. Program dropouts (n = 45, 25.4%) did not provide 8 weeks of pedometer data nor did they attend the final scheduled assessment.
Cirignano 2010	ITS [+]	Students in grades 4	Weekly and daily steps recorded on	**Intervention** 6 week in school walking programme.	Student step logs recorded daily	Mean steps increased significantly from 19,149 (95% CI 18,224 – 20,073) in week 1 to 21,248 (95% CI	Not randomised, no control group.

USA Walking	Conveni ence sample	(n=64), 5 (n=68) and 6 (n=52). N=184, but 169 in final analysis. White 74% Female 51.6%	pedometers.	Pedometers and "Fit Bits" programme to implement physical activity breaks in the classroom throughout the school day with 10-15 minute activities. **Comparator** No direct comparator **Duration/length of follow up** 6 weeks Parental follow up at 6 months	steps. Teacher Step log recorded weekly step totals for each student. Parent evaluations by post before / after intervention. Teacher exit interviews.	19,730-22,765) at week 6 (p<0.001). The largest increase in steps was found among fourth graders. Six months after the intervention 40% of parents reported that their child continued to use a pedometer. 90% felt the programme was beneficial in promoting physical activity in their child.	Could not determine if increased steps due to pedometer or "Fit Bits" intervention.
Clarke 2007 USA Walking	BA [+]	Low income, overweight and obese mothers (n=124) Age 18 to 45 years; African-American, white, or Hispanic ethnicity; youngest child aged 1 to 4 years; ability to speak and read English; BMI ≥25, low-income Comparison group (n=38). These women met the same qualifications as the intervention	Self-reported height and weight Waist circumference Steps, energy expended, and the elapsed times that the pedometer was worn were documented directly from the pedometer onto the worksheets.	**Intervention** An 8-week physical activity and dietary program. The eight weekly lessons included recommendations for physical activity, healthful eating, and behaviour modification. The physical activity component of the intervention consisted of class discussions and 30 minutes of exercise at each class. The participants shared ideas for establishing exercise goals, reducing barriers, and identifying sources of social support. The instructor led physical activities that mothers could continue on a daily basis, such as walking, resistance training, and video exercise tapes. Mothers were instructed to exercise at least 5 days a week for 45 minutes/session at a moderate intensity, equivalent to a brisk walk. Physical activity for the mothers was assessed by weekly recording of steps and energy expended via pedometers. Exercise intensity was not evaluated. The diet component of the curriculum consisted of menu planning with ethnic foods, cooking demonstrations, and information on recipe modifications,	The participants completed demographic, motivational readiness for exercise, and exercise self-efficacy questionnaires and recorded pedometer steps for 3 days at weeks 0 and 8. Trained personnel collected anthropometric data at baseline and post-intervention . Intervention participants completed a 23-item program evaluation. The form included items on a five-point scale	Higher self-efficacy at week 8 was reported by mothers in the action/maintenance stage than the contemplation and preparation stages (3.0 vs. 2.6, P<0.05). Improvements in exercise self-efficacy scores were correlated with reductions in body weight (r= -0.22, P<0.05) and percent body fat (r= -0.27, P<0.01). Pedometer steps increased significantly by the end of the program. Only 4.3% (n=4) of subjects averaged fewer than 4,000 steps/day (low), whereas 49.5% (n=46) recorded between 4,000 and 10,000 steps/day (moderate) and 46.2% (n=43) met the 10,000 steps/day criteria for high activity (the intervention group increased their steps from a mean of 5969 ±3123 to a mean of 9757 ±3843). This corresponds to initial levels of 30.1% (n=28; low), 58.1% (n=54; moderate), and 11.8% (n=11; high). Energy expenditure, as calculated by the pedometer, increased by 224 kcal/day (P<0.001). Mean pedometer steps at week 8 were associated positively with submission of self-monitoring pedometer worksheets (r=0.38, P<0.01). Overall, there were significant correlations between exercise self-efficacy and pedometer steps (r=0.30, P<0.01), energy expended (r=0.28, P<0.05), and exercise readiness (r=0.28, p=0.01) at week 8. Intervention participants significantly decreased their body weight (mean= -6.6 lb; range= -29.6 to 7.4 lb), percent body fat (mean= -1.4%; range= -7.3% to 5.6%), and waist circumference (mean= -1.4 in; range= -8.3 to	Of the 124 participants, seven did not complete pedometer records and 24 reported a disproportionate number (≥3) of "not applicable" responses for the exercise self-efficacy questionnaire. The number of exclusions for this questionnaire was within the expected range. An example of a question that yielded a non-applicable response included the following: "I am confident I can participate in regular exercise when I feel depressed." This left a final sample of 93 women in the intervention group. Of these 93 women, 84% of participants (n=78) completed the follow-up

		subjects; however, they were of a healthful weight (BMI <25).		portion control, food budgeting, and the energy content of fast foods. Behaviour topics that were presented included social support, self-monitoring, role modelling by successful dieters, and stress management. **Comparator** Usual lifestyle **Follow-up** **8 weeks**	(one=strongly disagree to five=strongly agree) and (one=not useful to five=very useful), as well as open ended questions.	6.3 in) during the program. Similar increases in pedometer steps were found across the range of weight-loss outcomes (P>0.05). Also, there was further weight loss (mean= -0.3 lb; range= -15.4 to 16.6 lb) at week 24 for the intervention group that totalled -6.9 lb (range= -41 to 10.2 lb) for the entire study period.	visit at week 24.
CLES 2011 UK Walking	nRCT [++]	(48%) of all those engaged reported being inactive when they first got involved; 25% were insufficiently active. 57%) the control groups were more active, with 39% of people being classified as 'active' and 21% 'insufficiently active'. 47% of all beneficiaries, excluding the online packs, live in the top	Walking Physical activity	**Intervention details** Get Walking Keep Walking (GWKW) is the Rambler's flagship everyday walking programme. It is a four year project developed by the Ramblers to increase regular independent walking amongst previously inactive and insufficiently active people. GWKW comprises six projects – five local projects in Birmingham, East London, South London, Manchester, and Sheffield, and one project specifically to provide 'Get Walking packs' to inactive people across the rest of England. It is funded by the Big Lottery Fund and the Ramblers Holiday Charitable Trust with additional in kind funding. **12 week programme**: Each adult programme involves five sessions that incorporate bespoke, led walks developed specifically for the session. The sessions occur on Weeks 1, 2, 3, 4 and 12. Between Weeks 4 and 12 participants are encouraged to undertake independent walking and are given an independent walking pack,	Baseline and follow up survey.	By the end of 2010, GWKW staff and volunteers had delivered 1,740 led walks over the course of the programme. Two thirds (67%) of beneficiaries increased the amount of exercise they did each week, one in five (18%) saw no change, and a slightly smaller proportion (16%) reported a decrease. A large majority (83%) of the most inactive group increased the number of days a week on which they undertook a minimum of 30 minutes exercise; only around one in eight (12%) saw no change; and a very small minority (4%) a decrease. For those categorised as 'insufficiently active' at registration (people undertaking a minimum of 30 minutes exercise for 3-4 days a week) over half (56%) increased their rate of exercise, and around a fifth (22%) stayed the same. For beneficiaries who (at registration) were already meeting the government's recommendation on exercise (5 x 30 minutes), around one fifth (22%) increased this still further by participating in GWKW. In general, there was an increase in walking amongst beneficiaries between registration and follow up. In terms of walking from place to place,	GWKW has successfully engaged large numbers of people (over 75,000), and is on course to meet or exceed its targets before the end of the programme in December 2011. GWKW has also worked hard to engage schools, and local programme teams have delivered 54 schools programmes. In each of the five project areas, progress against targets for people attending led walks is on track, with one area having met their targets more than nine months early. Spending to date is in line with delivery and there is no significant under or overspend. Overall, the programme is progressing well and

		20% most deprived areas in the country. 48% of programme beneficiaries were from BME backgrounds 77% of programme beneficiaries and 74% of pack beneficiaries were female 7,883 completed registration and follow-up questionnaires (7,240 for those beneficiaries who received Get Walking packs, and 587 for those who participated in GWKW Programmes and tasters).		identical to the Get Walking pack. At Week 12, there is a closing session to celebrate participants' walking progress. At Week 4 or 12, there is also signposting to other walking opportunities to encourage people to carry on walking. In addition, there is at least one interim contact during the seven weeks of independent walking, either from GWKW staff or volunteers. By the end of March 2011, 7,953 people had been involved in GWKW through the local programmes. **Taster events** are also organised and run by local GWKW staff. These occur either when it is impractical to run a full programme, or to cater for people who would like to find out more before committing to the 12-week programme. The taster events involve a one-off led walk and are often tied into a specific event, such as a local fun day. In Birmingham, walks were run as part of the City's Arts Fest, and in Sheffield the GWKW team organise the Sheffield Walking Festival. Schools: GWKW delivers five and six week programmes for schools, which involve 5-6 weeks of continuous sessions designed to fit into the school timetable and link to the curriculum. The programmes also involve bespoke, led walks and sessions aimed at encouraging children and young people to walk. At the end of 2010, the GWKW team had delivered 54 of these.		there was an increase of 1.1 days per week; and in terms of walking for leisure, the increase was 1 day per week. Programme beneficiaries saw a small change in the amount they walked from place to place each week (from 4.9 to 5.1 days a week); however other beneficiaries experienced a greater change. After being involved in GWKW all beneficiaries walked more than the control group. GWKW has had a substantial impact on those who walked the least. Those classified as 'inactive' at registration increased the days on which they walked from place to place by 1.6, and the days they walked for leisure by 1.4 per week. In both cases, the least active at registration are now walking more than the control group. Whilst there was an increase in the number of days on which beneficiaries walked from place to place of 1.1 days per week, it was greater for those living in the top 20% most deprived areas of England, at 1.4 days per week.	milestones to date have been met. **Additional reports on individual areas also provided.**

				Also walking routes developed and publicised, walking packs distributed, online resources available. **Comparator details** A control group survey was implemented to assist us in exploring changing activity levels and walking in the wider population, and therefore to assess the extent to which increases in physical activity and walking amongst beneficiaries can be attributed to participation in GWKW. **Duration and length of follow up** 12 weeks			
Coleman 1999 USA Walking	RCT [++]	University at Buffalo employees . non-smoking women ages of 18 and 55; non-smoking men ages of 18 and 45 no history of diabetes or current diabetic condition, not more than 80% over ideal weight for their height, sedentary (not engaging in vigorous intensity	Self reported walking	**Intervention** Three groups of brisk walking/6 days per week: 30 continuous minutes, three 10-minute bouts, and 30 minutes in any combination of bouts as long as each bout was at least 5 minutes. **Comparator** **N/A** **Follow-up** Objective activity patterns were assessed at baseline, at the end of the 16-week program, and at the 32-week follow-up using the TriTrac accelerometer.	Diary self-report was assessed at base line, at the end of the 16-week program, and at the 32 week follow-up	Self-reported walking for all groups significantly increased throughout the program ($F(6, 186) = 26.16$; $p < 0.001$), with increases above 3&4 beginning in weeks 11&12 (average walking of 173 ± 46 minutes/week) continuing through weeks 13 & 14 (average walking of 170 ± 58 minutes/week) and weeks 15 & 16 (average walking of 158 ± 66 minutes/week) when compared to weeks 11 & 12. There were no group differences in self-reported walking of the program, nor was there a significant interaction of group with weeks of walking.	11.0% (4 in 36) attrition rate. The remaining 32 participants completed the program and all measures at follow-up. There were 11 participants in the choice and 3 X 10 minute groups and 10 in the 1 X 30 minute group.

		exercise at least three times per week for at least 20 minutes per session or not engaging in moderate intensity exercise for 30 minutes at least five times per week for the past 2 years),					
Cope 2009 UK Cycling	ITS [+]	Six towns: Aylesbury Brighton and Hove Darlington Derby Exeter Lancaster with Morecambe. No population details.	Overall changes in cycling activity.	**Intervention details** Cycling demonstration towns: invest in measures to stimulate levels of cycling through combinations of physical infrastructure, promotion and other smart measures over a three-year period. **Comparator details** None **Duration and length of follow up** 3 year project, 4 years follow up.	Cycle activity measurement and monitoring. Network of automatic cycle counters in each of the towns plus manual counts. Counts of parked bikes School travel surveys	Automatic counter data indicated an average change in cycles counted of +27% across all towns between January 2006 and December 2009. The average change in cycle counts ranged from +2.4% to +56.8%. Cyclists increased in 3 towns, decreased in two and the result was mixed in the final town. Counts of parked bikes increased in two towns ranging from +8% to +32%and decreased in a third -9% (others not measured). The proportion of children cycling as the usual mode of travel to school increase in 5 of 6 towns. Pre and post survey data are available for a total of 60 schools engaged in Bike It. The proportion of children 'never' cycling to school calculated from pooled pre-survey data (collected in either September 2006 or September 2007) was 79%, compared to 56% of children in the pooled post-survey data (collected in either July 2007 or July 2008). The proportion of pupils cycling to school at least once a week increased from 12% in the pre-survey to 26% in the post-survey (based on pooled	

						data).	
Cope 2011 UK Cycling	ER (-)	Whole populations of six towns: Brighton, Darlington, Derby (young people only), Exeter, Aylesbury and "Lancaster and Morecambe	Cycling.	**Intervention details** Interventions to increase cycling in 6 Passenger Transport Executive regions. Including: Increasing cycle access to public transport (secure parking, bike lockers, bikes on buses) Infrastructure (cycle training in all areas, signage, marketing and information, mass participation events). **Comparator details** No comparators **Duration and length of follow up** 2001-2011	Evaluation report, very little data given.	In South Yorkshire, secure parking for 300 bicycles at transport hubs translated to 21,700 intermodal journeys on cycles and public transport. 29% increase in cycles parked at Sheffield station and 44% at all stations. Bikes on buses scheme in rural areas – limited evidence of success. Sheffield Bike Boost – 73% of recipients of cycle training intended to become regular cyclists. Signage and infrastructure. Data from automatic cycle counts indicated 12% increase over all routes and up to 60% at specific sites. In Manchester, cycle and workplace challenge events resulted in 44 new cyclists and increased frequency of cycling amongst established cyclers. Overall results indicated a 66% increase in cycling since 2001 with cycling more than doubling in Sustrans Bike It schools.	Evaluation report data anecdotal. Reference to specific schemes – broken links and no further data in documents found.
Cox 2008 Australia Walking	RCT [++]	N=116 sedentary women age 50-70, mean age 55 (+/- 5yrs).	Retention Adherence State of exercise behaviour Fitness.	**Intervention details** Supervised 6 month swimming or walking programme 3 sessions a week. During first six months each attended same fitness centre free of charge 3 times/week for supervised sessions. In second six months encouraged to maintain same programme and intensity, unsupervised. Usual care: in first six months, given info sheets about programme, exercise technique, safety , and fitness reports at 6 months. 9 newsletters provided re-enforcement during the intervention. Behavioural intervention: 12 worksheets including strategies such as goal setting, time management and		Adherence to swimming or walking was similar at 6 months (76.3% 95%CI 69.5-83.1) vs. 74.3% (66.7-80.9) and at 12 months (65.8% (57.9-73.8) vs. 62.2% (54.6-70.0). During the supervised programme both groups exercised at target with no significant difference between groups (swimming 60.9% (58.9-62.8) vs. (walking 59.7% (57.9-61.6). After six months there was a significant difference ($p<0.001$) in the reduction in walk time between the walking and swimming groups (6.5 (7.9-5.4%) vs. 3.8 (4.9-2.8%). In addition the swimming groups swam significantly further than the walking groups ($p<0.001$). The behavioural intervention did not enhance retention or adherence. Fitness improved for both modes at 6 months and was maintained at 12 months.	100 (86%) at 6 months and 86 (74%) at 12 months.

				overcoming barriers, delivered through mini workshops be exercise facilitator. Also received worksheets to complete at home. Received newsletters only during second six months. **Comparator** Compared two interventions: walking or swimming with/without behavioural intervention. **Duration/length of follow up** 6 month and 12 month follow up			
Culos-Reed 2008 Canada Walking	BA [+]	N=52 (39 at post test) Mean age 66.4 (46-83) White 96.2% Female 80.8% Retired 76.5% Overall attendance rate 62.4%. Drop out (excluding non-starters) 19.2%	Fitness measures, physical activity behaviour, quality of life. Step count. Walk time.	**Intervention details** 8 week mall walking programme. Participants self selected pace, time, and frequency. Encouraged to attend as often as possible between 8am and 10am Monday to Friday. Provided with pedometers and checked in with research assistant prior to walking. Encouraged to increase speed and distance over the 8 weeks. **Comparator details** No direct control. **Duration and length of follow up** 8 weeks.		Significant improvement in physical activity behaviour and most fitness indices, but not quality of life. Significant effects for Leisure time questionnaire score increase from 20.6 (SD 10.8) to 28.1 (SD 11.9) (p<0.005) Average daily mall walk steps increased from 5055 (SD 1374) to 5969 (SD 1543) (p<0.002) Average daily mall walk time increased from 42.9 (SD 10.6) min to 50.4 (SD 13.5) min (p<0.002) BMI decreased from 29.1 (SD 4.6) to 28.5 (SD 4.4) (p<0.001) Walk test distance increased from 549.9 (78.5)m to 612 (88.1)m (p<0.001) Post walk test rate of perceived exertion increased from 5.6 (2.0) to 6.7 (1.9) (p<0.001).	Financial reward (discount card) provided on completion of the programme but not revealed to participants before. Small sample size, short recruitment period, brief intervention, potential selection bias (not discussed further), moderate dropout rate, accuracy of pedometers.
Darker 2010 UK Walking	RCT [++] Waiting list randomised	n=130 Age 16-65, not walking more than 90 minutes/day.	Walking (self reported) Walking (pedometer)	**Intervention** Took place in a laboratory. Behavioural change intervention aimed to alter perceived behavioural control (PBC) concerning walking and to develop plans to "enact intentions to walk" (using theory of planned	Neighbourhood physical activity questionnaire Theory of planned behaviour questionnaire	The intervention increased objectively (pedometer) measured walking from 20 to 32 minutes per day. At 6 weeks, participants maintained their increases in walking. Significant difference in number of minutes spent walking (pedometers) in the week up to t2 between the	Study focuses on success of TPB model to predict increases in walking, rather than the effectiveness of the intervention to do so. Difficult to attribute

		92 female (70.8%) Mean age 40.60 (SD 10.84). 80% power calculation. No significant differences in mean scores at baseline. Drop out 24 (intervention) and 15 (control) over all.		behaviour). Motivational component had 3 stages: shown 10 statements about what would make it easier for them to walk more, complete scale to show how confident they would be about walking in each situation, discussed with facilitator and walking plan developed (including goal setting, action planning and coping planning) **Comparator** Controls received the intervention at t2. **Duration/length of follow up** Follow up one week (t2), two weeks (t3) and one month (t4). No blinding.		control group (M=138.7, SD=93.3) and the intervention group (M=22.5 SD=100.3). The increase in walking was from a mean of 19.8min to 32.2min per day (increase of over 60%). Significant increase in number of minutes spent walking per week for intervention group t1-t4 (mean 287.3, SD=129.4) [t(46)=8.12, p<0.001). Significant also for t1-t2, t1-t3 (mean 305.0, p<0.001) but not t2-t3. Control group significant increase in minutes spent walking t2-t3 (mean 293.7, p<0.001) and t2-t4 (mean 259.0, p<0.001) but a decrease t2-t4.	change to particular aspects of the intervention. Intervention resulted in a large increase in the number of minutes spent walking. Although the level was not maintained fully at t4 it was still significantly above baseline.
De Cocker 2009 Belgium Walking	BA [+]	N= 438 intervention participants (207 male) with a mean age of 49.8 (SD 13.1) years. About 52.9% (n = 232). The majority (n = 344, 79.1%) reported good to excellent health.	1-year follow-up: Have you used a pedometer in the last 10 months? (yes/no). Have you heard or seen any messages about PA promotion? (yes/no); Do you have any idea about the amount of physical activity	**Intervention** During the intervention, physical activity was promoted in the entire city of Ghent, using the central theme of '10,000 steps/ day', with secondary taglines of 'every step counts') and 'every revolution (of bicycle pedals) counts'). The guidelines, recommending 30 minutes of moderate-intensity physical activity on five days a week, or 20 minutes vigorous-intensity physical activity on three days a week were also promoted. Multiple strategies, based on the social ecological	Descriptive statistics (numbers and percentages) were calculated using cross tabs. Binary logistic regression was used to examine whether individual characteristics and intervention exposure variables were associated with	Only 72 (16.4%) intervention participants used a pedometer during the one-year intervention period. Participants older than 49 years (p = 0.001), those who reported having heard or seen a message about PA promotion (p = 0.006), and those who knew about "10,000 Steps Ghent" (p = 0.047) were more likely to report pedometer use. None of the other potential explanatory variables was significantly associated with pedometer use during the intervention. Overall, 209 (47.5%) participants showed an increase in average step counts of 896 steps/day or more at one-year follow-up.	All self reported measures, recall over one year. The authors said 440 participated in the one year follow-up., but reported results for 438. and did not report on why the numbers were different. 2081 randomly selected 25–75 year old adults, living in the city of Ghent (Belgium), were invited to participate. Of those, 872

			that is required for health benefit? (yes/no + open ended); Have you heard of the "10,000 Steps Ghent" project? (yes/no);	model, were designed to intervene at the individual, social and environmental level. A local media campaign (street signs, press conferences, advertisements), the sale and loan of pedometers, the use of a website, workplace projects, projects for older people and the dissemination of information through Health professionals, schools and associations were concurrently implemented. Participants were asked to record the date, steps taken at the end of each day, and the type and duration of non-ambulatory activities (i.e. biking and swimming). For every minute of reported biking and/or swimming, researchers added 150 steps to the daily total number of reported step counts **Comparator** N/A **Duration/length of follow up** One year follow-up.	(1) pedometer use during the intervention and (2) greater than mean step count increase (> 896 steps/day). Results are expressed as odds ratios with 95% confidence intervals and p values. All data were analyzed using SPSS 15.0 for Windows and statistical significance was set at 0.05.	Participants with a college or university degree (p = 0.046), and those who used a pedometer during the intervention (p = 0.014) were more likely to have increased their step counts by 896 steps/day or more, while those with a baseline average step count level of more than 10,000 steps/day were less likely to have increased their step counts by 896 steps/day or more (p <0.001). None of the remaining variables was significantly associated with the step count increase of 896 steps/day or more.	were interested, 648 completed baseline measurements and 440 participated in the one year follow-up.
Dinger 2005 USA Walking	BA [+]	Insufficiently active women. N=43 (36 at post intervention). 88.9% White 69.4% college degree. 33.3%	Walking behaviour (time spent walking). Transtheoretical model of change Self efficacy	**Intervention** 6 week minimum contact intervention on walking behaviour. Women given brochures and pedometers and were sent emails that contained messages designed to positively affect TTM constructs. At the end of the orientation session participants received a pedometer, 6	Participants returned weekly step counts and completed intervention questionnaires at the beginning and end of the intervention.	Participants significantly increased their total walking minutes from baseline (median 55) to post intervention (median 245, Z=4.03,p=0.001). The calculated effect size (d) was 0.82. Participants significantly increase the number of minutes they spent walking whilst at work (Z=2.79, p=0.005, d=0.63), for transport (Z=2.86, p=0.004, d=0.60) and during leisure time (Z=3.54, p=0.001, d=0.81).	Preliminary feasibility study. No control. Sample small and homogenous.

		overweight 44.4% obese Age 27-52 (41.7 +/-6.8)		weeks of step log sheets, self addressed envelopes, and three commercial brochures describing strategies for increasing physical activity and the risks and benefits of physical activity. Told to use the first week of the study to assess their normal number of steps and afterward to set weekly goals to increase steps based on past performance. **Comparator** No direct control **Duration/length of follow up** 6 week	No incentives were given.	Participants significantly increased their use of counter conditioning, dramatic relief, reinforcement management, self-liberation, stimulus control and social liberation ($p<0.05$).	
Dinger 2007 Australia Walking	BA [+]	Aged 25 to 54 years, not full-time college students, participating in <150 minutes/week of moderate intensity physical activities and <60 minutes/week of vigorous physical activities, not pregnant or planning to become pregnant during the study, and answered	Minutes spent walking during the last 7 days. M motivational readiness to become regularly physically active. Use of 20 cognitive and 20 behavioural processes of change	**Intervention** The intervention group received a pedometer and step logs. They were instructed on pedometer placement and told to wear it during all waking hours (except when in water) for the next 6 weeks. They were to record daily steps nightly on the log and to reset the pedometer each morning. Beginning the second week, they were to set a daily step goal based on the previous week's step counts and to record the new goal on the log. They received weekly email reminders to wear the pedometer and return that week's log in a self-addressed stamped envelope provided. This group also received three commercial brochures at the pre-intervention assessment, and their weekly emails contained transtheoretical model based strategies.	Mann—Whitney *U*-tests were computed to assess group differences in walking minutes post-intervention and in number of stages moved pre- to post-intervention. A series of ANCOVAs was computed to assess group differences in post-intervention transtheoretical model scores. Baseline score on the respective construct served as the covariate.	The two groups did not differ on any outcome variable post-intervention or on stage movement pre- to post-intervention ($p < 0.05$), indicating that the additional intervention components that the intervention group received did not impact the outcomes. Consequently, the groups were combined to test whether an email-delivered, pedometer based intervention can increase scores on outcomes pre- to post-intervention. Comparator and intervention participants together increased their weekly walking minutes ($p = 0.002$) and moved forward at least one stage ($p < 0.001$). Pre-intervention, 1.8% of participants were pre-contemplators; 94.6% were contemplators; and 3.6% were preparers. In addition, 53.6% moved forward at least one stage, 5.4% regressed one stage, and 41.1% maintained their stage. All other transtheoretical model variables also changed ($p < 0.001$) except self-efficacy ($p = 0.25$). These results were supported by also finding that daily steps increased significantly from 6419±2386 during week 1 to 7984±2742 during week 6 ($p < 0.001$) for both groups combined and increases did not differ between groups.	

		‘‘no’’ to Physical Activity Readiness Questionnaire		**Comparator** The comparator group received a pedometer and step logs. They were instructed on pedometer placement and told to wear it during all waking hours (except when in water) for the next 6 weeks. They were to record daily steps nightly on the log and to reset the pedometer each morning. Beginning the second week, they were to set a daily step goal based on the previous week’s step counts and to record the new goal on the log. They received weekly email reminders to wear the pedometer and return that week’s log in a self-addressed stamped envelope provided. **Follow-up** Participants attended a pre-intervention assessment, during which they had their height and weight measured, and completed questionnaires. After 6 weeks, participants attended a post-intervention assessment to complete the questionnaires again.			
Dunton 2008 USA Walking	RCT [++] Waiting list control.	Healthy women mean age 42.8 (21-65) yrs, 65% White. N=156 (85 intervention, 71 control).	Walking Moderate to vigorous physical activity.	**Intervention** Individually tailored Internet plus email physical activity intervention for adult women. Received 10 weekly emails containing links to a webpage with an interactive information tailoring tool to promote physical activity. Participants received $25 after completing all of the surveys. Completed standardized inventory of 29 activities (including walking) on monthly basis.	Participants completed web based assessments of physical activity, stage of behaviour change, psychosocial variables at baseline, one month, two months and three months	Compared to the control, the intervention group increased walking (69 vs. +32 min per week) and total moderate to vigorous physical activity (+23 vs.25 min per week) after 3 months. There was no impact on stage of behaviour change or psychosocial variables. Across the whole intervention, walking increased at a faster rate in the intervention group than the control group at three months, β=15.04 (SE=8.38), p=.035 (one-tailed). After three months, the intervention group increased	Target sample size n=200 for 80% power. No significant baseline differences between intervention and control. 75% (n=117) completed surveys at all time points. Suggest extended

				Comparator No intervention until after the study (waiting list control). Completed inventory. **Duration/length of follow up** 3 months		walking by 69 min per week, as compared to the increase by 32 min per week observed in the control group. Multilevel modelling analyses found that there was a significant group difference in the rate of change in MVPA β=17.02 (SE=10.11), p=.045 (one-tailed). Between baseline and the three months assessment, minutes per week of MVPA increased to a greater extent in the intervention group (mean increase of 23 min per week) as compared to the control group (mean decrease of 25 min per week). After three months, the proportion of participants in action or maintenance significantly increased across both the intervention and control group (OR=1.31 (95% CI=1.16–1.48) (14% for the control group and 18% for the intervention group). The rate of change in the likelihood of being in action or maintenance did not significantly differ between the two groups OR=1.16 (95% C.I.=0.93–1.4) across the three-month time period.	exposure to internet based interventions may be necessary to sufficiently impact behaviour.
Eastep 2004 USA Walking	RCT [++] Crossover design	N=26 Group 1 (n=14) were 38.0 +/- 12 yrs old, and overweight (BMI= 24.7 +/- 5.0). Group 2 (n=12) were 40.5 +/- 13 yrs, and overweight (BMI= 27.5 +/- 3.8). All	Walking time Step count.	**Intervention details** Study to investigate whether feedback from pedometer data motivated walking. Two eight week walking for fitness classes. Crossover design: group one wore pedometer for 3 weeks (feedback condition) then sealed disguised pedometer for 3 weeks (no feedback condition. Reversed for group 2. One class met at lunch time and another late afternoon (6pm) for 50min twice a week during one semester. Delivered by a certified physical activity specialist. Classes were designed to provide a safe		Neither group increased their walking time or number of steps significantly over time and interactions between groups were not significant at week 3 or 6 indicating that groups did not respond directly to feedback from the pedometers. Group 1 attended 86% of the walking for fitness classes where as group 2 attended 74%.	If a motivational effect from pedometers exists it must be small, dissipate before 3 weeks, only work in combination with goal setting, or only motivate certain types of individuals. Limitations: participants self selected – may have been more motivated to increase walking. Baseline step counts were not taken

		participants were students or employees at a large university.		walking environment and educated safety and enjoyably. Information was provided on how to increase physical activity through walking. Participants were encouraged to walk outside the class. **Comparator details** Cross over design, intervention reversed. **Duration and length of follow up** 8 weeks			Small sample size. Short timeframe. Weekly step counts calculated from self reported amount of time pedometer was worn – may under or over estimate.
Estabrooks 2008 USA Walking	BA [+]	Participants (n=1,493 were under 18 years of age (n=49), those who reported greater than 14 h of moderate and vigorous activity per week (i.e., >2 SD from the mean) at baseline (n=124) or follow-up (n=194), and those (n=47) that did not complete the baseline PA assessment were excluded. These	Moderate/vigorous activity.	**Intervention** Walk Kansas program manuals were developed and training was offered to Cooperative Extension System agents from all 105 counties to facilitate adoption and consistent delivery of the program. The program was marketed to recruit teams of six individuals who would collectively walk the 423- mile distance across Kansas over an 8-week period. Participants could acquire miles through participation in any moderate intensity PA. With the exception of walking and jogging, which were documented as miles covered, 15 minutes of moderate or vigorous intensity PA was defined and reported as 1 mile. Team size was determined to emphasize the current recommended guidelines for regular PA. Thus, if six people were active for 30 minutes at a moderate intensity 5 days a week, for 8 weeks, they would meet the team goal of 423 miles. The participatory research team developed nine social cognitive theory-	Categorised according to baseline PA status (inactive, insufficiently active, active), and change in PA was stratified by this variable	Walk Kansas participants from the 15 randomly selected counties increased minutes of moderate and vigorous activity between baseline and 8 weeks. For both moderate and vigorous minutes of activity, there was a significant interaction between time and baseline activity level after accounting for the influence of age, gender, and the clustering of teams within counties [moderate: $F(2,1008)= 59.6$, $p<0.001$; vigorous: $F(2,1008)=12.4$, $p<0.001$]. Tukey–Kramer pairwise comparisons between participants at each baseline activity level indicated that the increase in moderate PA was significant for inactive ($p<0.001$) and insufficiently active ($p<0.001$) individuals, but was not significant for individuals who were already meeting PA guidelines at baseline. For minutes of vigorous activity, multiple pairwise comparisons revealed a significant increase between baseline and 8 weeks for individuals classified as inactive ($p=0.005$), insufficiently active ($p<0.001$), and active ($p=0.003$) at baseline. Specifically, previously inactive participants increased from no moderate or vigorous activity to an average of 172.85 (SE=15.0) and 45.49 min (SE=8.7) per week, respectively. Similarly, previously insufficiently active participants increase from 66.3 min (SE=2.0) of	The outcome measures were not reported in detail. Ten percent of the participants were lost to follow-up (n=145).

		exclusion criteria resulted in a sample of 1,045 individuals who participated in the effectiveness evaluation. Ninety-seven percent of the participants were Caucasian, 86%were women, and the average age was approximately 48 years.		driven newsletters that included fun messages, activities to encourage PA, and weekly team mileage updates. All materials were packaged in a program manual to facilitate ease of implementation. **Comparator** N/A		moderate and 4.4 min (SE=0.57) of vigorous PA to an average of 171.7 (SE=6.4) and 60.8 min (SE=5.3), respectively. Finally, participants who were active at baseline did not substantially increase their levels of moderate [214.3 minutes (SE=6.0) to 228.3 min (SE=6.2)] or vigorous [94.3 minutes (SE=4.3) to 111.3 minutes (SE=5.0)] PA.	
Faghri 2008 USA Walking	ITS [+]	Employees of two large state agencies with 1100 employees, where most jobs were sedentary. N=206 50% 45 years or older, 80% were female, 59% were white majority overweight	Numbers of steps taken were compared on weekly basis.. Physical activity was measured as both a subjective and an objective outcome. Stage of change was defined	**Intervention** The progressive walking program lasted for 10 weeks. Participants were allowed to choose their own walking speed and increase their speed and time walked based on level of comfort. Each day participants put on pedometers upon arriving at work, prior to getting out of their cars. Almost all of the participants drove to work or used public transportation. They then recorded the number of steps taken and minutes walked before they left work each day on individualized walking logs distributed to each participant before the study. To increase motivation, participants were encouraged to	At both pre- and post walking program, all participants completed a health history questionnaire, as well as a stage of behaviour change questionnaire based on Procheska's transtheoretical model for physical activity, smoking, dietary habits and stress	Analysis of weekly logs showed that there was a significant increase in the number of steps per week for weeks 2, 3, 4, 5, 6 and 8 in comparison to baseline (p=0.001 for weeks 2, 3, 4, 6 and 8; p = 0.029 for week 5). There was a significant drop in the number of steps taken in week 7 compared to the other weeks, perhaps due to the Thanksgiving holiday. The group reached a plateau in week 8; however, 10% of the participants did not reach a plateau by the time the program ended. The average steps per person per week were 23,803 ± 1,720 steps. The average steps per day during the working hours at baseline were 4,185 ± 174 steps. At plateau, the average steps per day during the working hours were 5,300 ± 356 steps, resulting in an increase of 27%. There was a significant increase in the physical activity reported by the participants (p = 0.044). With respect to	

		with BMI of 27.3 ± 0.47 (Mean ± SD).		develop teams, and each team chose a team leader. The team leader was responsible for collecting the walking logs and delivering the logs to the investigators on a weekly basis. Weekly motivational emails were sent to participants and were posted on the website encouraging them to continue their walking as well as instructing them on how to set goals and overcome barriers. **Comparator** N/A **Follow-up** Of the 206 participants, 56% completed the entire 10-week program.	management. The health history questionnaire also contained questions about participants' lifestyles such as level of physical activity, eating habits, stress level, smoking habits, as well as motivation to participate.. The independent variables were age, height, weight, race, and health status.	self-reported physical activity level, there was a significant increase in the percentage of participants who reported that they were active at post assessment. More than one- third or 40% of the participants who reported themselves as 'not active' moved to 'active'. Overall, there was a 33% increase in the number of participants who reported being active at post assessment. T-test analysis showed that there was a significant reduction in systolic blood pressure ($p = 0.011$). Forty percent of the participants who were considered hypertensive at pre-assessment became normotensive at post-assessment. There was no significant difference in body weight, but 33% of the participants lost at least 0.5% of their body weight and another 23% maintained their weight. Furthermore, body weight, BMI and BP did not affect the number of steps taken per week	
Fisher 2004 USA Walking	RCT Cluster (+ +)	N=582 community dwelling senior residents (65 years of age or older), sedentary or inactive. In 56 neighbourhoods from a total of 93 (total population = 73,828) in Portland, Oregon. Low-income and high-	SF12 (Physical Mental summary scores)and life satisfaction (SWLS); the secondary outcome measure was neighbourhood walking activity, assessed at baseline, 3 months, and 6 months.	**Intervention details** The effects of a neighbourhood walking program on quality of life among older adults. Neighbourhoods (N=56) were randomly assigned to a 6-month, 3 times per week, leader-led walking group activity (n = 28) or an information-only control group (n = 28). Neighbourhoods in the intervention condition participated in a leader-led walking program three times per week for 6 consecutive months. Walkers were also provided an informational booklet describing the benefits	Recruited through telephone, direct mail, and referrals. Neighbourhoods corresponding to primary sampling units and residents to secondary units. To control for potential neighbourhood-level confounders, neighbourhoods were stratified by a "walking-	Compared to the control neighbourhoods, results from multilevel, longitudinal analyses indicated significant improvements in the primary outcomes of SF–12 Physical ($p < .05$), SF–12 Mental ($p < .05$) summary scores, and SWLS ($p<.05$), over the course of the 6-month intervention. A significant increase was also observed in the secondary outcome of walking activity ($p < .05$). SF–12 Mental. The mean slope for SF–12 Mental scores ($M = 1.24$) was statistically significant ($p < .001$), whereas the mean slope for the control neighbourhoods was not ($M = 0.26$, $p = .10$). The effect size for this outcome measure was 0.23. Life satisfaction. There was a significant between-	The overall response rate from 2,181 interview invitations mailed to eligible individuals was 30.5%. All individual-level data at baseline were collected during a 30- to 40-min personal interview conducted by trained research assistants. Follow-up assessments were collected through the mail and by telephone contact. Participants in the control condition were encouraged to continue

		minority neighbourhoods were oversampled 82% White Age 74 +/-6.3 years Female 74% A total of 582 senior residents (men = 182, women = 400) were recruited from the 56 neighbourhoods over 10 months from March through December 2001. No difference was evident at either the neighbourhood level (p = .08) or the individual level (p = .10).		of walking, instruction about what to do before commencing an exercise program, precautionary medical advice, information on proper shoes and clothing, and examples of warm-up and stretching exercises. Each walking session lasted approximately 1 hr and consisted of stretching and warm-up exercises, a 30- to 40-min "leisurely, but purposeful" walk in or near their neighbourhood, and a set of "cool down" exercises. **Comparator details** Information-only control group (n = 28). Neighbourhoods in the control condition received a health education and information program, mailed regularly during the 6-month intervention period. These informational materials, were identical to those mailed to walkers in the intervention group **Duration and length of follow up** 6 months	friendliness" ranking variable. The 56 neighbourhoods were matched on this variable, then randomly assigned by a coin flip to either a leader-guided neighbourhood walking condition (n = 28) or an education-only control condition (n = 28).	neighbourhood difference in the mean slope for this variable ($p = .05$). Compared to the non significant mean slope in the control neighbourhoods ($M = 0.013$, $p = .33$), the mean slope was significant for the intervention neighbourhoods ($M= 0.14$, $p < .001$). The effect size for this outcome measure is 0.24 Walking activity. There was a significant difference between the intervention and control neighbourhoods ($p < .05$). The results indicated that a significant change occurred in the slope mean for the intervention neighbourhoods ($M = 0.21$, $p < .001$), showing an increase in neighbourhood walking. There was no observed change in the control ($M = 0.01$, $p = .12$). The slope factor intraclass correlation was 8% [0.01/(0.12 + 0.01)]. The effect size for the change in walking activity was 0.20. There was no statistically significant effect at either the neighbourhood level ($p = .09$, SF–12 Physical scores, $p = .23$; SF–12 Mental scores, $p = .43$; Life Satisfaction scores) or individual level ($p = .31$, SF–12 Physical scores; $p = .82$, SF–12 Mental scores, $p = .12$; Life Satisfaction scores). Collectively, these results indicated no differential effects for walking-group adherence on intervention.	their usual daily activities. They were also paid $10 per completed assessment and were eligible for a prize drawing of $100 if they completed all three study assessments. Of the 224 neighbourhood walking participants in the intervention condition, 68 (30%) withdrew. Of those who completed the intervention (n = 156), 99 (64%) attended 50 or more walk sessions, 46 (30%) attended 25 to 49 sessions, and 11 (7%) attended 7 to 24 sessions.
Gilson 2006 UK	RCT [++] Baseline step	UK academic and administrative university employees	Step counts Body fat Waist	**Intervention details** Two walking interventions on the work day step counts and health of UK academic and administrative university employees.	Step counts assessed at 1, 5 and 10 weeks.	A significant intervention effect ($p<0.002$) was found for step counts with mean differences indicating a decrease in steps for the control group (-767 steps/day) and increases in walking routes (+926 steps/day) and walking in tasks (+997 steps/day). Control vs. walking	No significant demographic differences between groups.

Walking	counts used to randomly allocate participants to control (maintaining normal behaviour) or one of two treatment groups	N=58 women age 42 +/-10 years and 3 men age 40 +/-11 years	circumference Blood pressure	Walking routes N=21 employed prescribed walks around campus with participants asked to complete at least 15min continuous brisk walking every day. Walking in task N=21encouraged the accumulation of step counts through the working day. Rather than prescribed routes, the office, lectures and seminars were targeted as contexts where tasks were completed standing and walking rather than sitting. **Comparator details** Maintaining normal behaviour (n=22) no intervention. **Duration and length of follow up** 10 weeks		routes p<0.008, control vs. walking in tasks p<0.005. Small non significant changes in body fat, waist circumference and blood pressure.	Control data suggests that distributing pedometers without augmentation reduces step counts over 10 weeks.
Gilson 2009 UK Walking	RCT [++]	White-collar university staff from the UK (n = 64; age = 41.4 ± 10.4 years; 58 women), Australia (n = 70; age = 43.1 ± 10.8 years; 54 women) and Spain (n = 80; age 39.1 ± 9.7 years; 58 women	Step counts	**Intervention** Pre-intervention workday step counts and block stratification were used to randomly and equally assign participants at each site to a waiting list control or one of two intervention groups. Intervention participants were asked to increase their step counts. Employees in the first intervention group were directed to achieve this through brisk, sustained, route-based walking during work breaks. The second intervention group was asked to engage in incidental walking and accumulate step counts during working tasks – this strategy targeted walking and talking to colleagues, rather than sending emails or making telephone calls, and standing and walking in		A significant interactive effect (F = 3.5; p < 0.003) was found between group and timeline for step counts; follow-up simple effects analyses showed significant differences for routes (pre-intervention vs. week one: t = 4.7; p < 0.000) and incidental (pre intervention vs. week one: t = 2.1; p < 0.038) groups. An overall comparison of pre- against intervention average step count data showed a non-significant decrease in the control group (-391 steps/day t = 1.76; p <0.08) and significant increases in both the routes (968 steps/day; t = 3.9; p < 0.000) and the incidental (699 steps/day; t = 2.5; p < 0.014) group. Data viewed across step count classifications, showed that the magnitude of step count change progressively increased relative to pre-intervention step count classifications. "Inactive" (<5000 daily steps) routes and incidental employees demonstrated the largest change in workday walking; comparisons with "highly active" [>12,500 daily steps] employees evidencing mean differences of 2,312 and	

				meetings, instead of sitting at desks. Importantly, participants in all groups were instructed not to engage in additional physical activities beyond those usually undertaken and – for route and incidental groups – the walking strategies encouraged in the workplace as part of intervention. Employees were asked to report additional activities or unusual workdays in their pedometer diaries. **Comparator** Control group participants were asked to maintain their normal behaviour over a ten-week period (October-December at each site). **Follow-up** From a potential sample size of n = 214, 16% of participants (n = 35) had missing data at pre- intervention or two or more intervention measurement points – these data were removed prior to analyses, resulting in a final sample size of n = 179.		2,166 steps/day respectively.	
Hawthorne 2011 USA (1095) Walking	BA [+]	10 elementary schools with large Latino populations. 51% boys Ethnicity of only 54% known: 51,5% Latino 39.4% White 9.1% Other. 55% healthy	Total miles walked BMI Waist circumference Cardio-respiratory fitness	**Intervention details** Grand Canyon Trekkers (GCT) 16 week walking programme. School based lunchtime walking programme, 3 times per week. ¼ mile walking trail marked out with large orange traffic cones and bright red paint. Parent orientation night offered. Entire staff and student body encouraged to walk, not just participants. Received index sized mileage cards marked off with stickers.	Progressive Aerobic Cardiovascular Endurance Run (PACER) measured fitness Mileage card measured walking	No significant change in BMI or waist circumference (p<0.05). Cardio-respiratory fitness increased by 37.1% over baseline (p<0.01). (number values not given).	Informed consent from 24% of parents asked. Post test 1074/1293.

		weight 19.2% overweight 25.8% obese N=1074 (post test)		Incentives and prizes were provided. **Comparator details** No direct comparison. **Duration/length of follow up** Post test one week after completion.			
Hemmingsson 2009 Sweden Walking/Cycling	RCT [++] (2 arm design) Stratified randomisation (age, waist circ). Intention to treat analysis. Sample size power calc at 80% (n=120 has power of 2.8). Powered for 30% attrition.	N=120 Women age 30-60 years, mean 48.2 (7.4). Abdominally obese (waist >=88cm) Baseline mean walking 8471 steps per day (+/- 2646), bicycling 0km per day. Working at least 3 days per week.	Treatment success defined as bicycling >=2km/day (primary outcome) or walking 10,000 steps per day. Waist circumference. Behaviour change (trans-theoretical model) .	Hypothesis: cycling success more common in intervention group, no difference for walking between groups. **Intervention** Moderate intensity programme with physician meetings, physical activity prescriptions, group counselling, and bicycles. Trans theoretical model of behaviour change. (Encourage cycling and walking) **Comparator** Control group: low intensity group support programme with pedometers. 2hr counselling session at baseline and 6 months. (Encourage walking only). **Duration/length of follow up** Study duration 18 months.	Diaries of active travel kept by participants. Waist circumference measured by research nurse.	Intervention group were more likely to achieve treatment success for cycling than controls (38.7 vs. 8.9%, OR= 7.8, 95% CI 4.0-15.0, p<0.001), but there was no difference in compliance with the walking recommendation (45.7 vs. 39.3%, OR 1.2 95% CI 0.7-2.0 p=0.5. Intervention group more likely to comply with at least one treatment goal (cycling or walking) 60.8% vs. 41.8% OR= 2.2, 95% CI 1-3-3.8 p=0.003. Commuting by car and public transport were reduced by 34% (p<0.01) and 37% (p<0.0001) with no difference between groups. Both groups achieved similar waist reductions (-2.1 and -2.6cm, p=0.72).	Attrition at 18 months was 10% (intervention) and 25% (control) p=0.03. Potential participants excluded at baseline were not S.D. to those recruited. Active commuting by bicycle was not at the expense of walking. In contrast, community by care and public transport decreased in both groups as cycling and walking increased. Both groups reduced waist circumference – authors speculate that, as pedometer data did not suggest that the control group were significantly more active in their leisure time, the intervention group may have compensated for their increased energy expenditure (cycling) by

							increasing their energy intake (eating more).
Hendricks 2009 USA Walking/ cycling	BA [-]	Elementary school children (KS6), working age adults. No further demographic details.	Walking (number of people) Active transport	**Intervention** 3 pronged community intervention utilising the 5P model (Preparation, Promotion, Programs, Physical Projects and Policy) to increase safe physical activity opportunities and encourage walking and biking for short trips. Aims to maximise support for individual behaviour change by integrating traditional health promotion approaches with policy and environmental projects. The focus included work on projects at elementary schools (international walk to school day and safe routes to school to increase daily walking and biking to school), worksites (Active living programmes and city wide smart commute day) and city-wide networks (including development of a multidisciplinary partnership). Modifications were made to the physical environment including more bike lanes, and large sidewalks and trail sections. **Comparator details** No direct comparison **Duration and length of follow up** At least one year	Not reported	Evaluation results show changes in attitudes towards active transportation (8% increase in children who thought walking to school was safer post intervention), intentions to try active commuting (43% of Smart Commute Day participants would smart commute more often post event) and increased physical activity (the number of students walking to school more than doubled at 3 of 4 intervention schools and increased at the other (no statistics given). The number of people seen using active transportation increased from 1028 in 2005 to 19=853 in 2006 (63% increase).	Data presented graphically or in text so not always full detail given. Methods section of paper includes details of intervention not methods of data collection or analysis.
Humpel 2004 Australia	RCT [++]	Participants completing the baseline survey had a mean age of	walking in the neighbourhood, walking for exercise, walking for pleasure, and	**Intervention** The participants were randomly allocated to receive one of two physical activity programs: (1) Print only, where participants were mailed self-help print	walking in the neighbourhood, walking for exercise, walking for pleasure, and	There were no significant differences between the two groups on any of the walking measures. The additional support of the telephone contact had no additional impact on participants' walking behaviour over the Print only program. Analyses run separately for men	This study was a funded by a health insurance organization, indicating that the development of the intervention was

Walking		60 F 11 years and 57% were women. Age over 40 years	walking to get to and from places.	materials (three brochures and other printed materials) designed to promote walking. One brochure was mailed each week for 3 weeks; and (2) Print plus Telephone, where participants received the same print program plus three weekly telephone support calls. The print materials were three ‘‘Walking for Health and Wellbeing’’ brochures. Each one was a coloured double-sided A4 page folded (brochure style) so they could be posted in a standard envelope. Content of the brochures was designed to draw participants’ attention to explicitly identifying opportunities for walking within their own neighbourhoods and local communities. Brochure 1 suggested looking around the neighbourhood for things to do and places to go that might encourage them to start or increase their amount of walking. It contained information about the benefits of walking, how much walking is needed for health benefits and about barriers they may have to overcome to be more active. Brochure 2 was specifically aimed at helping participants identify and plan opportunities for walking, and how to monitor their walking program. Included with Brochure 2 were maps of local walking paths and trails. Brochure 3 offered ways to keep motivated and suggestions for social support, including contact details for nearby walking clubs. **Comparator** Participants in the Print plus Telephone	walking to get to and from places.	and women also found non-significant differences between programs. Analysis by ITT showed all participants had increased the reported number of minutes per week walking. Both groups significantly increased the reported number of minutes walking for exercise per week using ITT analysis (Print only group 130 to 147 $p<0.01$, Print + Telephone group (132 to 150 $p<0.02$). Additionally, a trend was shown for the Print plus Telephone contact group to increase the number of minutes walking for pleasure ($P < 0.06$) and to get to and from places ($P < 0.06$). At follow up (8-10 weeks post intervention) there were no significant differences between the two groups on any of the walking measures. Both groups significantly increased time reported walking for exercise per week: Print from 130 to 147 minutes, $t(1,277) = -3.50$, $p<0.001$; Print plus telephone from 132 to 150 minutes, $t(1,106) = -2.44$, $p<0.016$. Additionally, a trend was shown for the Print plus Telephone contact group to increase the number of minutes walking for pleasure ($p<0.06$) and to get to and from places ($p<0.06$). Significantly, more participants in the Print plus Telephone group reported receiving and reading the materials ($v2 = 20.11$, $P < 0.0001$) which may affect the reliability of the result obtained.	guided by business realities.

				group also received one telephone call each week for 3 weeks. The **Follow-up** Data were collected via mailed self-complete questionnaires at baseline and 8 to 10 weeks post-baseline. Follow-up questionnaires were received from 181 (62.7%) participants in the Print condition, and 79 (70.3%) participants in the Print plus Telephone condition.			
Jackson 2008 USA Walking	BA [+]	290 college students. Age 24.3 +/- 7.8 years. 70% female 22% ethnic minorities. Underweight 41 Normal weight 147 Overweight/ obese 102	Daily step averages for weeks 1, 6 and 12. BMI	**Intervention details** Participants wore a pedometer 5 days per week for 12 weeks and completed questionnaires assessing demographic information. Delivered through the fitness for living programme (FLP) which is a required health and fitness course taken in the first year of college. Week 1 =baseline, students given no information on recommended no. of steps. After baseline given suggested number of steps to meet recommendations, instructions for goal setting and other behaviour change strategies to gradually increase number of daily steps. Student charted daily steps using Excel. **Comparator details** No direct comparison **Duration and length of follow up** 12 weeks	Questionnaires. Pedometer step counts	The average number of steps increased from week 1 to week 6 ($p<0.001$) and week 12 ($p=0.002$) Underweight participants reported the fewest steps at each time point but this was not significantly different to normal weight participants ($p=0.03$). The time by group interaction was not significant ($p=0.55$) indicating no difference in the pattern of increase across time for the 3 groups. 65% were sedentary or low active at the start of the intervention (less than 5000 steps per day). By week 12 only 25% were sedentary or low active.	No differences in average steps between groups at baseline. Largest increase seen in first 6 weeks suggestion a shorter intervention may have been as effective.
Jancey 2008	BA [+]	30 neighbourhoo ds within	Walking time for recreation	**Intervention** The intervention program was designed to address motivators and barriers to	Not reported	The self-completed International Physical Activity Questionnaire indicated that the baseline mean walking time for recreation was one hour (SD =1.65), increasing	

Australia Walking		metropolitan Perth, the capital of Western Australia. participants were required to be (a) aged 65 to 74 years, (b) insufficiently active (defined as not achieving at least 30 min of moderate physical activity on at least five days a week; and (c) healthy to the extent that participation in a low-stress walking program would not place them at risk for or exacerbate any existing health condition. N=260. mean age 69 years (SD=2.89); female (67%, n=174), had a partner (66%, n=72) and		physical activity. In particular, the local neighbourhood meeting points were aesthetically pleasing, and had facilities such as toilets and park seating available for resting. The exercise locations were easily accessible, thereby avoiding transport difficulties and costs associated with inconvenient location. The researchers contacted the Council (local government) responsible for each meeting place and informed it of the program. The walking groups met twice a week for 26 weeks. The walk leaders received a prescriptive progressive weekly exercise program that contained written information on the appropriate length for the walking program; illustrations for stretching exercises; and suitable ball skills, such as side twist leader ball. The graduated and standardized physical activity program commenced at a very low level and catered to the previously inactive older adults. The first meeting comprised 10 minutes of walking and two stretching exercises. By the end of 6 months, the group was physically active for one hour, which consisted of walking for 45 minutes plus doing flexibility and ball drills. This range of activities aimed to improve endurance, balance, and flexibility. **Comparator** N/A **Follow-up** A total of 65% of walkers completed the program.		to 2.69 hours (SD =2.02) per week by the end of the program. Results of the self-completed postal satisfaction survey showed that the majority of walkers ‘‘felt fitter’’ (81%, n = 143), were ‘‘able to get more done in a day’’ (59%, n = 102), and were ‘‘more aware of health and well-being’’ (77%, n = 136). The participants acknowledged that they generally became more active (68%, n = 121), with some becoming involved in additional physical activities (26%, n = 46).	

		Australian born (67%, n=174). All participants were insufficiently active					
Johnson 2010 USA Walking	BA [+] Pre- and post-intervention study. [+]	The study used a longitudinal, one-group, pre–post, quasi-experimental design and was conducted in two public housing facilities in a city with a population of approximately 100,000 in the Midwest of the US. Recruitment of the convenience sample occurred. Adults were included in the study (N = 26) if they were age 40 years and older, able to walk without	The investigator-developed Demographic Questionnaire (DQ) addressed age, gender, race, marital status, years of education, body weight, height, exercise history for each decade of life, physical activity during the preceding week, health history, number and types of medications taken, and pet ownership history. In particular, the DQ asked whether or not the participant currently owned any pets, if so what kind of pet, how long they had owned the pet, and who is the primary caretaker of the pet. The instrument also	**Intervention** **Dog walking** After participants completed pre-test questionnaires, they were taken by study staff to a local athletic store, and fitted with proper walking shoes according to their particular foot needs. Insofar as it was physically possible for them, participants began walking 10 minutes, 3 times per week. Those who could not walk this long began walking as long as they felt they could and were gradually increased to the desired 10 minutes, 3 days per week. After participants had walked 10 minutes, 3 days per week for 3 weeks, they were advanced to 20 minutes, 3 days per week for 3 weeks, and then to 20 minutes, 5 days per week for the duration of the study. In Facility 1, the participants walked for 50 weeks, whereas in Facility 2 they walked for 26 weeks. A two-leash system was used in which the participant and a handler each held the dog's leash during the walks. Weather permitting, walks took place on pre-measured routes outside in the neighbourhoods surrounding the two facilities. During inclement weather, walks took place inside the facilities on pre-measured	Before each walk, exercise and physical activity undertaken since the last walk was recorded. Blood pressure was monitored in those with hypertension to ensure their safety to walk. After each walk, handlers recorded the distances walked, and read questions to the participants from the daily data collection instrument to elicit participants' comments during the walk about the walks, the program, or the dogs. These were handwritten, verbatim on the instrument. Weight was recorded weekly and BMI was	Participants at Site 1 had an adherence rate of 72% and statistically significant weight loss (14.4 pounds, p = .013 per Wilcoxon signed rank test). Their pre-test mean weight was 228 pounds (SD = 56, range = 140-301) and post-test mean weight was 218 pounds (SD = 59, range = 140-312). BMI for participants at Site 1 decreased significantly (mean = −1.9, SD = 2.71, p = .021). The Site 2 group had an adherence rate of 52% and a mean weight loss of 5 pounds (p = .29 per Wilcoxon signed rank test). Their pre-test mean weight was 224 pounds (SD = 57, range = 112-365) and post-test mean weight was 228 pounds (SD = 68, range = 116-420). By 7 weeks into the program at each site, all participants were able to walk 20 minutes, 5 days per week. At Site 2 (26-week program), BMI increased slightly but this was not significant (mean = +0.77, SD = 2.69, p = .91). This finding suggests that a skew resulted in Site 2 data, perhaps because of one participant's weight gain of 8 pounds.	

		human assistance canes and walkers were acceptable), and were socio-economically disadvantaged as evidenced by qualifying for and residing in subsidised housing. Additional selection criteria included those who were English-speaking, unafraid of dogs, expressed an interest in increasing their exercise levels, and had assent of their primary health care provider to participate.	asked whether or not the participant had recently lost a pet, if so, how long ago this had happened, and whether or not the participant had felt attached to the pet. Regarding health information, the instrument asked the participants to list any medications that they were taking, and to complete a check list of any health problems that their primary health care provider had diagnosed. The list included hypertension, heart trouble, diabetes, osteoporosis, thyroid problems, headaches, glaucoma, cancer, stroke, rheumatoid arthritis, anxiety, depression, bipolar disorder, fibromyalgia, immune, or	routes. Walking dogs were members of the College of Veterinary Medicine's (CVM) Pet Assisted Love and Support (PALS) animal assisted activity program, and were certified by this program. PALS screens dogs for health and socially appropriate behaviour and carries liability insurance to cover its volunteers. **Comparator** N/A **Follow-up** There was a 26 week program and a 50 week program	calculated weekly. Descriptive statistics were calculated for all variables. Difference scores for weight and BMI were calculated using pre-test and end of program values. Adherence was calculated by summing the total number of walks per person per facility and dividing this number by the total number of walks possible. The Wilcoxon signed rank and Kruskal–Wallis tests were used to identify within and between group differences.		

			reproductive system, or liver problems. Participants also rated their present physical and emotional health as excellent, good, fair, or poor, and also their health compared with how it was 1 year ago. Weight was measured weekly on the same scale (a Sunbeam dial scale) as close to the same time of day as was possible. Height was measured against a measuring tape applied to the wall in the study office by having the participant stand against it while study staff placed a ruler front to back atop the participants' head. BMI was calculated using the formula of weight (in kilograms) divided by height (in meters squared).				

Johnston 2006 USA	nRCT [-]	47% African American 23% Asian 22% Latino 93% free school meals.	Mode of transport to school.	**Intervention** Walking School Bus. School implemented three routes staffed by parent volunteers. **Comparator details** Two nearby schools without WSB. **Duration and length of follow up** 6 months	Measured by show of hands surveys and direct observation. Surveys	Number of children who walked to school increased from baseline to follow up by 25%. A decrease in children arriving by private vehicle was also documented (no data). There were small improvements in observed street crossing safety.	Surveys completed by 695 students at baseline and 782 at follow up.
Koizumi 2009 Japan Walking	RCT [++]	N=68 women (60-78 years). LIFE n=34, age 60 to 78, mean 66 +/-4. Control n=34, age 60 to 76, mean 67 +/-4.	Quality and quantity of daily physical activity(DPA). Daily steps. Cardio respiratory endurance (12 minute walk test).	**Intervention** Lifestyle physical activity intervention. LIFE Feedback based on accelerometer DPA, number of daily steps and time spent performing daily moderate physical activity (MPA) was provided to each participant every two weeks. Recommended to accumulate 9000 steps and 30 minutes of MPA per day. During the 12 weeks, the only contact made with the participants was when they attended the local community centre to download their accelerometer data. **Comparator** No feedback. Locked pedometer. **Duration/length of follow up** 12 weeks	Analysis of accelerometer data. 12 minute walk test.	Significant group interactions were observed for steps (f=10.53, p<0.01), MPA (f=11.76, p<0.01), and cardio respiratory endurance (f=9,28, p<0.01). Intervention group increased steps by 16% (7811 +/-3268 to 9046 +/-2620 steps), MPA by 53% (17.83 +/-13.3 to 27.23 +/-14.71 min) No changes in the control group. Intervention group increased distance walked by 10% compared to 3% in the control group (significance level not given).	
Kong 2010 USA Walking	BA [+]	Kindergarten – 5th grade students residing within 1 mile of school N=28 Hispanic 56% Spanish first language. Age 5-11	BMI percentile, physical activity, TV viewing, fruit/veg consumption, soda/juice intake.	**Intervention** Students were recruited through classroom presentations by a School-Based Health Centre physician to two walking school buses which ran sequentially from March to May 2006 for 10 weeks. Chaperones were parents or relatives of student participants. Participants walked a designated route with pick up and drop off points approved for safety by the police. Four health themes were emphasised during	Pre and post survey questionnaire CDC Youth Risk Behaviour Survey. 24 hour diet recalls Height and weight measurements by	BMI percentile remained stable among overweight and not overweight participants: 50.8 (SD 7.9) before vs. 49.3 (SD 8.1) after intervention. Mean difference -1.4 (0.8) p=0.10. Physical activity increased from mean 4.3 days/week (SD 0.49) to 5.3 days/week (SD 0.43), mean difference 1.0 (0.55) p=0.08. Fruit consumption nearly doubled from 0.83 (0.13) to 1.59 (0.24) servings per day. Mean difference 0.76 (0.28) p=0.01	Three students dropped out during the 10 weeks. Future studies need control group, larger sample size, longer trial length, follow up of participants .

		64% female.		the walks: get up and play, turn off your TV, eat 5 fruit/veg per day, reduce soda/juice intake. Prizes e.g. jump ropes, pedometers, Frisbees and water bottles were distributed every other week. **Comparator** No direct comparator **Duration/length of follow up** 10 week intervention. Follow up immediately before/after	school physician.		
Krieger 2009 USA Walking	BA [+]	Multi-cultural public housing site. 36% African American, 29% Asian, 17% other. Female 77.4% Low income 69.5% Age: 25-44 23.4% 45-64 48.7% Over 64 26% Only 20% reported moderate physical activity at baseline (150 min/week) Walking group	Self reported walking (minutes per day) Physical activity General health Social connectedness	**Intervention details** Multiple interventions to increase walking activity. Community based participatory research partnership and community action teams (made up of youth s and adults) assessed assets and barriers related to walking and developed multiple interventions to promote walking activity including sponsored walking groups, improving walking routes, providing information about walking options, advocating for pedestrian safety. Interventions included walking groups: community action group identified a1 mile path around the new central pond as a walking trail. Trained 6 staff as group leaders. Five residents also served as walk leaders. Groups met 5 times per week during weekday, evening and weekend sessions. Groups ranged in size from 10 to 30. Participants received T-shirts, pedometers, and prizes for meeting individual walking goals.	Door to door survey. Questionnaire. Sample size had power of 0.8 to detect difference of 22.6 minutes per day of walking.	Self reported walking activity increased among walking group participants from 65 to 109 minutes per day (44.1%, 95% CI 28.0-60.2, .p=0.001). The proportion that reported being at least moderately active for at least 150 minutes per week increased from 62% to 81% (change =19.2% 95% CI 2.2=36.3, p=0.018). Walking for exercise and errands both increase. There was no significant changes in walking to work or school (p=0.281), or bus stops (p=0.645).	Qualitative data: impact of walking groups. Could not distinguish the relative contributions of each strategy. Discussions among participants suggested walking group was the most potent element. The walking group continued to meet more than 18 months after: currently 3 active groups with 30 to 45 walkers (2009).

		participants N=53 at follow up.		**Comparator details** No control group. **Duration and length of follow up** Post-test 3 months after walking groups set up.			
Lamb 2001 UK Walking	RCT [++]	The recruitment process was two staged. Firstly, a random sample of 2000 people, aged between 40 and 70 years old, with no serious medical problems were identified from the list of a large general practice (list size 26,500). The practice comprised 14 general practitioners, serving almost entirely the population of Lower Earley, a large suburb of Reading, UK. The	Assessments were carried out before the advice session (baseline) and 6 and 12 months later. Physical activity was assessed using a postal questionnaire, based on the well validated Stanford 5 Cities physical activity questionnaire. It recorded the type, frequency and duration of physical activities undertaken in the past week. People were asked to identify moderate intensity activities, by the degree of sweat and breathlessness that resulted. The activities assessed were comprehensive, ranging from basic mobility	**Intervention** People randomised to the health walks were treated in exactly the same manner as those in the advice only group, but in addition, they were given verbal and written information about the local health walks programme and encouraged to consider this as an option for increasing physical activity. They were referred to the local walk coordinator who telephoned each person to explain the programme in more depth and extend an invitation to join a specified walk. People received a maximum of three telephone calls. The first attempts to contact the participants were made within two weeks of the exercise seminar. The health walks programme ran in two forms. Accompanied walks were provided at several different times in the day and evening, during the week and at weekends, and were led by lay volunteers. Walk packs were available for those who might find it more convenient or preferable to walk independently. The packs included information on routes, calibrated times for each walk, and details of local points of interest. A maximum of three telephone calls was made during the year of the study to encourage people to join the	The primary outcome was the proportion of people increasing their activity above 120 minutes of moderate intensity exercise per week. Secondary outcomes were changes in the continuously scaled physical activity variables, blood lipid profile, body mass index, blood pressure, and aerobic capacity. Statistical comparisons of the dichotomous outcomes were made using logistic regression and differences in mean changes of continuously scaled outcomes by analysis of covariance. All models were	By 12 months the proportion of active people in the advice only group increased by 22.6% (from 4.3% to 26.9%). In the health walks group, the proportion of active people increased by 35.7% (from 3.2% to 38.9%). The difference between the groups was 13% (95% CI 0.003% to 25.9%). Analysis of the continuously scaled physical activity items supported the trend of improvement in activity. People in the health walks arm of the trial increased the frequency of moderate intensity activity more than the advice only group, but there were no statistically significant differences between groups in terms of total amount of activity. Improvements in physical activity levels took some time to occur. At six months there were only small increases in physical activity, but motivation to exercise had improved more quickly in the health walks group (c2=7.71 df=3, p=0.05). By 12 months, the advice only group had "caught up" in their motivation level (between group difference c2=1.63 df=3, p=0.65). Although there were modest, statistically significant improvements in aerobic capacity in both groups, there was no difference between the groups at 12 months. There were no statistically significant changes in body mass index, cholesterol, or blood pressure in either group.	

		practice manager identified the random sample from computerised records. Postal questionnaires were sent with a cover letter from general practitioners to ascertain whether people met the study criteria and to establish their willingness to participate in a trial of physical activity promotion. The response rate was 48%. Questionnaire s were returned to a research nurse who was responsible for recruiting and randomising participants. Of the people who returned questionnaires	tasks, activities of daily living through to high intensity structured exercise. Attitudes to exercise were also measured as part of the questionnaire, using the validated stages of change for exercise measure. Stage 1 was that they currently took no exercise, and were not thinking of taking up any exercise. Stage 2 was that they were thinking about exercising, but had done nothing about it in the past six months, stage 3 that they had started exercising in the past six months, and stage 4 that they were exercising regularly. Cardiovascular fitness tests were also conducted in the general practice, at each	scheme, each person was sent a local walk pack and promotional flyers through the post. Attendance on the walks was free of charge. Walks were designed with crèche facilities, car parking and access to public transport networks. Participants were encouraged to bring along other members or their family or friends. **Comparator** All participants attended a standardised advice session in the primary care setting, led by a physiotherapist. Sessions were conducted in groups of 10–20 people, and the topics covered were the health benefits of exercise, recommended levels of exercise for adults using published guidelines, and tips on getting started and sticking to a physical activity programme. The key message was to take at least 120 minutes/week of moderate intensity activity per week, and to choose an activity that was enjoyable and convenient. Suggested activities included swimming, racquet sports, and aerobics. Walking was also suggested as an activity, but participants in the control group were not referred to or contacted by the health walks scheme. Participants were advised that moderate intensity activity should result in at least a slight sweat or breathlessness. Participants were encouraged to ask questions and share experiences. The seminar lasted 30 minutes, and was supplemented by general written guidance. The health walks and advice	adjusted for age, sex, baseline moderate intensity activity, and aerobic capacity. Continuously scaled variables of physical activity demonstrated very skewed distributions, which were not sufficiently improved by transformation and were therefore analysed using non-parametric methods. Two analyses were undertaken. The first included all people who attended the 12 month cardiovascular fitness assessment, regardless of whether they attend health walks or increased their activity. The second was a full intention to treat analysis, in which the last known value for all missing cases was		

		, 438 people were eligible and potentially willing to participate in a further study. In the second stage of recruitment eligible people, who had indicated willingness to participate, were sent a letter explaining the trial in more detail. They were advised that the researchers wanted to investigate different methods of encouraging physical activity, but there was no specific mention of walking. This was followed up by a telephone call from a research nurse to gain	assessment interval and took about 30 minutes to complete. Blood pressure was measured using a digital monitor. Participants rested in the seated position (elbow at 90 degrees, legs uncrossed, hand at the level of the heart) for at least three minutes before the measure was taken. A non-fasting blood sample was taken for total cholesterol, and analysed under standard laboratory conditions. Weight was measured using a digital calibrated bathroom scale on a firm surface, with participants wearing light indoor clothing only. Height was measured using a wall mounted stadiometer, to the nearest 0.1 cm, in	group continued to receive any advice about exercise that they sought from their general practitioner. **Follow-up** The follow-up period was one year. Loss to follow up was approximately 27% in each group. There were no statistically significant baseline differences between people who were lost to follow up and those who remained in the trial.	used as an imputed value. All people were analysed in the groups they were randomised to. Statistical significance was claimed at $p<0.05$. The analysis was undertaken using the statistical package SPSS for Windows version 8.5.		

		consent, register, and make arrangements for the baseline assessment. Before making telephone contact with participants, the research nurse contacted the randomisation centre, and was issued with a randomly allocated series of dates from which the participant could choose to attend. Seminars were conducted for groups of people allocated to the same experimental group. Ten dates were allocated randomly to advice only and health	stocking feet, and body mass index (BMI) calculated using the formula weight/height^2 (kg/m^2). A sub-maximal step test was used to estimate age corrected $VO_{2\ max}$ from BMI, age, sex, resting and exercising pulse rate. Walk leaders collected data on attendance on organised walks.				

		walks arm of the trial a priori and the research nurse was unaware of whether the dates pertained to health walks or advice only seminars.					
Lombard 1995 USA Walking	RCT [+]	Staff and faculty members of a large south-eastern university. N= 135, 132 women and 3 men, average age 40 years (range 21 – 63 years), average weight 150lb (range 105lb to 225lb).. Subjects were randomly assigned to one of five groups. Control n=27, frequent feedback and goal setting n=27, frequent	Each week all participants completed and mailed to the project a weekly walking log. The two main outcome measures were the number of participants walking at least one day for 20 minutes in a given week in each condition and the number in each condition walking on at least three days for at least 20 minutes on each day (or meeting the ASCM goal).	**Intervention/Comparator** Research assistants telephone half the participants once a week (frequent) and the other half once every three weeks (infrequent) during the initial eight weeks of the intervention. During the last four weeks of the intervention, the research assistants called the participants in the frequent condition once every second week and the participants in the infrequent condition only once to fade the telephone prompting. The study consisted of three data point collection phases. The first phase was the intervention and lasted 12 weeks, with the data collected each week from each participant. The second phase, follow-up 1, consisted of one week of data collected one month after the completion of the intervention period. The thirds phase, follow-up2, consisted of two weeks of data collected three months after the intervention period. From the week a participant stopped returning a weekly log their data was	The study used a 2 x 2 design plus a control group with the two independent variables frequency of telephone prompt (once a week versus once every 3 weeks) and structure of the prompt (highly structured versus touching base). The control group received no intervention strategies beyond the minimum informational program offered to all participants. The study used survival analysis. The analysis conducted LEE-DESU (LD)	The LD values for each set of survival curves indicated that there was a significant effect for treated (the combined four treatment conditions versus the control condition), LD= 17.661 p<0.001, with higher values for the participants in the treated conditions compared to those in the control condition. A significant effect for the frequency of prompting (once a week contact versus once every three weeks) , LD=17.719, p<0.001, with the more frequent prompted participants performing better than those prompted every third week. There was no significant difference between the prompted structure (highly structured conditions, versus touching base conditions), LD=0.007, p<0.9349. The authors noted that more women than men joined the program out of a population of more than 5,000 individuals (with about 50% each of men and women). An informal interview with 22 men from this population indicated that the majority of those interviewed (n=21) did not believe walking was exercise, and most (n=15) believed walking offered no health benefits. As the name of the program was 'Noontime walkers' it was concluded that men did not join because they did not believe they would benefit from a walking exercise program.	Reported average age and weight but gave a range, assume they were reporting the median age and weight. The authors did not discuss possible contamination between groups.

		touching base n=27, infrequent feedback and goal setting n=27, and, infrequent touching base n=27.		entered as 0, but these participants were not eliminated from the final data set.	statistics on the slopes of the different survival distributions functions to highlight any differences between conditions.		
Mackett 2005 UK Walking	BA [+]	5 primary schools N=101 pupils Varied from 41 to 3 in individual schools.	Walking rates Mode of travel to school	**Intervention details** Walking buses promoted within school, at meetings, and information sent home to parents to encourage participation. Report includes case studies on 5 primary schools as well as general information. **Comparator** None **Duration/length of follow up** Interventions ran for 18-30 months.	School travel survey questionnaires.	Around 62% of those using the walking bus had previously travelled by car. On average each child walked for 22 minutes. Overall reduction in the number of children travelling by car was around 50%. The number of children using the walking bus declined over time at each location.	Poor data reporting.
McAuley 1994 USA Walking	RCT [++]	Previous sedentary middle-aged (45-64 years of age), healthy individuals. N= 114, 56 males and 58 females. Mean age 54.52 years, SD = 5.79 years. Subjects were randomly	Exercise behaviour, measured by program attendance, where exercise leaders kept daily attendance records, and subjects kept extensive daily logs, which were completed at the end of each exercise session and returned to the exercise	A 20 week exercise program was designed for middle-aged adults and employed low-impact aerobic exercise, in this case walking. Subjects exercised three times per week, exercising for 10-15 minutes at the beginning and progressing up to 40 minutes by mid-point of the program. Subjects were led in stretching exercises by the exercise leader for approximately 10 minutes each session. They then participated in the walking program. **Intervention** Exercise and provision of efficacy-based information, mastery accomplishments, social modelling,	Student t-tests Multivariate analyses of variance.	At the end of the 20 week program, subjects in the intervention group exercised more frequently ($p<0.01$), exercised more minutes per month (($p<0.01$) and walked more miles per week ($p<0.05$) than the control group. Only p-values were given. The authors concluded that there was evidence to suggest that a simple information-based intervention program can significantly improve adherence patterns in previous sedentary middle-aged males and females.	**Comments** Subjects were not followed up after the end of the program. The dropout rate was not reported, nor did the authors report if all participants completed the 20 week program. No details given on baseline characteristics.

		assigned to one of four exercise classes (two intervention and two control). Two of these classes were held in a morning and two in the evening. **Intervention** Exercise (walking) and provision of efficacy-based **Comparator** Attention control group	leader. Duration of exercise participation at each session. Distance covered in each session. Subjects were given a map of all walking routes so subjects could calculate and record their walking distance.	social persuasion and interpretation of physiological states. The intervention began at the end of week 3 of the exercise program and continued into the third month of the program with six 15-minute biweekly meetings prior to exercise. **Comparator** Attention control group, in this group the subjects participated in the 20 week exercise program and also met with an investigator biweekly for the 12 week period. The intervention lasted for 20 weeks.			
McAuley 2000 USA Walking	RCT [++]	Sedentary, older adults recruited by use of local media (advertisemen t sin local newspapers, announcement s, and local radio and television, know to have a large senior audience), as well as flyers	Each participant completed an inventory providing demographic information and details of their medical history and lifestyle habits. This information was used to assess the individual's risk of cardiovascular disease; to ascertain the	**Intervention** Aerobic exercise group, where exercise classes were conducted by trained exercise specialists and employed brisk walking as the aerobic component. The exercise program was conducted three times a week for six months. **Comparator** Stretching and toning group, this group met three times per week for six months under the supervision of an experienced exercise leader in a large gymnasium. The focus of this program was on the	Structured equation modelling was employed to conduct multiple sample latent growth curve analyses of individual growth in measures of subjective well being (SWB), happiness, satisfaction with life and loneliness, over	Group differences in growth of subjective well being ware all none significant. However, at follow up (12 months) 75% of the stretching/toning participants had continued to exercise at programme levels compared to only 51.3% of the walking condition.	

		posted in grocery stores, churches, senior centres around the area. N=174, mean age 66.71 years, (95% CI 56.23 - 77.20).	physical activity of all participants. Exercise frequency. Frequency of exercises participation was assessed by having participants completed an exercise log at the end of every scheduled exercise session. Participants indicated on the log the number of minutes they had been active plus their resting and exercise heart rates. Well being. Happiness was assessed by the Memorial University of Newfoundland Scale of Happiness (MUNSH). Satisfaction with life was measured by the Satisfaction with Life Scale (SWLS).	provision of an organised program of stretching, limbering, and mild strengthening for the whole body designed specifically for older adults. Participants were followed-up six months after the end of the six month program.	time. Subsequent analyses used the χ^2 test.		

			Social support, was measured by the Social Provisions Scale (SPS)				
McKee 2007 UK Walking	nRCT (+)	Two primary schools, Scotland. Two primary 5 classes, their families and teachers. N=60 (31 intervention, 29 control). 92% at follow up (29 int, 26 control). Participants lived with walking distance of school (3 miles) and were currently driven to school. Pupils mean age 9 yrs (range 9-10). 40% boys (24) 60% girls (36)	Distance travelled to school. Modes of travel. Distance travelled per mode. Behaviour change model outcome.	**Intervention** Travelling Green: School based active travel project for one school term. Active travel integrated into the curriculum, participants used interactive travel planning resources at home. Curriculum materials included resource guide for teachers, designed by Sustrans. Included ideas for making an active travel project informative, interactive, and appropriate. Additional pack of interactive tools for use in the home. Primary aim to provide practical guidance about how to plan an active journey to school. **Comparator** Control school participated in the before and after measures but did not receive the intervention. **Duration/length of follow up** Follow up 10 weeks.	Children assisted to use a computerised mapping programme. Online computerised questionnaire for behaviour change component.	Mean distance travelled to school by walking increased in the intervention group from 198 to 772m (389%) increase. Control group mean distance walked increased from 242 to 285m (17%). The difference between the schools was significant (t(38)= -4.679, p<0.001 (95% CI -315 to -795m). Car travel to school decreased in the control school from 2018 to 933m (57.5%) and increased in the control school from 933 to 947m (1.5%). The difference between schools was significant (t(32) = 4.282, p<0.001 (95% CI 445-1255m). 71% (20) of the intervention group progressed to a higher "stage of change" on the behaviour change model relating to active commuting (or remained in the action and maintenance groups), compared with 52% (14) of the control group in relation to making an active journey to school.	QUAL: benefits of, motivations for, and barriers to making an active journey. Being able to walk and talk to friends on the way to school, getting lots of fresh air, and becoming healthier were regarded by both groups as the top three benefits associated with actively commuting to school. Intervention and control group children who were driven to school said they would be motivated to walk if they were driven some of the way and dropped off within walking distance, and cars were kept away from the school entrance. Significant difference in mean distance travelled to school at baseline between schools –

							children in intervention travelled greater distance on average. But mean walking distance low for both school and no significant difference.
Merom 2009 USA Walking	nRCT [+]	Public elementary schools (1 intervention, 2 controls) in Seattle. Ethnically diverse students age 5-11.	Method of transportation to school: walked with adult, walked without adult, biked, school bus, metro bus, carpool, car.	**Intervention** Walking School Bus (WSB): Part time co-ordinator and parent volunteers. Three routes ranged from 0.3 to 1.5 miles and took 15-40 minutes. WBS operated once or twice a week. **Comparator** 2 schools with no WSB **Duration/length of follow up** 1 year follow up	Students method of transportation to school was assessed by a classroom survey at baseline and 1 year follow up	At baseline the proportion of students (n=653) walking in the intervention (20% +/-2%) or control schools (15% +/- 2%) did not differ (p=0.39). At 12 months, higher proportions of students (n=643 p=0.001) walked to the intervention (25% +/- 2%) verses the control schools (7% +/-1%). There were no difference in the proportion of students riding in a car or talking the bus at 12 months (all p<0.05).	Result may underestimate the change in proportion of students who walked to school since they reflect days without scheduled WSB. However, this may suggest that WSB programmes need not operate everyday to have an impact on school travel patterns.
Merom 2003 Australia Walking & Cycling	BA [+]	Telephone survey of a cohort of adults of ages 18-55 years were conducted and were grouped according to distance from a recently constructed 16.5 kilometres Rail Trail cycleway 9inner area within 1.5 Km, outer area 1.5 to 5	Walking and cycling behaviour, short-term intention to be more active, unprompted recall of any physical activity messages and promotion of bike riding, and awareness and use of the new trail.	**Intervention** Short-term local promotional campaign around a new Rail Trail cycleway. Campaign target groups were potential cyclists and pedestrians living within 5 km of the rail trail in four Local Government Areas. A comprehensive full-colour brochure with information and a map was distributed through local organisations, factories, high school, and motor registries. Media components included local press advertisements. The campaign ran from 2 December 2000 to 29 February 2001 **Comparator** Not applicable	Pre- and post-questionnaires included similar questions on walking and cycling behaviour, short-term intention to be more active, unprompted recall of any physical activity messages and promotion of bike riding, and awareness and use of the new trail.	Analysis of unprompted message recall, 198 (44%) respondents at baseline could not recall any generic message promoting and/or bike riding compared to 153 (34%) at post-test, the reduction was significant (p<0.001). The highest percentage of Trail awareness was observed among inner cyclists, while smaller proportions were noted among inner pedestrians and out cyclists (51.0, 30.1, 29.3% p=0.001) Significantly more males than females were aware of the Trail (39% vs. 28%, p=0.015). Trail use was significantly higher among bike owners than those without a bike (8.9$ vs. 3.3%, p=0.014).	

		km from the trail). The inclusion criteria was, ability to complete questionnaire in English and in the outer area, having access to a bicycle and having ridden it in the previous 12 months. The pre-campaign survey was conducted November 16 to December 4, and the post-campaign survey from March 1 to March 20. A total of 775 eligible respondents were identified in their households and 568 (73%) completed the baseline interview,					

		79% of the cohort (n-450) completed both interviews.					
Merom 2005 Australia Walking	BA [+]	Adults aged 18-65 (40% aged less than 40yrs) N=1100 60% female 62% married 37% degree level education 93% English speaking 72% employed (n=794) 55% response rate	Travel mode Walking time Physical activity. Awareness of campaign	**Intervention** Australia Walk to Work Day media campaign **Comparator** No direct comparator **Duration/length of follow up** At least a year.	Pre and post campaign telephone surveys. National physical activity questionnaire. Inactive: <30min/wk activity Sufficiently active: >150min/wk activity.	Among participants who didn't usually actively commute to work was a significant decrease in "car only" use and an increase in walking combined with public transport ($p<0.005$). Amongst those who were employed was a significant increase in total walk time (+16min/week t[780]=2.04, $p<0.05$, and other moderate physical activity (+20min/week (t[1087]=4.76, $P<0.005$) resulting in a significant decrease in people who were inactive ($X2(1)=6.1$, $p<0.05$) and an increase in the proportion who were sufficiently active (5.4% $p<0.005$).	Indicates short term change in behaviours. Active commuting patterns were measured on Fridays and may not reflect other days of the week. Causal contribution of walk to work day to observed effects cannot be established. Cycling was not measured separately (author note).
Merom 2007 Australia Walking	RCT [++]	Inactive adults aged 30 to 65 years, n=369, living in urban or rural regions of New South Wales, Australia, English proficient and with no physical limitations.	The Active Australia Questionnaire was used to assess the number of times and total minutes accrued by walking continuously, for at least 10 minutes, for exercise, recreation, or to get to/from places in the past week.	**Intervention** A self-help booklet, plus six weekly diaries printed on reply-paid postcards, along with a pedometer was mailed to participants in the Walking Program with Pedometer group. The program consisted of three incremental stages, starting with short walks (<15 minutes) three days a week, typically by incidental walking, gradually increasing the duration of walks to three to four days, then (continuously) walking briskly for 30 minutes, typically for exercise to	The intention-to treat (ITT) principle, with baseline data carried forward for missing data, was used to determine intervention effects. Within-group changes from pre- to post-intervention were explored using McNemar's chi-	For the last week all purpose walking minutes, the change was twice as great in the intervention group (30 minutes) as in the comparison group and control groups. For the previous three month leisure time walking session, mean changes in intervention and comparison groups were significantly greater than in the control group. For the previous three month leisure time walking session, mean changes in intervention and comparison groups were significantly greater than in the control group; control 1.2 sessions/week (0.6-1.8) t=3.97 ($p<0.001$); comparisons 1.3 sessions/week (0.5-2.0)	

		N=123 for the intervention group, n=123 for the comparison group and for a control group n=123.	This was defined as all=purpose walking. The College Alumni Questionnaire was used to assess leisure time physical activity over the last three months.	improve fitness, on most days each week. **Comparator** The Walking Program group received the same but without a pedometer. **Control** A control group received no treatment **Follow-up** A structured 20 minute telephone interview was conducted at baseline and at three month follow-up. The response rate for the follow-up interview was 85% (n=314)	square and paired *t* tests.	t=3.32 (p<0.001); intervention 2.3 sessions/week (1.6-3.1) t=6.30 (p<0.001), X2=7.41 (p<0.021). Intention to treat analysis indicated significant within group increases in all purpose walking and leisure time walking, but mean and median session and minutes were greatest in the pedometer group. The pedometer group also significantly increased participation in other sports and were more likely to meet physical activity recommendations by leisure time physical activity (OR =2.40, 95%CI 1.17-4.93), all purpose walking (OR=1.75, 95% CI 0.92-3.34) and all physical activity (OR=1.59, 95% CI=0.92-2.79) in the last week.	
Merom 2008 Australia Walking/Cycling	BA [+]	N=794 Response rate 55% Working age (18-65) Female 54.8% 18-40 yrs 43% Uni degree 41% Lived 2.5km or less from work 9,6% Commuted by car only 70%	Initiating/maintaining active community (walking/cycle and public transport) on a single day and HEAC (health enhancing active community) in a usual week	**Intervention** Walk to Work Day (WTWD). Mass media campaign. Collaborative annual event in which members of the public are encouraged to walk or cycle to work. **Comparator** No direct control. **Duration/length of follow up** Follow up 1-2 months.	Telephone survey (before/after intervention)	A significant population level increase in HEAC was seen (3.9%, p=0.01) with 136 (19%) achieving HEAC post campaign.	QUAL: High confidence in incorporating walking into commute, being active pre-campaign and being younger (<46) positively associated with both outcomes.
Merom 2009 Australia Walking	RCT [++]	In active adults aged 30-65 (mean 49.1). 85% women.	Perceptions of environmental walkability. Changes in self	**Intervention details** Individually based intervention to promote walking. Single mail out of a theoretically based self help walking programme guide: how to self regulated	Baseline interview. 13 characteristics of neighbourhood.	Adjusting for baseline walking, walking times at follow up were lower if street lights or esthetics were perceived to be low (-24% and -22% respectively), compared with high (p<0.05). In low conditions WPP were significantly more likely than controls to increase total walking time (Exp (b) = 2.53, p<0.01), where as in esthetically pleasing	

		92.9% from English speaking backgrounds. N=369. At 3 months FU response rate = 85%.	reported walking time. Pedometer daily step count (one group) Proportion of participants meeting public health recommendations by walking >150 min and >5 sessions per week.	walking using goal setting, monitoring and recording (WP n=102), the same plus a pedometer (WPP n=105), and a no treatment control (C n=107). Suggested: starting with 15 min walks 3 days/week, increase duration of walking in 3to 4 days, then focus on brisk walking for at least 30 min on most days. Guide included tips on how participants could use their existing environment for their own health benefits, or how to overcome environmental barriers. WPP also encouraged to set goals and monitor daily steps. **Comparator details** No treatment control (n=107). **Duration/length of follow up** 3 months.	Follow up telephone interview at 3 months.	environments, the differences between groups were non-significant. At baseline, study completers walked on average 66 min (SD 79.9) per week with a median of 40. There was no difference between low and high walkability environments. At follow up, the mean walking time was 124 min (SD 135) median 90. Participants with a walkability score above the median reported greater increases in walking time than did their counterparts (77 vs. 33min t=2.56, p=0.011). The effect size was small: Cohen's d=0.29, 95% CI 0.07-0.51. Of the environmental dimensions, only streetlights were significantly associated with change in walking time (71 vs. 32 min t=2.42, p=0.016, but with a small effect size; Cohen's d=0.03, 95% CI 0.05=0.53. At follow up 23.9% walked regularly, a mean increase of 16.5% (-<0.001). Greatest differences between low and high categorises were observed for nearly destinations (7.6%), perceived safety (6.4%), and streetlights (4.2%). Several variables were independently associated with change in walking time: participants who were young (<55), with no children at home and not married had significantly higher levels of walking at follow up. Suggests those interested in changing walking behaviour can do so with no intervention if they have a supportive environment. A minimum contact intervention as described, can make a difference if there are environmental barriers.	
Mier 2011 USA Walking	BA [+]	N=16 Age 18+ Mean age 32.44 (+/-9.7) Mexican American women living in economically disadvantaged poorly urbanised areas on the border with Mexico. Majority born	Changes in walking levels (minutes) Depression Stress	**Intervention details** Home based, culturally sensitive, theoretically driven intervention facilitated by community health workers. Researchers and community workers developed Spanish physical activities workbook. Programme consisted of 12 weekly sessions and encouraged participants to accumulate at least 30 min of moderate intensity walking on most/all days of the week. **Comparator** No direct comparator **Duration/length of follow up**	Data collected at baseline and 3 months. Face to face pre and post test questionnaire. Included International Physical Activity Questionnaire.	After exposure to the programme, participants reported a significant increase in walking (915.8min/week, p=0.002) lower depression (p=0.055) and stress (p=0.017) scores.	All participants attended at least 7 classes, average was 11 (92% attendance rate). Sample size small. Lack of control group. Self reported outcomes.

		in Mexico (93.8%), unemployed (56.3%), low education (56.3%), and obese (62.5%).		12 weeks.			
Milton 2009 UK Walking	nRCT [+]	Barrow-in-Furness, Cumbria. Ten programmes were run across the five Action for Children Centres between May and August 2009. 119 people participated in the programme, which included 41 adults (including five Action for Children workers), 10 young people and 68 children. Survey data	Walking	**Intervention details** Furness Families Walk4Life is a 12-week intervention designed to encourage regular independent walking close to home as part of everyday life – not only health and leisure walks but every day trips to the shops, school or work. The project involves delivery of a number of intervention programmes consisting of several key components: - Four week period of led walks - Resource pack - Seven week period of independent walking - Celebration event Week one involved an informal workshop focused on the benefits of regular walking, as well as the barriers to walking and how to overcome them, which was followed by a short walk. Each programme involved three further weekly walks which started and finished at the same centre. Each walk took a different route and was designed to be safe and easy for children, while also incorporating places of interest. 40	Adult participants completed a short survey at baseline and 12 weeks. The baseline survey collected data on participant demographics including age, gender and ethnicity, car access, current walking levels and overall physical activity level. Walking data was captured using questions from the Brookes Walking for Health Questionnaire (Dawson et al., 2007) and the walking questions from the International Physical Activity Questionnaire	Participants collectively walked 220 times over the four week led walk period, with each individual participant generally attending one (n=52, 44%) or two (n=39, 33%) led walks. Four participants attended all four led walks, which included a family (one adult, two children) and one young person. One participant attended five led walks which was achieved by taking part in two programmes. The average number of participants in each walk was six, however, one walk, which was attended by a nursery group, attracted 20 walkers, including 5 nursery workers, one young person and 12 children. 34 participants supplied data at both baseline and week 12; 21 in the intervention group and 13 in the control group. Responses to items from the Brookes Questionnaire and the IPAQ were used to calculate mean minutes of walking per week, and comparisons were made between reported walking levels at baseline and week 12. No consistent patterns of increased walking were found between groups but the amount of change (increase in self reported walking for purpose) was greater in the intervention group than the control group. The authors also observed a greater increase in the	The control group reported higher levels of walking than the intervention group at baseline.

		were available for 34 adults who took part in the programme. Participants were typically female (9 males), aged between 16 and 44 years, and all were classified as White British. Intervention group (n=34) and control group (n=28)		minute themed walks: walking is healthy, walking is fun, walking is green, walking for adventure, walking with friends and family, and walking safely. One ‘Trail Tales’ resource pack was provided to each child, and contained a log book and stickers for children to record the amount of walking they undertake and a set of story books tailored to match the needs and interests of the child(ren); ages 2-4, 4-7, 7-11. It was intended that families would continue to meet at the Centre and undertake group walks independently, without the leadership of the Project Officer. Phone calls were made to the families at week five and week seven. **Comparator details** No intervention **Duration and length of follow up** 12 weeks	(IPAQ; Craig et al., 2003). Overall physical activity level was assessed using the Single-Item Measure developed by a group of key agencies in the UK (Milton et al., 2009). The 12 week survey included the walking questions and physical activity question which were included on the baseline questionnaire. Survey data were collected from both the intervention and the control group.	number of days reporting at least 30 minutes of physical activity in the intervention group than the control group. Neither of these increases are statistically significantly due of the small sample size within the study.	
Miyazaki 2011 Japan Walking	BA [+]	N=56 Aged 65+ (mean age 71.32 +/-3.67) BMI 24 (+/- 8.8)	BMI Waist/hip Step count.	**Intervention** Subjects were given a pedometer and instructed to walk at least 7,500 steps each day. Additional monthly advice on healthy diet and lifestyle provided in a newsletter. Researches met the subjects at pre and post test only. **Comparator details** No direct control **Duration and length of follow up** 4 month intervention	No info.	Mean body mass and waist circumference decreased slightly from 59.11kg to 57.37kg (p<0.05) and from 87.6cm to 85.71cm p<0.01). Mean steps per day increased significantly from 9389 to 11846 (p<0.01). Among those whose steps increased by more than 1000 HDL-c increased significantly (p<0.05). Increased number of steps was correlated with increased HDL-c (r=0.2751) and was calculated at 0.7mg/dl for every 1000 extra steps (p<0.05).	Conference abstract only.

Moreau 2001 USA Walking	RCT [++]	Twenty-four postmenopausal women (mean age 54 ± 1 yr) with borderline to stage 1 hypertension (systolic BP of 130–159 mm Hg and/or diastolic BP of 85–99 mm Hg Fifteen women were randomized to the exercise (EX) group and 9 to a non-exercising control (CON) group. The women had cessation of menses for at least 1 yr and were not participating in regular physical activity within the past year. They were non-smokers, had no orthopaedic limitations to	Blood pressure and heart rate Body mass index (BMI) was Abdominal circumference Walking steps were recorded on daily log sheets along with any additional physical activities and were collected on a biweekly basis.	**Intervention** Subjects were given a pedometer (to wear throughout the day for a 1- to 2-wk period before beginning the 24-wk walking program in order to document pre-intervention daily lifestyle walking activity. Women in this group were provided with a target number of steps that would lead to a 3-km increase in daily. The target steps were added onto their baseline step value in order to prevent a decline in their current daily lifestyle activity. Initially, all women were prescribed a distance of 1.4 km/d^{-1} above their baseline walking during week 1. The distance was then increased by 0.5 $km{\cdot}d^{-1}$ until the desired walking distance was achieved by the third week. The women were instructed to walk at a self-selected, comfortable pace, and were allowed to accumulate their steps in whatever pattern best fit their lifestyle. Other than walking, subjects were asked not to make any changes in their current lifestyle activities. **Comparator** Women in the control group were asked not to change daily activity and subsequently wore a pedometer 1 wk each month to document their walking. **Follow-up** Testing procedures were performed at baseline, 12 wk, and 24 wk.	Testing procedures were performed at baseline, 12 wk, and 24 wk. Statistical significance for all tests was established at P < 0.05.	At baseline (within their daily lifestyle activity), women in the EX and CON groups walked an average of 5400 ± 500 and 7200 ± 700 $steps{\cdot}d^{-1}$, respectively, equivalent to walking 3.4 ± 0.3 and 4.7 ± 0.4 $km{\cdot}d^{-1}$ (significantly different between EX and CON groups, P < 0.05). Women in the EX group increased their daily walking by 4300 steps (2.9 ± 0.2 $km{\cdot}d^{-1}$; significantly different from baseline and from the CON group, P < 0.05) and averaged a total of 9700 ± 400 $steps{\cdot}d^{-1}$ (including baseline steps) across the 24-wk walking program (significantly different vs. the CON group). The women in the CON group did not change their walking activity over 24 wk (-0.3 ± 0.3 $km{\cdot}d^{-1}$). Body mass was reduced by 0.9 ± 0.3 kg after 12 wk (P < 0.05) and was reduced by an additional 0.3 kg at 24 wk of walking in the EX group (P < 0.005), but remained constant in the CON group. There were no significant changes in abdominal and hip circumferences, over 24 wk in either the EX or CON group. Resting systolic BP was reduced in the EX group after 12 wk by 6 mm Hg (P < 0.005) and was further reduced by 5 mm Hg at the end of 24 wk (P < 0.005). There was no change in diastolic BP with walking. The CON group experienced no change in BP at either 12 or 24 wk.	

		walking, and were absent of known cardiovascular disease (CVD).					
Murphy 2006 Northern Ireland Walking	RCT [++]	Subjects were recruited from staff at the Northern Ireland Civil Service via internal email. Thirty seven subjects (24 women) aged 41.5 ± 9.3 years were randomised to either a walking (n = 23; 16 women) or control group (n = 14; 8 women) on a 3 to 2 basis (3 walkers for every 2 controls). Exclusionary criteria were a physically active lifestyle, current cigarette smokers,	Height and body mass: BMI % Body fat	**Intervention** **Walking programme** Subjects were allowed to choose their own walking speed. The progressive walking programme lasted eight weeks. During week one, subjects completed a 25 minute walk on two days. During week two, subjects walked for 35 minutes on two days. From week three to week eight, all walkers completed two 45 minute walks per week. All walking sessions were performed outdoors. Those assigned to the walking group were given a training diary to record their walks and note the day, time of day and duration of the walk. Subjects were also required to rate their perceived exertion during the walk on the Borg 15- grade scale. **Comparator** No training **Follow-up** At end of the 8 week programme. Four individuals dropped out of the study due to: illness (1 control), moving job (1 control), family circumstances (1 walker) and lack of interest (1 walker).	Physiological differences between groups at baseline were compared using independent *t*-tests.	During week 0 (i.e. the week prior to commencing the intervention) daily step counts for the walking and control groups averaged 6437 ± 2285 and 6831 ± 2727 respectively. There was no significant difference in the week 0 step counts between groups (P > 0.05). Walkers took significantly more steps on Walk-days compared to Rest-days (P < 0.001). Walkers undertook more voluntary steps (steps per day not including any accrued from prescribed walking) on Rest-days (5803 ± 2749) than on Walk-days (4567 ± 2639) (P < 0.05). During the intervention, mean step counts for the control group averaged 6470 ± 1709. Subjects assigned to the walking group completed a 45 minute walk on two days of the week, at approximately 62.0 ± 7.1% predicted HR_{max}. The walks elicited a mean RPE of 12.6 ± 0.9 and consisted of 4736.4 ± 539.2 steps. Subjects completed 83.9 ± 18.9% of prescribed sessions. There were significant differences in the change in systolic BP and body fat percentage between groups from pre- to post-intervention as identified by the group-by-time interaction (P < 0.05). Systolic BP for the walking group decreased from 120.4 ± 19.7 mm Hg at baseline to 115.4 ± 17.7 mm Hg at post intervention. Body fat percentage of the walking group was 28.0 ± 5.8 and 27.9 ± 5.6 at pre- and post-intervention respectively. No significant changes were observed in body mass, waist and	

		individuals with cardiovascular, pulmonary or metabolic disease, pain or discomfort in the chest, dizziness or heart murmur				hip circumference, diastolic BP or lipid variables.	
Mutrie 2002 UK Walking & Cycling	RCT [++]	Participants were recruited from three larger public sector workplaces, with a spectrum of socioeconomic groups within the workforce. in the city of Glasgow, Scotland, UK. One workforce was a University, one workplace was an acute hospital trust and the third was a health board. Employees identified as contemplating	Participants were sent a baseline questionnaire that measured demographic variables and contained the main outcomes measures, which were: stage of change for active commuting, seven day recall of physical activity and perceived physical and mental functioning measured by the SF-36 scale.	**Intervention** The intervention consisted of a pack entitled 'Walk in to Work Out', which the intervention group received immediately. The pack contained a booklet with written interactive materials based on the transtheoretical model of behaviour change, educational, and practical information on: choosing routes, maintaining personal safety, shower and safe cycle storage information, and useful contacts. The pack also included an activity diary in the form of a wall chart, a workplace map, distance from local stations, local cycle retailers and outdoor shops, contacts for relevant organisations, local maps, and reflective safety accessories. **Comparator** The control group were told they would receive the pack in six months time, they were not requested to refrain from beginning active commuting. **Follow-up** Outcomes measured at the end of the	Focus groups were conducted after the six month responses had been received, on sub-sample of walkers and cyclists who had progressed or regressed in active commuting state of change. Those participants that had actively progressed over the first six months were compared with those who did not progress or regressed. The comparison was modelled by stepwise logistic regressions on the main effects and interactions of three potential explanatory	Over six months, a significantly larger percentage of the intervention group (49%, n=50) progressed to a higher stage of active commuting behaviour change, compared with the control group (31%, n=29). The average difference between the two groups was 18% (95% CI, 5% to 32%). Analysis of the effects of distance travelled to work, gender and age, showed that none of these variables or their interactions, significantly influenced the probability of improvement in active commuting stage of change over the first six months. **Walking** Analysis of the seven day recall of physical activity data showed a significantly greater average time per week spent walking to work for those in the intervention group compared with controls, among those who had not walked to work at the start of the study (mean of 125 minutes per week for the 14 such persons in the intervention group and 61 minutes per week for the 12 in the control group). There was also a significant increase in the average time spent walking to work per week, in favour of the intervention group among those who already walked to work (mean increase from 52 minutes per week at baseline to 79 minutes per week at six months for the 61 such persons in the	The authors report significantly changes and gives confidence intervals but no p-values.

		or preparing to actively commute were sent a baseline questionnaire, those returning the questionnaire were included in the project. N= 295, 145 in the intervention group, 150 in the control group. The mean age was 38 years (range 19 – 69 years), 64% were women, most participants were members of social class 1 and 2 (professional and managerial).		six month study period. The response rate at six months was 66% (n=194) and at 12 months after the start of the study, the response rate was 56% (n=166)	variables (age, gender and distance travelled to work) as well as study group (intervention and control).	intervention group compared with an increase from 50 minutes to 60 minutes per week for the 43 in the control group). **Cycling** The intervention was not successful in increasing cycling; only 18 participants reported cycling to work at six months. There was no difference in the reported average weekly minutes of cycling between cyclists in the intervention group (n=9) and control group (n=9). **SF-36** A comparison of the subscales of the SF-36 from baseline to six months showed that individuals sin the intervention group, improved their scores significantly more than the control group on three of the eight subscales. For Mental Health subscale, the intervention group mean went from 72 to 76 at six months, while the control group mean were 73 and 71 for the same period. For the Vitality subscale, the mean change for the intervention group was from 57 to 64 while the control group had a mean of 61 at both time points. For the General Health subscale, the mean for the intervention group were 71 at baseline and 76 at six months and 75 and 73 respectively for the control group. At 12 months, the percentage of participants in the control group (after they received the pack after six months), who progressed from the stage of actively commuting behaviour change recorded at six months (46% n=31) was similar to the percentage in the intervention group who progressed their stage of change in the first six months (49% n=50). The 95% CI for the	

						difference between the two percentages was -16% to 17%.	
Napolitano 2006 USA Walking	BA [+]	Two local worksites (hospital and administrative offices) consisting of approximately 6300 male and female employees aged 18-65. Promotional booths: At baseline, mean age was 39.7 years (SD 10.7) and 68.8% were female.	Observation of walking on path.	**Intervention** Communications based worksite campaign to promote awareness of an existing local walking path and to increase walking. Promotional material were distributed for 1 month via flyers, email, website postings, and during bi-weekly information booths. Promotional ideas were developed from initial focus groups. Organisation of walking along the "path to health". **Comparator** No direct control **Duration/length of follow up** 1 month intervention plus 2 week follow up.	Observation. Questionnaire to determine awareness. Observation = two weeks before campaign, four weeks during and two weeks after. Week days at selected 15min intervals beginning at 10am, 12pm and 2:30pm at four observation sites.	Borderline statistically significant increases in walking activity from baseline were observed midway through the campaign (p=0.069) and following the campaign (p=0.075). Counts observed during the intervention were almost triple those at baseline and increased in the post intervention phase to approximately three and a half times those at baseline. Discussion (no data): there was a trend for walking to increase during the afternoon. There was almost a tripling of walkers from baseline to post campaign. Suggests a clinically if not statistically significant difference.	Potential for "noise" in the data due to people commuting to their cars instead of walking for exercise.
Nies 2003 USA Walking	RCT [++]	The sample consisted of 197 women from metropolitan communities of states in the north and south between the ages of 30 and 60 years (mean = 44.4 years, SD=7.5). The	Exercise benefits scale. Self efficacy. Social support. Self reported minutes walked/day. VO2 max. Profile of mood	**Intervention** Intervention participants (n= 67) received telephone calls for 24 weeks. Major components of each telephone call were scripted and followed by the research assistant. Field notes were taken during telephone conversations. A research assistant called the women 16 times over the 24 weeks to assess their physical activity levels and to help them problem solve how to fit adequate walking activity into their week. Participants received calls once a week for the first 8 weeks and then every	An initial model including all 4 main effects and the 3 interactions with the intervention was run. To assess the intervention effects on the intervening variables ANOVA was	The intervention group reported more time walked each day than did the control group (p<0.05). Between group analysis: Women in the intervention group reported more time walked each day than the control women (F (1,191)=4.10, p<0.05). Other measures not significant. Within group analysis. The intervention group significantly improved reported minutes walked per day (t(66)=3.20, p<0.01), 1 mile walk test (t(65)=3.54, p<0.01).	Retention at 6 months was 81%. Women likely to have overestimated activity and confidence at baseline.

		women were considered physically sedentary or mostly inactive at the beginning of the study based on self-report at the time of a telephone screening At baseline, the majority of women (80%) reported they were thinking about or trying to start exercising. Participants were paid $15 to participate in the study for a 6-month period. Sedentary women N=197 Age 30-60 (mean 44.4 +/-7.5) African/European Americans	states (POMS).	other week for the remaining 16 weeks. The intervention telephone calls were constructed to provide counselling on exercise benefits, goal setting, exercise efficacy, social support, restructuring plans and relapse prevention. **Attention-control** Participants assigned to the attention-control group (n = 60) received the same number of telephone calls as the intervention group. These participants were to report on their physical activity over the past week or two, but none of the intervention components were included. **Comparator** This group (n = 70) received no telephone calls but came in for baseline and 6-month assessment. **Follow-up** 6 months	used. Convenience sample. Paid $15. Self reported questionnaires.	VO2 max (t(65)=2.16, p<0.05), systolic blood pressure (t(66)=2.8, p<0.01), POMS vigour (t(66)=3.80, p<0.01) and POMS fatigue (t(66)=4.16, p<0.01).	
Nies 2006	RCT [++]	Three hundred thirteen	Physical activity level was	Intervention Telephone calls with counselling	A latent growth analysis (LGC)	All interventions increased the number of reported minutes walked and decreased the time	The authors did not report on the number of participants in

USA Walking		women were recruited for the study. The women were considered physically sedentary or most inactive at the beginning of the study based on self-report at the time of a telephone screening. Women were randomly assigned to one of three groups.	measured with an 11-point scale developed by the investigator. Participants checked a number from 1 to 11 indicating their current activity level. A value of 1 denotes someone who does not do any physical activity or walk and who does not intend to start in the near future. A value of 11 denotes someone who does vigorous exercise 6 or more times per week. The 7-Day Physical Activity Recall (PAR) was administered as a semi-structured interview by a trained research assistant. To assess physical fitness the Rockport 1-mile test was used. The profile of mood states (POMS) questionnaire was administered to	Telephone counselling participants received telephone calls over 24 weeks from a trained research assistant. Each person in this group received a call every week for 8 weeks and then every other week for the next 16 weeks for a total of 16 calls. The intervention telephone calls were constructed to provide counselling on exercise benefits, goal setting, exercise efficacy, social support, restructuring plans and relapse prevention. Telephone calls with no counselling Participants assigned to the brief telephone call group received the same number of telephone calls as the intervention group. These participants were to report on their physical activity over the past week or two, but none of the counselling was included Comparator The video education group received no telephone calls. The group watched a 20-minute video at baseline developed by the research team on the importance of walking and completed baseline measures. Follow-up The retention rate from baseline to 1 year was 81%. Assessment was made at baseline, 6 months and 1 year.	modelling approach was employed to assess the relationship between time and intervention group membership across 4 domains of outcome variables.	to walk a mile. The best fitting model for minutes walked per week indicated a linear increase from baseline to 6 months with a moderate maintenance from 6 to 12 months. This model held true across all groups ($X^2[6]=4.91$, p=0.557). The best fitting model for time to walk a mile suggests a linear decrease between baseline to 6 months and maintenance of that level from 6 to 12 months ($X^2[6]=1.97$, p=0.921). Although all three groups were similar for both parameters, in each case there was significant within group variance.	the three groups.

			assess mood of the participants				
NSW Health Department 2002 Australia	nRCT [+]	Two wards (an intervention and a control ward)	Physical activity participation rates, the proportion of people adequately active and use of local parks.	**Intervention details** The Walk It: Active Local Parks project aimed to increase participation in moderate physical activity in adults aged 25-65 years. Three parks in the intervention ward were selected to receive the park modifications and two parks from the control ward acted as control parks. The focus of the promotion campaign was raising awareness about the benefits of undertaking regular physical activity and using local parks. Activities included running an advertisement in the local newspapers, gaining publicity through feature articles, and the distribution of walking map leaflets to households in the intervention ward. An official project launch was also used to generate publicity. The publicity plan for the project, consisting of feature articles and paid advertisements. The walking maps were a double-sided, colour, A4, gloss-finish leaflet.. One side highlighted the importance of being active (and in particular walking), provided tips for being active, and had a map indicating four parks that have walking trails. These included the three intervention parks and an additional park adjacent to but located outside the intervention ward. The messages promoting physical activity were consistent with NSW Health Department (1995) moderate physical	telephone survey of residents from the control and intervention wards, direct observation of the five study parks, infra-red counting device to monitor park use.	Intervention ward respondents were more likely to have walked in the two weeks prior to the follow-up telephone survey than control ward respondents. A significant ward by gender interaction indicated that males in the intervention ward were 2.8 times more likely to walk than were males in the control ward whereas females in the intervention ward were only 20% more likely to walk than females in the control ward. Income, age and language significantly influenced the odds of walking. There were no significant differences between wards in the proportion of respondents that reported participating in activity at an adequate level at follow-up. There was also no measurable change from baseline to follow-up in levels of adequate activity in either ward. Gender was a significant factor, with the odds of being adequately active 30% lower for females than males. Both telephone survey and direct observation data indicated that there was no change in park use from baseline to follow-up.	The response to the telephone survey was low (20.3%) and respondents were not representative of residents in their ward in terms of education, household income, and usual language spoken at home, potentially biasing the results.

				activity recommendations. The reverse side of the leaflet provided more detailed maps of the walking trails in each of the parks Park modifications were undertaken in three parks within the intervention ward. Walking groups were also set up and promoted. **Comparator** Two parks in control area. **Duration/length of follow up** 2 years			
Pal 2009 Australia	RCT [++]	N=26 overweight and obese middle aged women, aged (35 – 55 yrs old), sedentary, overweight and obese women (body mass index {BMI} > 25 and < 35 kg/m2)		**Intervention** 26 overweight and obese middle-aged women were randomized into two groups: The control group was not able to record their steps daily, whilst the pedometer group, were asked to record the number of steps on a daily basis for 12 weeks. Participants in the pedometer group were told to record their pedometer steps on a daily basis for 12 weeks; those in the control group were asked to wear a sealed pedometer for 12 weeks with weekly recording. To collect baseline data, all thirty participants were asked to wear a sealed pedometer. At baseline, both groups were then given the National Australian Physical Activity Guidelines		The pedometer group significantly increased their steps/day, by 36%, at the end of the 12 weeks, whereas the control group's physical activity levels remained unchanged. There were no significant difference in the number of steps at baseline between the two groups. However, there was a significant increase in the number of steps with the pedometer group versus the control group at 6 and 12 weeks intervention ($p = 0.04$ and $p = 0.03$, respectively). At 12 weeks, the pedometer group had a 32% higher number of steps/day than the control group. The control group remained unchanged in the number of steps during the 12-week intervention. For the pedometer group, the daily average number of steps at weeks six (8321 ± 884 steps per day) and twelve (9703 ± 921 steps per day) were significantly higher than the baseline daily average of 6242 ± 541 steps per day ($p = 0.046$ and $p = 0.035$, respectively). At week	

				The pedometer group was also encouraged to reach a daily step goal of 10,000 steps/day. No step goals were set for the control group. At baseline, participants from both groups were encouraged to initially set small achievable goals like 10 minute walks and then to gradually increase the goal each week to at least 30 min/day. Physical activity was assessed at baseline and at 12 weeks using short-form International Physical Activity Questionnaire (IPAQ), **Control** The control group wore sealed pedometers **Follow up** 12 weeks		twelve, the pedometer group was taking an average of 3461 steps per day more (36% increase) than at baseline. There was no significant differences within groups or between groups in waist, BMI, waist/hip ratio, HR or % body fat at 12 weeks.	
Parker 2011 USA Cycling	BA [+]	New Orleans (LA) Observation area located between 2 neighbour hoods, with African American populations 87% above and 18% below national average with 45% and 19% below the	Number of men, women, children riding a bicycle with traffic, against traffic and on sidewalk.	**Intervention** Bike facilities (shared and exclusive cycle lanes) build in New Orleans on streets submerged by water during hurricanes of 2005. Intervention was 5ft wide striped cycle lane on both sides of the road. Speed limit 35mph. **Comparator** No direct comparator group **Duration/length of follow up** Follow up at one year. Data collected 6 months before and 6 months after cycle lane completed.	Trained observers used a tally form to record the number of cyclists. Baseline data collected for 10 days, follow up data collected for 14 days (daily for 9 hours 8am to 5pm).	57% (SD 18.5) increase in the mean number of riders per day (from 90.9 to 142.5) ($p<0.001$) 133% increase in mean number of female riders from 12.6-29.4 (-<0.001) 44% increase in mean number of male riders from 77 to 111.2 ($p<0.001$) Cyclist riding in the correct direction increase from 73% to 82% ($p<0.001$) (numbers not reported). No change in numbers riding on the sidewalk (24%) ($p=0.9$) (numbers not reported). Very few children were observed both times.	New Orleans is flat with temperate climate. Potential confounder = increasing gas prices, but prices decreased over the follow up period. Changes could be due to people returning to the area after the hurricanes. No comparison street; riders could be displaced from other streets without cycle lanes.

		poverty line.					
Perry 2007 USA Walking	RCT [++]	Age 21 to 65 years; Physically inactive, (defined by exercising less than 3 days a week at moderate intensity in the last month) Lived in a rural area. 67 women contacted the investigator in response to the flyers, and 46 women who met the criteria enrolled in the study. 23 were randomised to HTH and 23 to the comparison group.	BMI Cardio-respiratory fitness Self-efficacy for exercise	**Intervention** The key aspect of the individual-oriented component was motivational interviewing (MI). The main goal of the MI counselling was to assist the women in exploring their mixed feelings toward behaviour change, articulating the pros to change, and developing an action plan to increase Physical activity (PA). An advanced practice nurse (APN) conducted a private, in-person, 30-minute MI session at the beginning of the 12 weeks, followed by weekly, 10-minute MI booster session telephone calls. Additional strategies aimed at enhancing self-efficacy included women establishing individualized and realistic goals and monitoring their progress with heart rate monitors and logbooks. The main aspect of the group-based component was a 1-hour, weekly group walk using strategies to promote social support and self-efficacy. During the group walk, women walked together around a track for 30 minutes and were encouraged to walk with women who had similar walking paces. The APN moved back and forth across the track to provide encouragement and positive reinforcement to each woman during the walk. In addition, the APN led a weekly 15- to 20-minute discussion guided by the philosophy of MI before the start of the group walk at the track. In concert with MI, the women in the group, rather than the APN, identified salient topics to discuss and provided ideas on how to overcome	Pre-test measures were collected for each cohort at the start of their 12-week intervention. After the pre-test, women were paired based on their fitness level and then randomised using a procedure akin to a coin toss to either HTH or the comparison group.	At 12 weeks women in HTH had a greater improvement in cardio-respiratory fitness (P = 0.057) and in social support (P =0 .004) compared with women in the comparison group. Neither group of women experienced a change in exercise self-efficacy (P = 0.814).	

				challenges. They validated their experiences with each other regarding exercising in the past week and progress toward reaching their goals. Women also were encouraged to continue the weekly walks as the intervention came to an end. **Comparator** Women randomized to the comparison group received a brief 10-minute individual and private advice session and a monthly 5-minute reinforcement telephone call. In addition, they received an individualized exercise prescription following the American College of Sports Medicine guidelines and a logbook to record their walking. **Follow-up** Post-test measures were collected for each cohort at the end of the 12-week program. Forty-two completed the program (HTH, 20; comparison, 22).			
Prestwich 2010 UK Walking	RCT [++]	N=149 (144 students, 4 non-students, 1 missing data; 54 men, 95 women; mean age = 23.44 years, SD = 5.63 years). Participants were required to exercise less than three times per	Behaviour measure (pre manipulation and at the 4-week follow-up). Self-report index of walking The walking subscale of the SWET requires participants to note in a table their walks during the past week; the	**Intervention** To test the efficacy in promoting brisk walking of two theory-based interventions that incorporate implementation intentions and text message (Short Message Service; SMS) reminders directed at walking-related plans or goals. Each manipulation (and the information given to the control group) was presented as written text after the baseline measures were completed. **Implementation Intention + Plan**	Participants were recruited between January 15, 2007, and February 2, 2007, and completed follow-up measures 4 weeks after baseline. All participants were recruited using an e-mail distributed to a participant database that outlined the eligibility criteria	**Change in Brisk or Fast Walking** There was a differential change across groups on the primary outcome, F(2, 130) = 3.12, p = .048.1 Post hoc tests revealed that the implementation intention + plan reminder (vs. control: p = .04, d = 0.49, 95% CI [0.05, 0.94]) and the implementation intention + goal reminder (vs. control: p = .03, d = 0.45, 95% CI [0.04, 0.88]) conditions increased the number of days on which they met the physical activity daily guidelines, through brisk and fast walking, significantly more than did the control group. Forty-two percent in the goal reminder condition and 45% in the plan reminder condition benefited by at least an	This study provides preliminary evidence that an intervention using physical activity-based text messages and implementation intentions can increase physical activity. Specifically, implementation intentions paired with SMS that either reminded the participants of their brisk walking plans or their reasons for brisk walking significantly increased, relative to a control group, the number of days that a

		week (including brisk walking), not have a medical condition that prevented them from walking briskly, own a cell phone, and be able to attend a second (follow-up) session exactly 4 weeks after their first session. Participants received £15 ($24.74) each or course credit.	days on which they took these walks, the duration of each walk, and the speed of each Total physical activity Height, weight, waist size, and hip size were measured. From these measures, body mass index (BMI) and waist-to-hip ratio (WHR) were calculated.	**Reminder** Participants in this condition received the same text as the control group. Additionally, they were informed that it can be "helpful to make very specific plans regarding how you will walk briskly five times per week and receive text message reminders of these plans." They were also told that they were free to choose the situations in which to walk that would be easy, convenient, or enjoyable for them, and they were able to decide when they would receive text message reminders of these plans. Participants were then required to complete a task to help them form plans to help them to walk five times per week. They were required to think about when and where would be the most convenient or enjoyable for them to walk 30 minutes per day for 5 days per week in bouts of at least 10 minutes, provided with suitable examples, and asked to write this plan in the form "When I'm in situation X, then I will do Y." Participants were asked whether their plans identified enough situations to enable them to walk five times per week (30 minutes/day in bouts of at least 10 min). If they answered no, they were requested to formulate additional plans and were provided with space to do so. They then stated the day(s) and time(s) when they would like to receive text message reminders of these plans. They were required to receive at least one text message reminder of each plan. Finally, participants had to note down a username and password that would	and described the study as concerning attitudes and behaviour relating to walking.	increase of 2 days per week (compared with 22% in the control group). **Change in Total Exercise** The benefits of the amount of brisk or fast walking accrued through implementation intentions paired with text messages did not particularly have a negative impact on other physical activity. Specifically, there was a marginal difference in total physical activity across the three conditions, $F(2, 130) = 2.63$, $p = .076$. Post hoc tests indicated that the participants in the implementation intention + plan reminder condition exercised more than those in the control group ($p = .03$, $d = 0.55$; 95% CI [0.12, 1.01]). There were no differences between the other conditions (both p >0 .12). **Change in Weight and WHR** There was a marginal difference in the change in weight from Time 1 to Time 2 across the three conditions, $F(2, 136) = 2.42$, $p = .09$. The implementation intention + goal reminder group lost more weight than the implementation intention + plan reminder group ($p = .03$, $d = .47$, 95% CI [0.04, 0.91]). The main effect was significant when the implementation intention + goal reminder group was compared with the implementation intention + plan reminder and control groups combined, $F(1, 137) = 4.07$, $p = .046$, $d = 0.37$, 95% CI [0.03, 0.72]. The implementation intention + goal reminder group lost most weight (on average, 0.53 kg) compared with those in the other conditions (the implementation intention + plan reminder group gained an average of 0.10 kg; the control group lost an average 0.14 kg). There was no differential change across the three conditions in WHR, $F(2, 136) = 0.02$, $p = .98$.	participant self-reported brisk or fast walking for 30 min in bouts of at least 10 min. This was achieved without significant reductions in other types of physical activity of at least moderate intensity.

				enable them, if they desired, to log onto a website to change the content of the text message reminders, the number of text message reminders they would receive, or when these text messages would be delivered. They also wrote down their username and password on a tear-off slip of paper that noted the website address and kept this sheet of paper. Unless the participants logged in to stop their text message reminders, they were sent text messages over each of the 4 weeks. **Implementation Intention + Goal Reminder** The manipulation received by this group was exactly the same as that presented to those in the implementation intention + plan reminder condition with the following difference. Although participants were requested to formulate implementation intentions, they did not receive reminders of these plans. Instead, they were informed that it would be helpful to receive reminders of their brisk walking goal. They were subsequently required to decide the days and times when they would receive these text message reminders. The participants in this condition could also log into the system to change the content of the text message reminders, the number of text message reminders they would receive, or when these text messages were delivered, and they received text messages for the full 4-week period. **Comparator**			

				The control group received no text messages and was not required to form implementation intentions. However, as with all other participants, they provided their cell phone number and were informed of the current governmental guidelines for physical activity (30 minutes/day of at least moderate-intensity physical activity 5 or more days of the week) and the benefits of meeting these guidelines. Furthermore, they were told they did not meet these guidelines. Brisk walking was suggested as a good means to help them reach these targets, and they were then explicitly asked to try to walk for at least 30 minutes on 5 or more days per week (in bouts of at least 10 minutes). **Follow-up** Participants completed follow-up measures 4 weeks after baseline.			
Reger 2002 USA Walking	nRCT [+]	Sedentary and irregularly active adults aged 50 to 65 years, living in Wheeling, West Virginia, US (n=719) A comparison group was drawn from community of people living in Parkersburg,	The number of days in a usual week they engaged in brisk walking, moderate- and vigorous-intensity exercise behaviour, and the number of hours and minutes devoted to the activity each day. Additionally, all self-reported total	**Intervention** The ‘Wheeling Walks’ eight week campaign included paid advertising, special public relations events designed to generate additional media coverage, and public health educational activities at work sites, churches and local organisations. This was to promote 30 minutes of daily walking. **Comparator** No advertising campaign in comparison city.	College-level research technicians observed, counted and intercepted adult walkers at five predetermined popular walking sites two hours a day for one week, pre- and post-intervention. A telephone survey questionnaire measuring	Direct observation. There was a significant effect observed,(p<0.001) showing a 23% increase in walking observations in the intervention community versus a 6% decrease in the comparison community (Odds ratio 1.31, 95% CI 1.14 – 1.50). Self-reported behaviour changes. Of the pre-test sedentary adults, 32.5% reached criterion in the intervention community versus 18% in the comparison community (odds ratio 2.12, 95% CI 1.41 – 2.24). Respondents in the intervention community reported walking more minutes (mean = 129 minutes) versus comparison community (mean	

		West Virginia, US (n=753)	minutes of walking, moderate or vigorous activity that exceed 840 minutes (two hours a day) were recorded to equal 840 minutes.	Follow-up Of the 719 in the intervention community, at the end of the eight weeks, 517 (72%) were re-interviewed and 571 of the 753 (76%) of the comparison community.	physical activity and walking habits in a random sample of households in the intervention and comparison community.	= 87.6), p<0.003. The number of minutes reported walking also increased from pre-test (mean 63.8) to post-test (mean = 143) across both communities (p<0.001).	
Reger-Nash 2005 Australia Walking	nRCT [++]	Sedentary 50 to 65 year olds. N=750 at baseline. N=373 intervention and 357 control at 12 months.	Daily walking (min).	**Intervention details** Mass media, community wide physical activity intervention to promote sustained changes in walking. 8 week campaign. Consisted of paid advertisements (TV, radio, cable, newspapers), public relations and community participation. Recommended at least 30 minutes of moderate intensity daily walking. Booster campaign in month 11. 16 week free walking clinic started which had in excess of 300 adult and youth participants. **Comparator** Second, no intervention community. **Duration/length of follow up** 3, 6 and 12 months post intervention.	Telephone surveys at baseline, 3,6, and 12 months. Stratified into 3 groups; A walked 10min/day or less, B walked 15-60 min/day, C walked more than 60min/day.	Intervention community had higher proportions of sufficiently active walkers over time from 3-12 months. For the most sedentary (A) this was significant at 3 months (31% vs. 17%) and 12 months (32% vs. 18%) compared to baseline. Intervention group A (sedentary) compared to control were almost twice as likely to have made any increase in their daily walking at 3 months (OR=1.93, 95%CI 1.21-3.08, p<0.01), and 12 months (OR=1.72, 95%CI 1.01-2.95) and significantly more likely to have achieved sufficiently active walking status at 3 months (OR=2.13, 95%CI 1.25-3.62 p<0.01) and 12 months (OR=1.94, 95%CI 1.06-3.55, p<0.05).	12 week planning process before intervention. Power calculation suggests 180 per group. Intervention succeed in increasing walking amongst the least active and the effect was sustained at 12 months.
Reger-Nash 2006 Australia Walking	RCT [+]	Interventions communities were based in West Virginia (n=3) and New York State (n=1). No	Self reported rates of walking	**Intervention** Four community wide physical activity interventions to promote walking. Wheeling Walks, Welch Walks, BC Walks and WV Walks. Social ecological approach encouraged 10, 20 and then 30 minutes of daily moderately intense walking. 8 week multiple strategies included	Evaluated using telephone survey in intervention and comparison communities before and after 8 week media campaign.	32% of insufficiently active persons in Wheeling reported meeting the criteria for regular walking immediately post campaign compared to an 18% increase in the comparator community (OR=2.12, 95%CI 1.41-2.24). An increase in reaching regular walking was observed for the most sedentary group in WV walks (p<0.05).	In consistent reporting of results – reported as in paper

		demographic details given. Each intervention community had matched control with comparable walkability.		mass media campaign targeted insufficiently active residents (not defined). **Comparator** Each community matched with control located in same region but far enough away to have distinct local media. **Duration/length of follow up** 8 weeks.		The intervention community in Welch walks demonstrated a twofold (OR=2.0 95%CI 1.01-3.97) gain in weekly walking by at least 30 minutes versus the comparison community. 41% of the BC walks intervention community increased walking by 30 min/week compared to 30% in the control (OR=1.56 95% CI 1.07-2.28). There were no changes in any community for moderate or vigorous activity.	
Rissel 2010 Australia Cycling	nRCT [+]	A total of 1450 interviews were completed, with a response rate of 64.7 per cent. Of the 1,254 respondents at baseline who agreed to be re-contacted, 80.8% (n = 1,013) were able to be contacted, of which 909 agreed to be interviewed (89.7% response rate).	Socio-demographic characteristics (including age, sex, educational attainment, income, marital status, presence of children in the household and car ownership) were asked only at baseline. Frequency of Physical activity (PA) behaviour	**Intervention** Community based intervention. A range of project resources was produced or purchased and branded with the project name and logo. A map titled 'Discover Fairfield and Liverpool by Bike' showing the bicycle paths and useful cycling routes in the area was considered the key resource in raising awareness for non and infrequent cyclists by illustrating the extent of local bike paths. 20,000 maps were produced. A general information booklet addressing concerns of potential cyclists titled 'Thinking about cycling' was created to complement the map (n = 5,000). Water bottles (n = 2,000) and reflective slap bands (n = 2,000) were designed with specific project images to serve as cues to engage in cycling. As part of the project, a one-hour presentation was developed and delivered to 351 people attending 24 community or workplace groups between February and September 2008. The objective was to raise awareness of cycling, the benefits	Data were collected using standard computer assisted telephone interview techniques (CATI). Pre-post changes in the cohort were examined with paired t tests for continuous variables and McNemar's test for categorical measures.	At follow-up, almost a quarter (25.8%) of respondents in the intervention group had cycled in the last year compare with 19.4% of respondents cycling in the last year in the comparison area (p = 0.06). However, this difference is largely explained by the higher level of cycling in the intervention area at baseline (25.2%) compared with the control area (19.3%). At follow-up, there were no differences between the intervention and comparison areas in the proportion of respondents who had cycled in the past year overall or when the data were stratified by age and sex sub-groups. Despite similar path use at baseline, there was a significantly greater use of the bicycle paths in the intervention area (28.3%) at follow-up compared with the comparison area (16.2%) (p < 0.001) and path use was significantly associated with an almost ten per cent increase in having cycled in the past year (29.1% in the intervention area compared with 20.6% in the comparison area (p = 0.010). There was also a significantly greater proportion of respondents in the intervention area who	

				of physical activity, the CCC project activities and resources, and to generate discussion of how to progress to riding a bike or to riding a bike more. One of the main interventions in the early stages of the project was the offer of free cycle skills courses. These courses were designed for members of the public who wanted to ride but did not, and focused on basic skills and confidence **Comparator** No promotion **Follow-up** 24 months after baseline data collected.		were likely to use the paths in the future (28.6%) compared with the comparison area (17.8%) ($p < 0.001$). A greater proportion of respondents (13.5%) in the intervention area had heard of the Cycling Connecting Communities project compared with the comparison area (8.0%) ($p = 0.013$). Among those people who had heard of the project, there was a significantly higher proportion of respondents who had ridden in the last year in the intervention area (32.9%) compared with the comparison area (9.7%) ($p = 0.014$). In the intervention area, among those that had ridden in the past week there was a slight decrease in the mean minutes cycling for recreation or exercise (169.5 minutes to 152.1 minutes per week), but a large increase in the mean minutes cycling for transport (76.9 minutes to 174.2 minutes per week). In the comparison area there was a much bigger drop in the mean minutes of recreational cycling (190.3 minutes to 121.3 minutes per week) and a large drop in mean minutes of cycling for transport (197.6 minutes to 71.7 minutes per week). For the small subset of respondents that had ridden in the previous week at both baseline and follow-up ($n = 18$) a similar pattern was observed. Overall, among those that had ridden in the past week at baseline or follow-up, there was an increase in the total mean minutes cycled in the past week from 188.6 minutes to 233.0 minutes in the intervention area, compared with a decrease in the comparison area from 274.3 minutes to 134.1 minutes. Using the small	

						subset of paired data (riding in past week at both baseline and follow-up), after adjusting for baseline levels of minutes riding, there was a significant increase in the total mean number of minutes riding in the intervention area compared with the comparison area (p = 0.039). The increase in minutes riding can be explained in part because of an increase in the number of times participants went riding in the past week in the intervention area (2.9 to 4.8 times), and a slight decrease in the comparison area (4.6 to 4.5). There was no significant difference between the intervention and comparison area with regard to the total mean minutes of physical activity. There was a similar amount of change in the mean minutes of physical activity - from 234.1 to 260.7 minutes per week in the comparison area, and 210.9 to 242.2 minutes per week in the intervention area. There was no statistical difference between the intervention area (48.7%) and the comparison area (53.7%) (p = 0.130) in the proportion of respondents meeting physical activity guidelines of 150 minutes of moderate intensity physical activity per week. However, of those people who met the physical activity guidelines, 28.1% had cycled in the past year (16.0% in the past month) compared with 16.8% of those not meeting the guidelines having cycled (6.5% in the past month) (p < 0.001 for both past year and past month comparisons).	
Rowland 2003 UK Walking/ cycling	Cluster RCT [++]	21 primary schools in London.	Walking, cycling using public transport	**Intervention details** 11 intervention schools. Travel plans were developed by a school travel co-ordinator at the intervention schools but not in the controls.	Post intervention survey.	One year post intervention, 9 of 11 interventions schools and none of the 10 control schools had travel plans. The proportions of children walking, cycling, or using public transport on the school journey were not significantly	Grouping of public transport with walking and cycling.

				Comparator 10 control schools **Duration/length of follow up** 12 months		different between the intervention and control schools (school travel plans did not have a significant effect). In interventions schools 70% walked, 24% travelled by car and 6% cycled or used public transport. In control schools 71% walked, 23% travelled by car and 7% cycled or used public transport. Adjusted OR = 0.98 (95% CI 0.61-1.59) for walked, cycled or took public transport.	
Rovniak 2005 USA Walking	RCT [++]	61 sedentary (less than 90 minutes physical activity per week) adult women. Age 20 to 54, mean age 40.21 +/-9.14. BMI 35.5 to 39.9. mean 26.88 +/-4.91. 82% White. 67% married 74% college educated. 50 completed study: 25 high fidelity, 25 low fidelity.	1 mile walk test of fitness. Self reported walking quantity (time and distance) at baseline, post test and one year. Social cognitive theory measures	**Intervention details** Two 12 week email based walking programmes were compared. High fidelity programme designed to more precisely follow social cognitive theory (SCT) recommendations for operationalizing mastery procedures than the low fidelity programme, which was designed to simulate mastery procedures in most existing SCT physical activity programmes. Treatment contract and walking prescriptions were controlled across the groups. All participants met individually with project co-ordinator for 30 minutes. Informed of benefits of walking ,given 1 mile walk test, encouraged to plan walking and given a programme manual and walking log. Both groups instructed to walk 3 times per week for 30 min.. High fidelity group further instructed to walk around 2 miles each session. Both groups advised to gradually increase walking speed whilst maintaining perceived exertion, and to walk in a variety of settings. In addition, high fidelity group also	Walking logs completed during the programme. Process evaluation post test.	The high fidelity group improved more than twice as much as the low fidelity group on 1 mile walk test time (86 +/-0.50 vs. 32 +/-0.66 seconds $p<0.01$), goal setting ($p<0.05$) and positive outcome expectations ($p<0.05$) and reported greater programme satisfaction ($p<0.001$). There was a non-significant difference in the mean change in minutes walked per week between baseline and 1 year follow up: High fidelity increased walking by 34.23min +/-81.91 compared to a low fidelity increase of 7.91min +/-47.93, $F=3.207$ $p=0.08$	Suggests theoretical fidelity might advance the quality and effectiveness of walking and physical activity interventions.

				received a brief modelling demonstration, more long and short term goals, more precise, immediate self monitoring and more specific feedback about performance. They were given a free wrist watch and detailed list of 20 local walking routes of around 2 miles. **Comparator details** Comparison of two interventions. **Duration and length of follow up** 12 weeks. 1 year follow up			
Ryder 2009 Canada Walking	CS [-]	5 Canadian public libraries. 41 library patrons (33F, 8M, Age 18-65+).	Self reported: Walking patterns, patterns of pedometer use, reason for borrowing pedometer, effects of pedometer use (goal setting, changes in motivation).	**Intervention** Lending pedometers to library patrons to increase walking. 90 pedometers made available for 6 months. Loan for maximum of 9 weeks. Education packages handed out with pedometer: info on pedometer use, physical activity/walking recommendations, maps of local trails, Walking Challenge Questionnaire. **Comparator** None **Duration/length of follow up** 6 months.	Questionnaire	In 6 months more than 330 pedometer loans were made. Found significant association between change in walking and motivation to walk more (X^2=8.73 p<0.05), change in walking and goal setting (X^2=9.39, p<0.05) and motivation to walk more and goal setting (X^2=12.54, p<0.001). The majority of borrowers reported wearing the pedometer on a daily basis (79.5%). Of 38 respondents who reported their walking status, 39.5% indicated they walked more since borrowing the pedometer and 60.5% reported walking about the same. None reported walking less. 92.1% indicated that the pedometer acted as a motivational tool and 78.9% indicated that the pedometer succeeded in motivating them to set a walking goal.	Did not focus on number of steps per day, but whether participants used pedometer as an incentive to increase walking behaviour in general. Those maintaining walking levels may have had satisfactory levels at baseline – future testing should take baseline measurements. Sample is small, homogenous and self selecting.
Schofield 2005 New	Cluster RCT [+]	Low active adolescent girls.	Daily step counts or physical activity recall.	**Intervention** Girls stepping out programme. Compared effectiveness of daily step	Pre, mid and post intervention measures .	PED group had significant increase in steps between baseline and week 12 and between week 6 (p<0.001), and week 12 (p<0.001), but	No significant differences between group demographics at baseline.

Zealand Walking		N= 85 Mean age 15.8 (0.8). White. Three schools, least active girls selected from descriptive study (n=415) N=68 in analysis (unusable or missing data)	BMI 1 mile walk test (heart rate monitors). Participants assigned by school to control (CON), pedometer (PED), or minutes of activity (MIN) group	counts with time based prescription for increasing the health related physical activity of low active adolescent girls. 12 week physical activity self monitoring and educative programme. PED group set daily step targets, MIN group set daily time based activity goals. Personal log book included 12 week log and information on how to be more active, overcoming barriers, injury prevention. PED group encouraged to increase daily activity by 1-2000 steps each week until reached at least 10,000 steps per day. MIN group encouraged to increase daily activity by 10-15 minutes to daily average of 30-60 min. **Comparator** No information on control – no intervention? **Duration/length of follow up** 12 weeks; baseline (week 0), intervention phase (week 1-6), maintenance phase (week 7-12).	Personal log books (self reported).	not baseline and week 6 (p=0.11). MIN group had significant increase in steps between baseline and week 12 (p<0.01), and between week 6 and week 12 (p<0.001), but not baseline and week 6 (p=0.06). There were no significant differences between time points for CON (p=0.23=0.79). Daily step count resulted in greater increases in accumulated physical activity that time base prescription.	Significant difference at baseline between groups on step count (p<0.01), but control group highest. Significant differences not seen at 6-12 week measures; PED may not be superior to MIN beyond an initial 6 week period. Short timeframe. Non-random assignment of individuals. Small sample.
Sloman 2009 UK Cycling	BA [+]	Six towns following the first phase of the Cycling England / DfT Cycling Demonstratio n Town .	Changes in cycling and physical activity	**Intervention details** The towns involved in the first phase of the Cycling Demonstration Towns programme were Aylesbury, Brighton & Hove, Darlington, Derby, Exeter and Lancaster with Morecambe. One of the towns, Darlington, was also part of the Government's Sustainable Travel Town	Cycle activity measurement by automatic cycle counters, manual counts; secondary data sources, in particular from school and	Mean increase in cycling levels across all six towns was 27%, relative to a 2005 baseline (to March 2009. Annual percentage change in cyclists using data from all the towns is 4%. The proportion of adult residents of the local authorities with Cycling Demonstration Towns	The towns involved in the first phase of the Cycling Demonstration Towns programme were Aylesbury, Brighton & Hove, Darlington, Derby, Exeter and Lancaster with Morecambe. One of the towns, Darlington, was also

		Survey quota sample: n=1,500 aged 16+		programme. More generally, all of the towns implemented a range of wider initiatives with the potential to increase cycling levels, beyond those that were directly funded by the Cycling Demonstration Towns programme – for example, through school travel planning supported by the Travelling to School Initiative; through investment in cycle facilities at new schools built as a result of the reorganisation of delivery of secondary education in Exeter; and through capital investment from the Community Infrastructure Fund for a cycle / pedestrian bridge in Aylesbury **Comparator details** Compared to cycle rates nationally - the general trend in medium urban areas over the period since 2005 (and indeed since 2002) was either for cycling levels (in terms of average distance cycled per person) to have been broadly stable, or perhaps, if average number of cycle trip stages are examined, to have slightly declined. Compared with London: Transport for London. Cycling levels, as measured by cycle counts on the strategic road network (the Transport for London Road Network, or TLRN), grew by 107% in the eight years between 2000/01 and 2008/09. **Duration and length of follow up** October 2006-March 2009	workplace travel surveys; and additional monitoring mechanisms such as cycle parking counts. Two surveys of cycling activity and physical activity, carried out by ICM in all six towns in March 2006 and again in March 2009.	cycling for at least 30 minutes once or more per month increased from 11.8% in 2006 to 15.1% in 2008, an increase of 3.3%-points or 28%. Meanwhile, the proportion of adult residents of the six towns who cycled regularly (that is, for at least 30 minutes 12 times or more per month) increased from 2.6% in 2006 to 3.5% in 2008, an increase of 0.9%-points or 37%. Using a validated measure of physical activity, EPIC (taking together cycling, other physical exercise, and activity at work), the proportion of adult respondents classed as inactive fell from 26.2% in 2006 to 23.6% in 2009, a fall of 2.6%-points or 10%. Pupil Level Annual School Census: the proportion of children who usually cycled to school increased by 16% or 0.3%-points (from 1.9% to 2.2%) over this 12-month period. 129 schools (46% of all schools) were offered the intensive support of a 'Bike It' officer. The proportion of pupils surveyed who 'never' cycled to school fell by 29% or 22.6%-points (from 78.5% to 55.9%) between the baseline survey at each school (in either September 2006 or September 2007) and the ex-post survey approximately 10 months later	part of the Government's Sustainable Travel Town programme Manual counts included both 'on-carriageway' cyclists and those cycling on cycle paths or tracks, while most, but not all, automatic counters were sited in traffic-free locations. Exeter and Lancaster with Morecambe, showed quite large increases in automatic cycle counts but a small decline in manual counts. The cycle count data show changes in the flow of cyclists passing designated points, but this does not distinguish where existing cyclists cycle more often, and new people have begun cycling. Definition of cycling activity – a trip lasting at least 30 minutes – is problematic because it fails to capture a significant proportion of (shorter) cycling trips.
Sloman	BA	Whole	Rates of walking	**Intervention details**	Detailed travel	Cycling: the number of cycle trips per head	Some disagreement between

2010 UK Walking / cycling	[+]	populations of Darlington, Peterborough and Worcester. N=4000 in each site	Rates of cycling	Sustainable travel towns. Intensive town wide Smarter Choice Programmes to encourage use of non car options; bus use, cycling and walking, and less single occupancy cars. Strategies included: Development of brand identity Large scale personal travel planning programme Cycling and walking promotions Travel awareness campaigns Public transport information and marketing. School travel planning Workplace travel planning. **Comparator** Data from national travel survey and household survey. National road traffic estimates. **Duration/length of follow up** 2004-2009	surveys in 2004 and 2009. Interim household, school and workplace surveys, bus passenger counts, automated cycle and vehicle counts, manual counts,.	grew substantially in all three towns by 26-30%. In comparison towns cycle trips decreased. Walking: The number of walking trips per head grew substantially by 10-13% compared to a national decline in similar towns.	household survey and manual counts.
Spence 2009 Canada Walking	RCT (+ +) 4 group design	N=63 female university students. 95% under 30.	Self reported walking. Walking intention. Self efficacy.	**Intervention** Pedometer and pre-test n=16, pedometer and no pre-test n=16, no pedometer and pre-test n=15, Pre-test conditions included questions on walking, interventions to walk 12,500 steps per day, and self efficacy for walking 12,500 steps per day. In the pedometer conditions, pedometer was worn for one week for all waking hours. All participants completed post test questionnaires.	Questionnaires. Step counts.	No significant interaction was observed for either walking intention F=0.61, p=0.44, or self reported walking F=0.13, p=0.72. The effect of pedometers on walking was significant F=12.04, p=0.001. After using the pedometers for one week, those in the pedometer group formed weaker intentions (M=3.19) than those in the control group (M=3.90) to walk 12.500 steps/day in the next week. No main effect of pedometers was observed for self reported walking F=0.81, p=0.37.	The observed statistical power of the study was low (no further detail).

				Those in the non-pedometer conditions were informed they could wear a pedometer the following week. **Comparator** No pedometer and no pre-test n=16 Health benefits questionnaire administered to participants in the no-pre-test groups. **Duration/length of follow up** One week intervention.		In comparison to the no pedometer group, the pedometer group reported more walking, F=5.22, p=0.03. However, no significant effects of the pedometer were observed for either task self efficiency or scheduling self efficiency F=0.00, p=0.98. Around 75% (N=25) returned the log sheets of their steps. This data showed no significant difference was observed in the average number of steps per day between those users who were pretested (M=10,307) and those who were not (M=10.276, T(23)=0.04, p=0.98.	
Staunton 2003 USA Walking/ cycling	BA [+]	21 elementary and middle schools (recruited by the third year of the programme). Six schools completed survey in year 1, and 7 schools in year 2.	Walking and cycling to school	**Intervention details** Safe Routes to School Programme Promote walking and cycling to school using a multi-pronged approach. The programme identifies and creates safe routes to school and invites community wide involvement. A full time educator is employed to develop the curriculum and oversee classroom education. A traffic engineer assists in identify and creating safe routes. **Comparator** None **Duration/length of follow up** 2 years	Classroom surveys	Participating schools reported an increase in school trips made by walking (64%), biking (114%), and carpooling (91%), and a decrease in trips made by private vehicles carrying only one student (39%).	Only two schools participated in surveys in both years. Authors report that analysis of these two schools only produced similar results to those reported for all schools.
Steele 2007 Australia Walking	RCT [++]	N=192 Inactive adults with internet access. Age >18. FACE n=65 IM n=65 IO n=62	Self reported physical activity (PA) at four time points. Step counts	**Intervention details** Effectiveness of delivery modes for behaviour change program targeting physical activity. Face to face, internet mediated or internet only intervention. Based on social cognitive theory and self management skills. Health eSteps: variety of topics	Measurements collected at baseline, immediately post intervention (12 weeks) and at 2 and 5 month follow up.	No group x time interaction for PA (F(6,567)=1.64, p>0.05) and no main effect for group (F(2.189)=1.58, p>0.05). However a main effect for time (F(3,567=75.7, p<0.01) was observed for each group.	Support for internet in delivery of PA interventions but no difference between mediated an unmediated PA delivery. AT 80% power, suggests 50 per group. Dropout rate was 17.2%

		White females (83%) age 38.7 (+/-12 yrs) BMI 32.1 (+/-3.4)		focusing on lifestyle PA, benefits and barriers, goal setting, self monitoring, self talk, self-reinforcement, time and stress management, relapse prevention, social support. Face to Face: 1 hour weekly groups based sessions on relevant behavioural and self management strategies. Received log book to record step counts and encouraged to attend. Internet-mediated: Intervention website with weekly module, weekly emails. Also two face to face sessions. (weeks 5 and 9). Online log to record steps and email support available. Internet only: website only no support. **Comparator** Three delivery modes compared. **Duration/length of follow up** 12 weeks, 5 month follow up.	Questionnaires were self reported and administered face to face. Included the Active Australia Questionnaire.		immediately post intervention and retention varied from 80% FACE to 72%IM at 5 months.
Sustrans Bike it 2008 UK Cycling	BA [+]	"Sample of roughly 11,000 pupils at 52 schools"	Cycling rates	**Intervention details** Bike It works directly with schools who want to increase levels of cycling to help schools to make the case for cycling in their school travel plans; supporting cycling champions in schools and demonstrating that cycling is a popular choice amongst children and their parents. The aim is to create a pro-cycling culture in the school which continues long after the Bike It officer has left. Bike It is a partnership project and which works closely with schools, parents and local authorities.	Classroom surveys Cycle shed counts	Nearly half (47%) of pupils expressed a desire to cycle to school, 3% of them already cycled to school every day and by the summer of 2007, this figure had increased to 10%. The number of pupils cycling at least once a week had increased from 10% to 27%. The number of pupils who never cycle fell from 80% to 55%, representing a marked increase in the number of new cyclists London case study: Over 50 pupils at the school took part and together with staff and parents, they made over 300 cycle journeys during the challenge. The number of pupils cycling every day has trebled from 3% to 9% of school journeys	Only percentages reported. Report is written in promotional language and therefore is not critical.

				Comparator None **Duration/length of follow up** Annual report. Most individual projects measure data over a year.		whilst the number of pupils cycling at least once a week increased from 11% to 20%. The number of pupils who never cycle fell from 81% to 68%. A greater number of children owned a bike, up from 70% to 77% of pupils over the course of the year.	
TAPESTRY 2003 UK Walking	nRCT [+]	Primary schools (11 intervention, 2 control)	Walking to school	**Intervention details** "Targeting the environmentally aware". The TAPESTRY initiative is a three year EU sponsored project aiming to increase the knowledge and understanding of how effective communication programmes or campaigns can be developed to support and encourage sustainable travel behaviour. Interventions in school linked to national Walk to School Week. Included leaflets on benefits of walking, banners, stickers, certificates, and campaign website. Education packs are also provided. In addition classroom planners provide assistance with monitoring activity. **Comparator** Two schools **Duration/length of follow up** 4 weeks	Classroom surveys	The proportion of children walking to work at least once was not significantly different between intervention and control schools. Walking increased from 75% to 76% in interventions schools and decreased from 78% to 77% in control schools.	All intervention schools had also received walk to school campaigns, which the control schools had not received. Intervention was only 4 weeks.
Telfer 2006 Australia Cycling	BA [+]	20 CPT courses were conducted. N=113	Cycling Other moderate physical activity. Recorded by retrospective	**Intervention details** Cycling proficiency training programme for adults. Focused on practical skills development and supervised on road or cycle path training. Free courses for beginner and	Pre and post course self administered questionnaires. Follow up	Overall, at 2 month follow up, there was no change in participants reported mean frequency or duration of cycle trips based on a 1 week activity recall. However, those not cycling in the month before	Of 113 people who enrolled, 81 (72%) completed at least one course (beginner or intermediate) and 105 (93%) these took part in the pre and follow up interview.

		87% aged 25-54 85 (75%) female	recall.	intermediate level cyclists were conducted either on weekdays or weekends with each course comprising of 6 hours of tuition broken into 2 or 3 sessions. The maxim number of participants was 8. The programme was promoted through flyers, posters, media releases, articles and adverts in local news papers and on a popular TV programme. **Comparator details** **None** **Duration and length of follow up** Follow up 2 months after intervention.	telephone interview at 2 months	the course reported an significant increase (p<0.001) in their mean duration in minutes of cycling. In addition there was a significant increase (p<0.001) in participants mean frequency of moderate intensity physical activity other than cycling. Of the 105 participants interviewed 2 months after the course, more than half of participants (56%) said they cycled more 2 months after the course than before the course. There was a 40% increase in participants having cycled in the previous week at follow up among baseline non-cyclists, although this was not statistically significant. There was also a significant increase in weekly participation on other forms of moderate intensity physical activity.	
TenBrick 2009 USA Walking/ cycling	ITS: [-]	City of Jackson is blue collar city of 36,000. Population 20% black, 74% white, 4% Hispanic. 30% <18 yrs.	Transport mode Participation Walking to school cycling	**Intervention** Project U-Turn aimed to increase active transportation (e.g. biking, walking, transit use) through an integrated approach to Active Living by Design's community action model and Michigan Safe Routes to School model. **Comparator** No direct comparator. **Duration/length of follow up** 5 years.	Transport survey (questionnaire)	The 2005 survey documented a citywide count of 1028 people using active transport, a year later this study showed an increase of 63%. Safe routes data indicated a steady increase in students who walk to school (data not given). Participation in walk to school days increase from 600 in 2003 to 1200 to 2008. Community bike programme increased cyclists using and requesting improvements to bike facilities throughout the city. Approx 60% of 100 participants reported continued use of bike for transport 1 month after receiving bike training. Smart commute day increased steadily from 165 in 2004 to 520 in 2008.	The data reporting here is poor and often anecdotal with a lack of data. A further report will not be obtained in the timeframe of this review: Hendricks K. Use of active transport in Jackson 2006: Jackson MI: Fitness Council of Jackson 2008.
Thompson 2007	BA [+]	The study was conducted among	Daily walking Subjects were	**Intervention** Three treadmills selected for quietness were purchased, and workstations were	The data analysed were restricted to working hours	Subjects increased their steps during work hours from 2200 to 4000 during acclimation (p=0.01) and to 4200 during the treadmill period	

USA Walking		employees (n=25) in the Executive Health Program at the Mayo Clinic. Two volunteers from each of the four main occupations in the programme (nurses, clinical assistants, secretaries and appointment secretaries) were recruited.	surveyed regarding the feasibility and productivity of the new workstation. The survey consisted of 10 questions answered using a Likert scale.	devised and built to use with them. As the secretaries used a foot pedal to transcribe dictation, a special keyboard was constructed so that the Dictaphone could be controlled from the keyboard. Daily steps taken were measured with the StepWatch Activity Monitor system. This system provides an accurate and precise measure of steps per day and has been shown to be superior to pedometers, particularly at slow Speeds. Subjects used the StepWatch Activity Monitor system for 6 weeks in total, 2 weeks while performing their jobs in the usual fashion (i.e., seated), 2 weeks acclimating to the walking workstation and then 2 weeks using the walking workstation. Subjects were able to get off the workstation and sit any time they wished. No reminders were sent to subjects to use the workstation, nor were any behavioural support or instruction provided. **Comparator** N/A **Follow-up**	(9:00–16:00).	(p=0.03). There was variability in increased steps among the subjects. Most subjects increased their steps between 1.5 and 2 times when the treadmill was available. All subjects walked an additional 30 minutes per day (between 9:00 and 16:00) and two subjects walked an additional 2 hours per day.	
Travelsmart 2005 Walking /Cycling	ER [+]	Projects were conducted throughout Australia No population data are given	Cycling Walking Transport mode.	The evaluations cover three strands of TravelSmart in Australia: households, workplaces and schools. The projects and the evaluations fall into broadly two types: • small-scale pilots (typically 20–150 participants, or 1–4 organisations)	No analysis details given	Household projects routinely showed decreases in car use of 4-15% and rise in use of walking, cycling and public transport. Workplace results were more varied with reductions in car use of 0-60%, public transport increases of up to 50% and modest increases in	There is a small amount of evidence which suggests that changes are maintained for 5 years. There is summary data from each project but all provided as

				• larger implementations (600–1600 participants). TravelSmart Australia brings together the many community and government based programs that are asking Australians to use alternatives to travelling in their private car. TravelSmart programs by Commonwealth, State and Territory Governments ask people to make voluntary changes in their travel choices, encouraging people to use other ways of getting about rather than driving alone in a car. For example - using buses, trains and ferries, carpooling or by cycling or walking, or by tele-working. TravelSmart asks you to think about your travel needs. Use alternative transport to the car, for example using walking, cycling and public transport. Reduce the negative impacts of the car on traffic congestion and air pollution. Recognise the health benefits of incidental exercise such as walking or cycling. Choose shops and facilities that are near you to reduce the need to travel and to support your local businesses.		walking and cycling. There are few figures for School projects, and no general results can be drawn, apart from the general observation that some reduction in family car travel does seem to occur, and there is strong support for Walking School Buses amongst schools, parents and students. All the projects reviewed used some variation on community-based marketing principles, rather than mass-media approaches. The evidence from these evaluations support this emphasis. Factors that appear to be decisive in securing travel behaviour changes are: • personal engagement at a one-to-one, household or local workplace level • functional materials—such as public transport tickets, maps, and timetables—that allow people to explore new travel options, plan and make decisions • support of local leaders—councils, senior company management, school boards • whole-of-community involvement—larger interventions appear to have larger results, suggesting that individuals are supporting and reinforcing each others' behaviour • removing incentives for car travel, penalising car use, or rewarding 'green' alternatives.	% change only, with very little additional statistical analysis reported
Travelsmart 2011.	ER [+]	Whole population. Households in the project areas.	Walking Cycling Active travel Car use	As above.		At each site there was an increase in walking for travel which ranged from 11% to 29% annual increases. Cycling for travel increased by between 14% and 69% (from variable baselines). Travel by car decreased at each site by between 10 and 14%, and overall sustainable	Data given as percentages only in many cases, but cumulative data is compelling. Individual site reports have not been extracted due to time

						travel trips increased at each site (between 9% and 29%). It is not immediate clear from the reports which years these changes refer to and whether each measure was taken in the same year. However, it is reported that Travelsmart consistently achieves reductions on car trips of 10% or more, reducing car travel by between 740km and 1,400km per household per year	constraints.
Tully 2007 NI Walking	RCT [++]	Employees aged 40 years and older working in Northern Ireland Civil Service departments that agreed to facilitate the study (n=106). Participants were healthy, sedentary 40 to 61 year old adults of both sexes.	Height and weight used to calculate body mass index. Waist and hip circumferences. Arterial blood pressure and heart rate Functional capacity was then assessed using a 10 metre shuttle walk test. All participants completed a brief food frequency questionnaire and were asked not to change their diet during the study.	**Intervention** Three day group, participants allocated to this group were asked to walk briskly (at a pace faster than normal;, which lead to mild shortness of breath) during three days a week for 30 minutes a day. They were given a pedometer and a diary and asked to record the number of steps taken, the duration of the walk, the level of breathlessness, and any comments or difficulties during each bout of walking (n=44). Five day group, participants allocated to this group did the same as the three day group, but for five days a week (n=42). **Comparator** Participants in the comparison group were asked to maintain their current lifestyle for 12 weeks, given a diary, and asked to record any exercise taken above what they would normally do. After 12 weeks of the study they were given pedometers and invited to begin their own walking programme. **Follow-up** The questionnaire and other measurements were taken at baseline and were repeated one week after	Changes within the groups were analysed using paired *t* tests on baseline and 12 week results. The extent of change (between baseline and 12 week measurements) was compared between groups using ANOVA and Gabriel's post hoc test. Data were analysed using an intention-to-treat procedure, substituting baseline data for those at 12 weeks for the participants who withdrew during the study.	At baseline, the three day group had a larger waist circumference, lower triglyceride levels, and a higher total cholesterol to HDL cholesterol ratio than the five day group; compared with the control group they had lower triglyceride levels . Adherence was similar within the three day (89%) and the five day (83%) groups. Some participants in both the three day and the five day groups (eight and nine, respectively) chose some days to walk in multiple bouts. Relatively small percentages of both programmes were completed in multiple bouts (three day, 2.7%; five day, 6.5%). In both groups similar numbers of steps were recorded for each day's 30 minute programme (approximately 3500) and measures of breathlessness were similar. The mean walking time recorded each day was 2.6 minutes longer in the three day group than in the five day group. Within the three day group, weight, BMI, waist circumference, hip circumference, total cholesterol to HDL ratio, and systolic blood pressure decreased significantly, and functional capacity and triglycerides (log transformed) increased . In the five day group, waist circumference, hip circumference, and systolic and diastolic blood pressure decreased significantly, and functional capacity increased. No significant changes were observed within the control group. To determine whether the significant changes in	

				completion of a 12 week programme. Overall 89% (93 out of 106) completed the study.		weight and BMI observed in the three day group but not in the five day group were a result of a sex imbalance between the groups, subsequent subgroup analysis comparing the response of men and women in each of these groups was carried out by independent t test. No significant differences were found between the responses of men and women within each group with respect to their change in weight (three day group: men, mean (SD) 20.97 (1.9) kg; women, 21.1 (3.00) kg, p=0.78; five day group: men, 20.79 (2.08) kg; women, 0.05 (2.73) kg, p=0.28), or BMI (three day group: men, 20.29 (0.63) kg/m^2; women, 20.42 (1.10) kg/m^2, p=0.79; five day group: men, 20.27 (0.78) kg/m^2; women, 20.20 (0.93) kg/m^2, p=0.26). Analysis of the food frequency diaries revealed no changes in diet within any of the groups (Wilcoxon signed rank test). ANOVA analysis of distance walked in the 10 meter shuttle walk test (F=2.96, df=2, p,0.05) and subsequent post hoc analysis showed no significant differences between the three day and the five day group (Gabriel's post hoc test p=0.81) but the three day group had a significantly greater increase in functional capacity than the control group (Gabriel's post hoc test p=0.03).	
Vernon 2002 UK Walking	CS [+]	Of the respondents 82 per cent were women and 62 per cent were aged between 41 and 70 years.	Activity levels were determined using the Allied Dunbar National Fitness Survey (ADNFS),	**Intervention** The purpose of the 'Doorstep Walk' initiative was to design a pack of ten attractive, accessible, local walks ranging between 20 and 65 minutes in duration with an appeal to the general population. Seven of the walks linked 'green areas' within the City of Salisbury (Wiltshire) and three were in	The study adopted a pre- and post-intervention design utilising a subjective, self-administered postal questionnaire. The questionnaire,	**Sustainability** Sixty respondents reported that they were still using the pack 18 months after it was received; this represents 18.6 per cent of the original cohort. It should be noted that in the original study 87 per cent of those currently using the pack indicated that they would continue to do so.	

				the countryside on the outskirts. The walks were classified on a five-point scale of ease (distance and gradient) to allow participants to increase the intensity and duration as their fitness progressed. Enclosed within the walking packs was general information about the benefits of regular physical activity, clear directions of the walks, information of local interest and a record sheet for participants to record their achievements. Five hundred free packs were disseminated to the general public through general practitioner (GP) surgeries and health centres, leisure centres, libraries, social service departments and voluntary organisations. **Comparator** N/A **Follow-up** Of the 322 questionnaires issued, 178 were returned. However, 28 were soiled, therefore the analysis is based on 150 questionnaires; this represents a 46.6 per cent response.	which was designed to examine the longer-term impacts of the Doorstep Walks initiative, was issued to all participants (322) 12 months after the initial evaluation, that is 18 months after the implementation of the initiative.	Over a quarter of the respondents (26.7 per cent of the 'continued users') indicated that their involvement consisted of at least six walks in the last three months. Six walks equates to a minimum of two hours 'Doorstep Walking' or a maximum of 6.5 hours 'Doorstep Walking' per 3-month period, depending upon which 'Doorstep Walk' was used. 56.7 per cent said their involvement was between one and five walks. There was no significant difference between those self-reporting as active before the intervention and those who self-reported as sedentary in their continued use of the pack. 56.4 per cent of the active and 60 per cent of the sedentary were not using the pack p=0.924). There was no significant difference in the proportion of males and females reporting continued use of the pack (41 per cent of males, 40 per cent of females (p>0.05). Those who continued to use the pack were more likely to report that they had been encouraged to go on alternative walks than those who did not (p<0.001). Similarly continued users were more likely to say that the pack had increased the distance they were prepared to walk (p=0.001). Fifty-five per cent of the respondents (n=22) who classified themselves as 'sedentary' on the ADNFS at the time of receiving the pack reported a shift in activity status to 'active after 18 months (p<0.001). Of the 60 respondents still using the pack 25 per cent were sedentary when they received it. However, after 18 months of use only 3.3 per cent remained inactive; 96.7 per cent of the previously sedentary who still used the pack became active. These increases were statistically significant (	

						p<0.001).	
Warren 2010 USA Walking	BA [+]	10 work sites in rural NY state. N=188. Mean age 45. White 96.8% Women.	Step count. 5 step zones (Tudor-Locke et al 2004): sedentary, low active, somewhat active, active, higher.	**Intervention** Small steps are easier together. Ecologically based intervention to increase walking by women. Pedometers and personalised daily and weekly step goals. Local strategies included walking groups, marked walking circuits and posted walking maps. **Comparator** No direct comparator **Duration/length of follow up** 10 weeks.	Baseline questionnaire. Personal activity log (self reported).	Intention to treat analysis revealed a mean increase of 1503 steps (38% increase over baseline). Mean weekly step counts values for all intervention weeks were significantly higher than baseline (p<0.01). Participants reaching weekly step goals was 53% on average and gradually increased from 37% to 65% at the end of the intervention. Movement to a higher step zone over baseline was found for 52% of sedentary (n=80), 29% of low active (n=65), 13% of somewhat active (n=28) and 18% of active (n=10). This placed 36% at somewhat active or higher, compared to 23% at baseline (p<0.005). Sedentary participants decreased from 42% at baseline to 26% at week 10 (p<0.001). Participants who were somewhat active or higher increased from 23% at baseline to 36% at week 10 (p<0.01).	Over 10 weeks mean 60.7% retention (reporting) rate. Drop outs did not differ significantly. No weight outcomes . Authors suggest longer assessment and intervention periods needed. Design does not allow efficacy of specific strategies to be considered as each site differed.
Webb 2010 Scotland Stair climbing	BA [+]	The study was conducted in a UK shopping mall. No population info.	On Wednesdays and Thursdays (11.00 a.m. to 2.00 p.m.), an inconspicuous observer recorded the travel mode used by each ascending pedestrian (stairs/escalator). Individuals were counted if they	**Intervention** Two weeks of baseline monitoring was followed by a 5-week intervention in which banners were installed on the stair risers of both staircases. They carried the message 'Stair climbing burns more calories per minute than jogging. Take the stairs'. The text was 5-cm high. **Comparator** N/A	The site was chosen as it featured the prototypical layout found in previous stair climbing interventions—a bank of ascending and descending escalators, flanked on either side by a staircase. The site	The chi-square analyses revealed no significant difference in the proportion of men versus women between the baseline and intervention phase (P =0.78). By contrast, there was a significant difference in ethnic distribution, such that during the intervention 2.3% more people were coded as non-White than at baseline (P < 0.001). Similarly, the proportion of people coded as overweight significantly differed between baseline and the intervention (33.3% versus 31.7%; P < 0.05). There was, however, a significant interaction	

			completed an entire ascent using either mode. Additionally, personal/demographic characteristics: gender, ethnicity weight status (normal weight/overweight) and baggage	**Follow-up** Owing to limited man power, observations were not taken in Week 5 and the study was terminated after 7 weeks of observation.	featured an overhanging ceiling, such that the top of the staircase was not visible from the foot of the stairs. Each staircase contained 38 steps.	between condition and weight status, suggesting greater responses to the intervention among overweight individuals. Consequently, separate regressions were conducted for each weight category. The normal weight analysis showed a significantly increased likelihood of pedestrians taking the stairs during the intervention (OR = 1.29, CI = 1.09–1.53). Meanwhile, the overweight analysis indicated much larger intervention effects (OR = 1.95, CI = 1.34–2.83) and a main effect of gender.	
Wen 2005 Australia Walking & cycling	BA [+]	Randomly selected health service employees working in a health care facility in inner-city Sydney, Australia. N=68	Pre- and Post-intervention surveys measured changes in awareness of the concept of active transport, knowledge of active transport options, attitudes to promoting active transport, stage of change and mode of transport on normal working days and Sundays. Attitudes were assessed using a standard five-point Likert scale.	**Intervention** The intervention was staged over 12 months and consisted of the development of resources with target group involvement, social marketing and individualised marketing strategies. Social marketing programmes are developed to satisfy consumer's needs, strategized to reach the audiences in need, and managed to meet organisational objectives. Three focus groups with different segments of the employees were conducted to develop campaign slogans and to decide on images to be used in the social marketing strategy. A series of four events were held every three months of the 12 month period. Poster displays depicted five images of employees who used different modes of active transport (walking, cycling, travel by train or bus, or car pooling).	The study was evaluated using a test re-test survey design. Paired sample *t* tests between means were used to compare the changes in continuous variables. McNemar's test for paired proportions was used to compare the changes in dichotomous variable and the marginal homogeneity test was used for multinomial variables. Face-to-face	Following the intervention there was significant increases in all aspects of recall; unprompted recall increased from 9.8% to 49.0% (p< 0.05); prompted recall increased from 17.6% to 94.1% (p<0.001); awareness of the term 'active transport' increased from 27.5% to 70.6% (p< 0.001). Following the intervention there was an decrease in the percentage of those who stated they would be driving to work in the next 6 months (from 76.7% pre-intervention to 63.3% post-intervention), an increase in those who were planning to drive to work less in the next month (from 6.7% to 13.3%) and those who said they had been driving their car to work in the last month (from 6.7% to 13.3%) (p=0.039, marginal homogeneity test). Following the intervention there was significant increases in those saying 'If I could I would definitely cycle to work, from 39.2% to 51.0% (p= 0.011) and those saying 'If I could I would definitely walk to work' from 80.4% to 92.2% (p= 0.031).	

				E-mail newsletters were used as a strategy to deliver messages to employees. **Comparator** N/A **Follow-up** The baseline survey was conducted one month before the commencement of the individualised marketing strategy, the follow-up survey was conducted two months after the 12 month strategies had ceased. 68 people gave interviews at baseline, 51 people remained in the study and completed the post-intervention interview, giving a 75% follow-up rate.	interviews were conducted by four trained interviewers for both pre- and post-intervention surveys, in September 2001 and 2002.		
Wen 2008 Australia Walking/Cycling	Cluster RCT [+] Simple randomisation No blinding Sample size power calc at 80% (n=70 per school)	N=24 primary public schools in inner west Sydney. N=2258 students.	Mode of travel to and from school over 5 days (student reported). Travel to and from school in a usual week (parent reported). Eight options on travel to school: walked all the way, walked part of the way, went by car, went by bus or train, rode a bike.	**Intervention** Health Promoting Schools Policy: Two year multi-component programme included classroom activities, pedometer based walking activities (some schools) development of school Travel Access Guides, parent newsletters, and improving environments with local councils. **Comparator** Two year programme on healthy eating. **Duration/length of follow up** Two year follow up.	Students completed survey in classroom. Parents completed survey at home.	When data was analysed by cluster, there were no statistically significant differences in mean percentages of change in mode of transport to or from school from baseline to follow up between the intervention and control groups.	Mixed results with high variation in the travel patterns to and from school. Cluster analysis removed all significance. Intervention: 293/976 students and 369/772 parents lost to follow up. Control: 594/992 students completed follow up, 404/746 parents completed follow up. Design effect was 2.6, which was larger than the 1.7 anticipated, showing larger variability between than within each school cluster and compromising statistical power.

							QUAL: journey to school is influence by parent journey to work, degree of child independence, other family commitments and physical environment near school.
Wilbur 2003 USA Walking	nRCT [+]	Women, who were healthy, employed, aged between 45 and 65 years, and sedentary in their leisure time. N= 153 Of the 153 women, 103 were Caucasian and 50 were African American.	Previous exercise experience was measured with the leisure dimension of the Lifelong Physical Activity Measure. Social role influence used the Baruch and Barnett Role Quality Scales as a general measure of social role influence on the women. Self-efficacy was measured with McAuley's 14-item self-efficacy for exercise scale. Self-determination, exercise self-determination was measured using the Exercise Self-Determinism Index	**Intervention** The intervention consisted of a personal exercise prescription, instructions, and support from a nurse research team member. At the start of the intervention phase of the 24 week home-based walking program, all women were given an exercise prescription that was standard to mode (walking), frequency (four times per week), and duration (increasing within the first four weeks from 20 to 30 minutes of continuous walking). A research nurse met with each woman every two weeks to provide emotional support and reinforcement in the form of feedback on her progress, offer praise and encouragement. After completion of each pre-intervention and post-intervention data collection, each participant received $25 to compensate them for their time and travel. **Comparator** N/A **Follow-up** Measurements were taken at baseline and at 24 weeks.	Differences were evaluated using student's *t* tests, multiple regression analysis, and paired comparison *t* tests.	Adherence to frequency was 66.5% of the expected walks (range 6% to 104%). Adherence to both duration and intensity was greater than 90%, indicating that once the women walked, they walked at the appropriate duration and intensity. The women had moderately high self-efficacy for overcoming barriers to exercise (M=71.76 of a possible 100). The multiple regression of self-efficacy for exercise on demographic characteristics and previous exercise experience indicated that the model was significant, with 11.4% of the variance explained. However, only age had an independent positive effect. The multiple regression of self-efficacy for exercise self-determinism on demographic characteristics and previous exercise experience was also significant, explaining 11.5% of the variance. Higher education and more experience with regular exercise during the time when the participant was in her twenties and thirties were associated with higher exercise self-determinism.	

			Adherence to walking was measured by having the women wear a heart rate monitor and having them keep a record of each exercise session in an exercise log.				
Wilbur 2008 USA Walking	Cluster RCT [+] Random allocation to one of two community health centres	African American Women Sedentary (reported no participation in regular moderate or vigorous exercise). Age 40-65 ET N=156 MT N=125	Adherence Physical activity Fitness Body composition Duration of walking. Intensity of walking (indicated by heart monitors)	**Intervention details** Home based walking intervention enhanced by behavioural strategies. Orientation included tailored walking prescription, health information, problem solving and goal setting. Received heart rate monitors to wear during walking, log books for self monitoring, waist packs with programme logo, magnets imprinted with programme phone number, discount coupons to buy walking shoes. $50 incentive given at each data collection. Enhanced treatment (ET) group had four workshops followed by weekly tailored phone calls over 24 weeks. 12 month intervention trial: 24 week intensive adoption phase, 24 week maintenance phase. Works shops with 6-10 women lasted for 60 minutes and included benefits of walking, overcoming personal and environmental barriers to walking, anticipating and handling barriers. Each workshop included 10 min motivational video plus 50 minute discussion.	On treatment analysis. Intention to treat analysis.	Adherence was significantly higher in the ET than the MT group and was related to the number of workshops attended (r=0.58 p<0.001) and tailored calls (r=0.25 p=0.004) received. Relationships not significant in the MT group. Significant post intervention improvement in waist circumference and fitness in the ET group, however these were not significantly different between the groups. AT 24 weeks ET women completed an average of 45% of recommended walks compared to 29% of MT women. No significant difference in walking intensity between the groups. Intention to treat analysis showed a significant increase in fitness (p=0.024), decrease in waist circumference (p<0.001), and no change in body mass index (p=0.53) in both treatments. There was a significant negative time effect on adherence. Overall walking adherence declined between 24 and 48 weeks. (from 67.2% to 42.7% p<0.001).	Do difference in demographic characteristics between groups. Drop outs at 24 weeks were poorer, more likely to smoke and had higher cholesterol.

				Followed by tailored phone calls weekly for 3 weeks (week 5 to 7), then every other week for 14 weeks and monthly during the maintenance phase. **Comparator details** Minimal treatment (MT) comparator. Same orientation. **Duration and length of follow up** Follow up at 24 and 48 weeks.			
Wimbush 1998 UK Walking	BA [+]	Target population: age 30-55, not regular exercisers. Fitline callers at baseline: 59% female 46% 30-55 years (20% older, 34% younger). N=3476	Knowledge/ beliefs about walking as good form of exercise. Walking/exercise behaviour: no. days in last week spend at least 30 minutes walking.	**Intervention** Mass media walking campaign in Scotland. 40 second TV advert and telephone helpline (Fitline). Advertising ran for 4 weeks in September/October 1995 and again in March/April 1996. **Comparator** No direct comparator **Duration/length of follow up** 1 year follow up.	Telephone interview – self reported outcomes.	At the population level, the authors state that the campaign had notable positive impact on knowledge about walking (with an increase from 20% before the intervention to 56% after the intervention of the population who agreed with statements such as walking is good for exercise), but no impact on walking behaviour, with number of days walked at least 30 minutes per week being 4.26 in 1995 and 4.13 in 1996 (no significance statistics given). Among helpline callers: 48% of those followed up at 1 year claimed to be more physically active, 46% reported they were exercising at the same level, and 7% reported they were less physically active (no further statistics given). In addition, there was an overall shift from contemplation towards action stage of change at both 10 week and 1 year follow up.	No control. Accuracy of recall over one year may be limited.
Wray 2005 USA Walking	CS [+]	The campaign was designed to reach adult residents of St Joseph, Missouri. A midsize town with a population of	To discern media-type dose exposure, individuals were first asked if they had been exposed to any campaign advertisements through	**Intervention** The media plan consisted of billboard, newspaper, radio, and poster advertisements. (Television spots were not used because of the expense of buying airtime.) The strategy for media placement was to achieve the greatest visibility at the outset, in May and June, followed	A post-campaign-only design was used: phone numbers for residents living within the city were purchased from a market research firm, and	The exposed group reported a greater level of participation in three of six wellness or walking behaviours than the unexposed group at a statistically significant level. Amount of exposure was associated with the same three behaviours at a statistically significant level. Two of the outcomes were wellness behaviours: participation in a community-sponsored walk or participation in a	

		84,909 in 2003. Individuals were eligible to participate if they identified themselves as adult (aged 18 years or older) residents of St Joseph. Trained callers conducted the interviews between July 31 and October 31, 2003. The survey required an average of 15 minutes to complete. A total of 297 interviews were completed with the funds available for evaluation. The total number of eligible respondents was 336.	billboards, radio, or newspapers or if they had seen any campaign posters or news stories about the campaign to that type. The survey asked six walking behaviour questions.	by reduced numbers of advertisements from July through September. In a press conference to kick off the campaign, local political leaders and coalition partners announced the Walk Missouri campaign to local radio, television, and newspaper outlets. **Comparator** N/A **Follow-up** The total number of completed interviews was 297, resulting in a cooperation rate of 88% (297/336).	a random-digit–dial telephone survey was conducted.	health fair. The third outcome was a general walking behaviour: the number of days per week the respondent walked at least 10 minutes. Campaign-dose exposure was associated with the number of days per week walking at a statistically significant level when controlling for age and health status Post campaign, the authors report that the exposed group reported a greater level of participation in three of six wellness or walking behaviours than the unexposed group at a statistically significant level. Compared to the control group, those exposed to the campaign were more likely to participate in the sponsored walk (4.3% vs. 0.5% X2[1]=5.4, p=0.02), participate in the health fair (20% vs. 10% X2[1]=5.9, p+0.02), and walked for at least 10 minutes on more days of the week (2.73 days vs. 4.52 days t[7]=2.34, p=0.02. There was no significant difference in participation in worksite wellness, walking for at least 10 minutes during a usual week, or walking intensity. Amount of exposure is also reported to be associated with the same three behaviours at a statistically significant level;	
Zaccari 2003	BA [+]	One primary school	Walking to school	**Intervention details** Pupils were given a 4 week travel diary	Travel diaries	The percentage of car trips decreased by 3.4% and the percentage of walking trips increased by	Intervention was only 4 weeks.

Australia Walking		N=243 pupils		to complete. Classroom activities and weekly newsletters during term 1. Involvement of local press and a school assembly on Walk to School. Police enforcement to prevent pavement parking. **Comparator** Two schools **Duration/length of follow up** 4 weeks follow up		3.4%. Journey to school comparisons between the 1st and 4th week indicated an overall increase of 6% in the number of children walking to school.	

8.2 Appendix 2: Quality assessment criteria and table

The CPHE Methods Manual (NICE, 2009) methodology checklist outlines four aspects to be evaluated when rating a quantitative intervention study: relating to the population; the method of allocation to the intervention; the outcomes; and the analyses:

Population:

1.1 Is the source population or source area well described?

1.2. Is the eligible population or area representative of the source population or area?

1.3. Do the selected participants or areas represent the eligible population or area?

Method of allocation:

2.1. How was selection bias minimised?

2.2 Were interventions and comparisons well described and appropriate?

2.3 Was the allocation concealed?

2.4 Were participants and investigators blind to the exposure?

2.5 Was the exposure to the intervention and comparison adequate?

2.6. Was the contamination acceptably low?

2.7. Were other interventions similar in both groups?

2.8 Were all participants accounted for in the study conclusions?

2.9 Did the setting reflect usual UK practice?

2.10 Did the intervention or control comparison reflect usual UK practice?

Outcomes:

3.1. Were the outcome measures and procedures reliable?

3.2. Were the outcome measurements complete?

3.3. Were all the important outcomes assessed?

3.4 Were outcomes relevant?

3.5. Was there a similar follow up time in exposure and comparison groups?

3.6. Was follow-up time meaningful?

Analysis:

4.1 Were exposure and comparison groups similar at baseline? If not were they adjusted?

4.2 Was intention to treat analysis conducted?

4.3 Was the study sufficiently powered to detect an intervention effect (if one exists)?

4.4. Were the estimates of effect size given or calculated?

4.5. Were the analytical methods appropriate?

4.6 Was the precision of intervention effect given or calculable: Were they meaningful?

In addition an overall measure of internal validity (bias) and external validity (generalisability) are given (5.1 and 5.2).

Table of quality grades

Study	Avila 1994	Baker 2008a	Baker 2008b	Baker 2011	Behrens 2007	Bickerstaff 2000	Borg 2010	Brockman 2011	Brownson 2004	Brownson (2005)
1.1	+ +	+	+	+	-	+	+ +	+ +	+ +	+
1.2	+ +	+	++	+	+	++	+ +	+	+ +	+
1.3	+ +	+	++	+	+	++	+ +	+ +	+ +	+
2.1	+ +	+ +	++	+ +	NA	+	+	NA	NA	+
2.2	+ +	+ +	++	+ +	+	+	+ +	+	+ +	++
2.3	NA	NA	N/A	NA	NA	N/A	NA	NA	NA	N/A
2.4	NA	NA	N/A	NA	NA	N/A	NA	NA	NA	N/A
2.5	+ +	+ +	++	+ +	+ +	++	+ +	NA	+ +	+
2.6	+ +	+ +	+	+ +	NA	N/A	+	NA	+ +	++
2.7	+ +	+ +	++	+ +	NR	N/A	+ +	NA	+ +	++
2.8	+	+	++	+	+	++	+	NR	+ +	+
2.9	+	+ +	++	+ +	+	+	+	+ +	+	+
2.10	+	+ +	++	+ +	+	+	+	+ +	+	+
3.1	+ +	+ +	++	+ +	+	++	+	+	+ +	+
3.2	+	+	+	+	+	+	+	+	+	+
3.3	+	+	+	+	+	+	+	+	+	+
3.4	+ +	+ +	++	+ +	+	+	+ +	+	+ +	+
3.5	+ +	+ +	++	+ +	NA	N/A	+ +	NA	+ +	N/R
3.6	+ +	+ +	+	+ +	+	+	+ +	+ +	NR	++
4.1	+ +	+ +	++	+ +	NA	N/A	+ +	NA	+ +	N/A
4.2	NR	NR	++	NR	NA	N/A	+ +	NA	NR	N/A
4.3	NR	+ +	++	+ +	NR	N/A	+	NR	NR	N/A
4.4	NR	NR	++	NR	NR	++	+ +	NR	+ +	++
4.5	+ +	+ +	++	+ +	+ +	++	+ +	+	+ +	++

4.6	+	+	++	+	+ +	++	+ +	+ +	+	+
5.1	+ +	+ +	++	+ +	+	+	+ +	+	+ +	+
5.2	+	+ +	++	+ +	+	+	+	+	+ +	+
Grade	+ +	+ +	++	+ +		+	+	+	+ +	+

Study	Bull 2008	Chan (2004)	Cairns 2006a	Cairns 2006b	Cairns 2006c	Cirignano 2010	Clarke (2007)	CLES 2011
1.1	+ +	+	+	+	+	+	+	+ +
1.2	-	++	++	++	++	+	++	+ +
1.3	-	++	++	++	++	+	++	+ +
2.1	NA	+	+	+	+	NA	+	NA
2.2	+ +	+	+	+	+	+	+	+ +
2.3	NA	N/A	N/A	N/A	N/A	NA	N/A	NA
2.4	NA	N/A	N/A	N/A	N/A	NA	N/A	NA
2.5	+ +	N/A	++	++	++	NA	+	+ +
2.6	NA	N/A	N/A	N/A	N/A	NA	+	+ +
2.7	NA	N/A	N/A	N/A	N/A	NA	+	+
2.8	NA	++	++	++	++	+	++	+
2.9	+ +	+	+	+	+	+	+	+ +
2.10	+ +	+	+	+	+	+	+	+ +
3.1	+ +	++	++	++	++	+	++	+ +
3.2	+	+	+	+	+	+	+	+
3.3	+	+	+	+	+	+	+	+
3.4	+ +	++	+	+	+	+ +	++	+ +
3.5	NA	N/A	N/A	N/A	N/A	NA	-	+ +
3.6	+	-	+	+	+	+	+	+
4.1	NA	N/A	N/A	N/A	N/A	NA	-	+ +
4.2	NA	N/A	N/A	N/A	N/A	NA	N/A	NA
4.3	-	N/A	N/A	N/A	N/A	NR	N/R	NR
4.4	-	++	++	++	++	-	++	NR
4.5	-	++	++	++	++	+	++	+ +
4.6	-	+=	++	++	++	-	++	+
5.1	+	+	+	+	+	+	++	+ +
5.2	-	+	+	+	+	-	++	+
Grade	+	+	+	+	+	+	+	+ +

Study	Coleman (1999)	Cope 2009	Cope 2011	Cox 2008
1.1	+	-	-	+ +
1.2	++	-	-	+ +
1.3	++	-	-	+ +
2.1	N/R	NA	NA	+ +
2.2	++	+ +	+	+ +
2.3	N/A	NA	NA	NA
2.4	N/A	NA	NA	NA
2.5	++	+	+	+ +
2.6	++	NA	NA	+ +
2.7	++	NA	NA	+ +
2.8	++	NA	NA	+
2.9	+	+ +	+ +	+
2.10	+	+ +	+ +	+
3.1	+	+	+	+ +
3.2	+	+	+	+
3.3	+	+	+	+

3.4	++	+ +	+ +	+
3.5	++	NA	NA	+ +
3.6	+	+ +	+ +	+ +
4.1	++	NA	NA	+ +
4.2	N/R	NA	NA	NR
4.3	N/R	NA	NA	NR
4.4	++	-	-	NR
4.5	++	+	NR	+ +
4.6	++	-	-	+ +
5.1	+	-	-	+ +
5.2	++	+	-	+
Grade	++	+	-	+ +

Study	Culos-Reed 2008	Darker 2010	De Cocker (2009)	Dinger 2005	Dinger (2007)	Dunton 2008	Eastep 2004	Estabrooks (2008)	Faghri (2008)
1.1	+ +	+ +	+	+	+	+ +	+ +	+	+
1.2	+ +	+	++	+	+	+ +	+ +	+	++
1.3	+ +	+ +	++	+	+	+ +	+ +	+	+
2.1	NA	+ +	N/A	NA	++	+ +	+ +	+	N/A
2.2	NA	+ +	++	+ +	++	+ +	+ +	++	N/A
2.3	NA	NA	N/A	NA	N/A	NA	NA	N/A	N/A
2.4	NA	NA	N/A	NA	N/A	NA	NA	N/A	N/A
2.5	NA	+ +	+	+ +	+	+ +	+ +	N/A	N/A
2.6	NA	+ +	N/A	NA	+	+ +	+ +	N/A	N/A
2.7	NA	+ +	N/A	NA	++	+ +	+ +	N/A	N/A
2.8	+	+	+	+	++	+	+ +	+	+
2.9	+	+ +	-	+	+	+	+	+	+
2.10	+	+ +	-	+	+	+	+	+	+
3.1	+ +	+ +	+	+	+	+	+	+	++
3.2	+	+	+	+	+	+	+	+	+
3.3	+	+	+	+	+	+	+	+	+
3.4	+ +	+ +	+	+ +	++	+ +	+ +	++	++
3.5	NA	+	N/A	NA	+	+ +	+ +	N/A	N/A
3.6	+	+	+	+	++	+	+	-	+
4.1	NA	+ +	N/A	NA	+	+ +	+ +	N/A	N/A
4.2	NR	NR	N/A	NA	++	NR	NR	N/A	N/R
4.3	NR	+ +	N/A	NR	++	+	NR	N/A	N/A
4.4	+ +	+ +	++	+ +	++	NR	+ +	++	++
4.5	+ +	+ +	++	+ +	++	+ +	+ +	++	++
4.6	+	+ +	+	+ +	++	+	+ +	++	+
5.1	+ +	+ +	+	+	++	+ +	+ +	+	+
5.2	+	+ +	+	+ +	++	+	+ +	+	+
Grade	+	+ +	+	+	+	+ +	+ +	+	+

Study	Fisher 2004	Gilson 2006	Gilson (2009)	Hawthorne 2011	Hemmingsson 2009	Hendricks 2009	Humpel (2004)	Jackson 2008	Jancey (2008)
1.1	+ +	+ +	++	+ +	+	-	+	+	+
1.2	+ +	+ +	++	+ +	+	-	++	+	+
1.3	+ +	+ +	++	+ +	+ +	-	++	+	+
2.1	+ +	+ +	++	NA	+ +	NA	++	NA	N/A
2.2	+ +	+ +	++	+ +	+ +	+ +	++	+ +	N/A
2.3	NA	NA	N/A	NA	NA	NA	N/A	NA	N/A
2.4	NA	NA	N/A	NA	NA	NA	N/A	NA	N/A
2.5	+ +	+ +	++	+ +	+ +	NA	N/A	+ +	N/A

2.6	+ +	+ +	++	NA	+ +	NA	N/A	NA	N/A
2.7	+ +	+ +	++	NA	+ +	NA	++	NA	N/A
2.8	+	+ +	++	+	+	NA	++	+	+
2.9	+	+ +	++	+	-	+	+	+	+
2.10	+	+ +	++	+	-	+	+	+	+
3.1	+ +	+ +	++	+ +	+ +	+ +	+	+ +	+
3.2	+	+	+	+	+	+	+	+	+
3.3	+	+	+	+	+	+	+	+	+
3.4	+ +	+ +	++	+ +	+ +	+	++	+ +	++
3.5	+ +	+ +	++	NA	+ +	NA	++	NA	N/A
3.6	+ +	+	+	+	+ +	+ +	+	+	+
4.1	+ +	+ +	++	NA	+ +	NA	++	NA	N/A
4.2	NR	NR	N/R	NA	+ +	NA	++	NR	N/A
4.3	+ +	NR	N/R	NR	+ +	NR	++	NR	N/R
4.4	+ +	NR	++	NR	+ +	NR	++	NR	++
4.5	+ +	+ +	++	+ +	+ +	NR	++	+ +	N/R
4.6	+ +	+ +	++	+	+ +	-	++	+	++
5.1	+ +	+ +	++	+	+ +	-	++	+	+
5.2	+ +	+ +	++	+	+ +	-	++	+	+
Grade	+ +	+ +	++	+	+ +	-	++	+	+

Study	Johnson (2010)	Johnston 2006	Koizumi 2009	Kong 2010	Krieger 2009	Lamb (2001)	Lombard (1995)	Mackett 2005	McAuley (1994)	McAuley (2000)
1.1	+	+	+	+	+ +	+	+	+	+	++
1.2	++	+	+	+	+ +	++	++	++	+	++
1.3	++	+	+	+ +	+ +	++	-	++	+	++
2.1	+	NA	+ +	NA	NA	++	++	+	++	++
2.2	+	+	+ +	+ +	+ +	++	++	+	++	++
2.3	N/A	NA	NA	NA	NA	N/A	NA	N/A	NA	N/A
2.4	N/A	NA	NA	NA	NA	N/A	NA	N/A	NA	N/A
2.5	++	+	+ +	NA	+ +	++	++	++	++	++
2.6	N/A	NA	+ +	NA	NA	++	NR	N/A	++	N/A
2.7	N/A	NA	+ +	NA	NA	++	+	N/A	++	++
2.8	++	NA	+ +	+	+	++	+	++	NR	++
2.9	+	+	+	-	+	++	-	+	-	-
2.10	+	+	+	-	+	++	+	+	+	+
3.1	++	+	+ +	+ +	+ +	++	+	++	++	+
3.2	+	+	+	+	+	+	+	+	+	+
3.3	+	+	+	+	+	+	+	+	+	+
3.4	+	+	+ +	+ +	+ +	++	+	+	++	+
3.5	N/A	NA	+ +	NA	NA	++	+	N/A	++	++
3.6	+	-	+	+	+	++	+	+	+	++
4.1	N/A	NA	+ +	NA	NA	++	++	N/A	+	++
4.2	N/A	NA	NR	NA	NA	++	++	N/A	NR	++
4.3	N/A	NA	NR	NR	+ +	++	NR	N/A	NR	NR
4.4	++	-	NR	+	NR	++	NR	++	NR	++
4.5	++	+	+ +	+ +	+ +	++	++	++	++	++
4.6	++	-	+	+	+ +	++	++	++	++	++
5.1	+	-	+ +	+	+	++	+	+	+	+
5.2	+	-	+	+	+	++	+	+	+	++
Grade	+	-	+ +	+	+	++	+	+	++	++

Study	McKee 2006	Mendoza 2009	Merom (2003)	Merom 2005	Merom (2007)	Merom 2008	Merom 2009	Mier 2011	Milton 2009
1.1	+ +	+	+	+	+	+	+ +	++	-

1.2	+	+ +	++	+	++	+	+ +	+ +	+
1.3	+ +	+ +	++	+	++	+ +	+ +	+ +	+
2.1	NA	NA	+	NA	++	NA	+ +	NA	NA
2.2	+ +	+ +	++	+ +	++	-	+ +	+ +	+ +
2.3	NA	NA	N/A	NA	N/A	NA	NA	NA	NA
2.4	NA	NA	N/A	NA	N/A	NA	NA	NA	NA
2.5	+ +	+ +	+	NA	++	NA	+ +	NA	+ +
2.6	+ +	+ +	NA	NA	++	NA	+ +	NA	NA
2.7	+ +	+ +	NA	NA	++	NA	+ +	NA	NA
2.8	+ +	+ +	+	NA	++	NR	+ +	+ +	NA
2.9	+ +	+	+	+	+	+	+	-	+ +
2.10	+ +	+	+	+	+	+	+	-	+ +
3.1	+	+	+	+ +	++	+	+ +	+	+
3.2	+	+	+	+	+	+	+	+	+
3.3	+	+	+	+	+	+	+	+	+
3.4	+ +	+ +	+	+ +	++	+	+ +	+ +	+ +
3.5	+ +	+ +	N/A	NA	++	NA	+ +	NA	NA
3.6	+	+ +	NA	+ +	+	+	+	+	+
4.1	+	+ +	N/A	NA	++	NA	+ +	NA	NA
4.2	NA	NR	NA	NA	++	NA	NR	NA	NA
4.3	NR	NR	NA	NA	++	NR	+ +	-	NA
4.4	+ +	-	NA	NR	++	+ +	+ +	NR	-
4.5	+	+	++	+ +	++	+ +	+ +	+ +	+
4.6	+ +	+ +	++	+ +	++	+ +	+ +	+	-
5.1	+	+ +	++	+	++	+	+ +	+	+
5.2	+	+	++	+	++	+	+ +	+	+
Grade		+	+	+	++	+	++	+	+

Study	Miyazaki 2011	Moreau (2001)	Murphy (2006)	Mutrie (2002)	Napolitano 2006	NSW 2005	Nies 2003	Nies (2006)	Parker 2011
1.1	+	+	+	+	+	+	+ +	+	+ +
1.2	+	+	+	++	+	+	+ +	++	+
1.3	+	+	++	++	+	+ +	+ +	++	NA
2.1	NA	++	++	++	NA	NA	+ +	++	NA
2.2	+	++	++	++	+	+ +	+ +	++	+ +
2.3	NA	N/A	N/A	N/A	NA	NA	NA	N/A	NA
2.4	NA	N/A	N/A	N/A	NA	NA	NA	N/A	NA
2.5	+	++	++	++	NA	NA	+ +	++	NA
2.6	NA	++	+	++	NA	NA	+ +	++	NA
2.7	NA	++	+	++	NA	NA	+ +	++	NA
2.8	NR	++	++	++	NA	+	+ +	++	NA
2.9	-	+	++	++	+	-	+	+	-
2.10	-	+	++	++	+	-	+	+	-
3.1	+ +	++	++	+	+ +	+ +	+ +	++	+ +
3.2	+	+	+	+	+	+	+	+	+
3.3	+	+	+	+	+	+	+	+	+
3.4	+ +	++	++	+	+ +	+ +	+ +	++	+ +
3.5	NA	++	++	++	NA	NA	+ +	++	NA
3.6	+	++	+	++	-	+	+ +	++	+ +
4.1	NA	++	++	+	NA	NA	+ +	+	NA
4.2	NR	N/R	N/R	NR	NA	NA	NR	N/A	NA
4.3	NA	N/R	N/R	++	NA	NR	+ +	++	NR
4.4	NR	++	++	++	-	+	NR	++	-
4.5	NR	++	++	++	+	+ +	+ +	++	+ +

4.6	+ +	++	++	++	+	+	+	++	+
5.1	+	+	++	++	+	+	+ +	++	+
5.2	+	++	++	++	+	+	+ +	++	+
Grade	+	++	++	++	+	+	+ +	++	+

Study	Perry (2007)	Prestwich (2010)	Reger (2002)	Reger-Nash 2005	Reger-Nash 2006	Rissel (2010)	Rovniak 2005	Rowland 2005	Ryder 2009	Schofield 2005
1.1	+	++	+	+ +	-	-	+	+ +	+	+
1.2	++	++	++	+ +	-	+	+	+ +	+	+
1.3	++	++	++	+ +	-	+	+	+ +	+	+ +
2.1	++	++	-	NA	NA	-	+ +	+ +	NA	NA
2.2	++	++	+	+ +	+ +	+	+ +	+ +	+ +	+
2.3	N/A	N/A	N/A	NA	NA	N/A	NA	NA	NA	NA
2.4	N/A	N/A	N/A	NA	NA	N/A	NA	NA	NA	NA
2.5	++	++	+	+ +	+ +	+	+ +	+ +	NA	+ +
2.6	++	++	++	+ +	+ +	N/A	+ +	+ +	NA	+ +
2.7	++	++	+	+ +	+ +	N/A	+ +	+ +	NA	+ +
2.8	++	++	+	+ +	+	+	+	+	NA	-
2.9	+	++	-	+	+	+	+	+	+	+
2.10	+	++	+	+	+	+	+	+	+	+
3.1	++	++	++	+	+	+	+ +	+ +	-	+
3.2	+	+	+	+	+	+	+	+	+	+
3.3	+	+	+	+	+	+	+	+	+	+
3.4	++	++	+	+ +	+ +	++	+ +	+ +	+	+ +
3.5	++	++	N/A	+ +	+ +	++	+ +	+ +	NA	+ +
3.6	+	+	-	+ +	+	+	+ +	+ +	-	+
4.1	+	++	N/A	+ +	+ +	-	+ +	+ +	NA	+
4.2	++	++	NA	NA	NR	N/A	NR	NR	NA	NR
4.3	N/A	++	NA	+ +	NR	N/A	NR	+ +	NA	NR
4.4	++	++	++	NR	+ +	N/A	NR	+ +	-	+ +
4.5	++	++	++	+ +	+	++	+ +	+ +	-	+ +
4.6	++	++	++	+ +	+ +	++	+ +	+ +	-	+
5.1	++	++	+	+ +	+	+	+ +	+ +	+	+
5.2	++	++	+	+ +	+	+	+ +	+ +	-	+
Grade	++	++	+	+ +	+	+	+ +	+ +	-	+

Study	Sloman 2009	Sloman 2011)	Spence 2009	Steele 2007	Staunton 2003	Sustrans 2008	TAPESTRY 2003	Telfer 2006	TenBrick 2009
1.1	+	+	+	+ +	+	+	+	+ +	+
1.2	+ +	+	+	+ +	+	+	+ +	+ +	-
1.3	+ +	+	+	+ +	+	+	+ +	+ +	+
2.1	NA	NA	+ +	+ +	N/A	N/A	NA	NA	NA
2.2	+ +	NA	+ +	+ +	N/A	N/A	+ +	+ +	+ +
2.3	NA	+ +	NA	NA	N/A	N/A	NA	NA	NA
2.4	NA	NA	NA	NA	N/A	N/A	NA	NA	NA
2.5	+ +	+ +	+ +	+ +	N/A	N/A	+ +	NA	NA
2.6	+ +	+ +	+ +	+ +	N/A	N/A	+ +	NA	NA
2.7	+	NA	+ +	+ +	N/A	N/A	+ +	NA	NA
2.8	NA	NA	+	+	+	+	+ +	+ +	NA
2.9	+ +	+ +	+	+	+	+	+	+	+
2.10	+ +	+ +	+	+	+	+	+	+	+
3.1	+ +	+	+ +	+ +	+	+	+	+	+
3.2	+	+	+	+	+	+	+	+	+
3.3	+	+	+	+	+	+	+	+	+

3.4	+ +	+ +	+ +	+ +	++	++	+ +	+ +	+ +
3.5	NA	NA	+ +	+ +	N/A	N/A	+ +	NA	NA
3.6	+ +	+ +	-	+	+	+	+ +	+	+ +
4.1	NA	+ +	+ +	+ +	N/A	N/A	+ +	NA	NA
4.2	NA	NA	NR	NR	N/A	N/A	NR	NA	NA
4.3	NA	+ +	-	+ +	N/R	N/R	NR	NR	NR
4.4	-	-	++	+ +	++	++	-	-	-
4.5	+ +	+	+ +	+ +	N/R	N/R	+	+ +	NR
4.6	-	-	+	+ +	++	++	+ +	+	-
5.1	+	+	+ +	+ +	+	+	+ +	+	-
5.2	+	+	+	+ +	+	+	+	+	-
Grade	+	+	+ +	+ +	+	+	+	+	-

Study	Travelsmart 2005	Travelsmart 2011	Tully (2007)	Vernon (2002)	Warren 2010	Wen (2005)	Wen 2008	Wilbur (2003)
1.1	+	+	+	-	+ +	+	+	++
1.2	+	+	++	+	+	++	+	++
1.3	NR	NR	+	+	+ +	++	+	++
2.1	NA	NA	++	N/A	NA	++	+ +	+
2.2	+ +	+ +	++	+	+ +	++	+ +	++
2.3	NA	NA	N/A	N/A	NA	N/A	NA	N/A
2.4	NA	NA	N/A	N/A	NA	N/A	NA	N/A
2.5	NR	NR	++	N/A	NR	+	+ +	+
2.6	NR	NR	++	N/A	NA	N/A	+ +	N/A
2.7	NA	NA	++	N/A	NA	N/A	+	N/A
2.8	NA	NA	++	+	-	++	+	+
2.9	+ +	+ +	++	++	+	+	+ +	-
2.10	+ +	+ +	++	++	+	+	+ +	-
3.1	+	+	++	+	+	++	+	++
3.2	+	+	+	+	+	+	+	+
3.3	+	+	+	+	+	+	+	+
3.4	+ +	+ +	++	+	+ +	+	+ +	+
3.5	NA	NA	++	N/A	NA	N/A	+ +	N/A
3.6	+ +	+ +	+	-	+	++	+ +	+
4.1	NR	NR	++	N/A	NA	N/A	+ +	N/A
4.2	NA	NA	++	N/A	+ +	N/A	+ +	N/A
4.3	+	+	++	N/A	NR	N/A	-	N/A
4.4	-	-	++	++	-	N/A	+ +	N/R
4.5	+	+	++	++	+ +	++	+ +	++
4.6	-	-	++	++	-	++	+ +	++
5.1	+	+	++	+	+	+	-	+
5.2	-	-	++	+	+	+	+ +	+
Grade	+	+	++	+	+	+	+	+

Study	Wilbur 2008	Wimbush 1998	Wray (2005)	Zaccari 2003
1.1	+	+ +	+	+
1.2	+	+ +	+	+
1.3	+	+ +	+	+
2.1	+ +	NA	N/A	NA
2.2	+ +	+ +	++	+
2.3	NA	NA	N/A	NA
2.4	NA	NA	N/A	NA
2.5	+ +	NA	++	+
2.6	+ +	NA	N/A	NA

2.7	+ +	NA	N/A	NA
2.8	+	NA	++	NR
2.9	+	+ +	+	+
2.10	+	+ +	+	+
3.1	+ +	+	+	+ +
3.2	+	+	+	+
3.3	+	+	+	+
3.4	+ +	+ +	+	+ +
3.5	+ +	NA	N/A	NA
3.6	+ +	+	+	+
4.1	+ +	NA	N/A	NA
4.2	+ +	NA	N/A	NR
4.3	NR	NR	N/A	NA
4.4	NR	NR	N/A	NR
4.5	+ +	+	++	NR
4.6	+	-	++	+ +
5.1	+	+	+	+
5.2	+	+	+	+
Grade	+	+	+	+

8.3. Appendix 3: Study outcome measures

	Outcomes																					
Author, year	**Cycling**	**Walking time**	**Steps taken**	**Distance walked**	**Number of walkers**	**Transport mode**	**Fitness / cardio-respiratory fitness/ VO2 max**	**Physical activity (including recommendations**	**Blood pressure**	**Heart rate**	**Adherence / Participation/ Awareness**	**Weight**	**cholesterol**	**BMI**	**Waist circumference**	**Hip circumference**	**Change in diet**	**Depression Stress Anxiety Mood**	**Social support**	**Well-being / QoL**	**Behavioural change outcome**
Avila 1994							✓	✓					✓	✓	✓	✓	✓				
Baker 2008b		✓	✓																		
Baker 2008a		✓	✓					✓													
Baker 2011		✓	✓																		
Behrens 2007			✓																		
Borg 2010		✓						✓						✓						✓	
Bickerstaff 2000					✓																
Brockman 2011	✓	✓				✓															
Brownson 2004		✓			✓																
Brownson 2005		✓																			
Bowles 2006	✓																				
Bull 2008	✓	✓	✓			✓		✓													
Cairns 2006a					✓	✓															
Cairns 2006b					✓	✓															
Cairns 2006c					✓	✓															
Chan 2004			✓				✓		✓					✓	✓						
Cirignano 2010			✓																		
Clarke 2007			✓					✓						✓	✓						
CLES 2011				✓				✓													
Coleman 1999		✓																			
Cope 2011	✓							✓						✓							
Cope 2009	✓																				
Cox 2008				✓			✓				✓										✓
Culos-Reed 2008		✓	✓				✓	✓												✓	
Darker 2010		✓	✓																		
De Cocker 2008			✓																		
Dinger 2005		✓																			✓
Dinger 2007		✓	✓																		
Dunton 2008		✓																			✓

	Outcomes																				
Author, year	**Cycling**	**Walking time**	**Steps taken**	**Distance walked**	**Number of walkers**	**Transport mode**	**Fitness / cardio-respiratory fitness/ VO2 max**	**Physical activity (including recommendations**	**Blood pressure**	**Heart rate**	**Adherence / Participation/ Awareness**	**Weight**	**cholesterol**	**BMI**	**Waist circumference**	**Hip circumference**	**Change in diet**	**Depression Stress Anxiety Mood**	**Social support**	**Well-being / QoL**	**Behavioural change outcome**
Eastep 2004		✓	✓																		
Estabrooks 2008								✓													
Faghri 2008			✓					✓	✓												
Fisher 2004		✓																✓		✓	
Gilson 2007		✓	✓						✓				✓		✓						
Gilson 2009			✓																		
Hawthorne 2011				✓			✓							✓	✓						
Hemmingsson 2009	✓		✓												✓						✓
Hendricks 2009					✓	✓															
Humpel 2004		✓																			✓
Jackson 2008			✓											✓							
Janine 2008		✓					✓	✓													
Johnson 2010											✓	✓		✓							
Johnston 2006						✓															
Koizumi 2009			✓				✓	✓													
Kong 2010								✓						✓			✓				
Krieger 2009		✓						✓											✓		
Lamb 2001									✓					✓							
Lombard 1995											✓										
Mackett 2005					✓	✓															
McAuley 1994		✓		✓																	
McAuley 2000																				✓	
McKee 2007						✓															✓
Mendoza 2009						✓															
Merom 2003											✓										
Merom 2005		✓				✓		✓			✓										
Merom 2007		✓																			
Merom 2008						✓															
Merom 2009		✓	✓	✓				✓													
Mier 2011		✓																✓			
Milton 2009				✓																	
Miyazaki 2011			✓											✓	✓	✓					
Moreau 2001									✓					✓	✓	✓					
Murphy 2006			✓						✓					✓	✓	✓					

	Outcomes																				
Author, year	**Cycling**	**Walking time**	**Steps taken**	**Distance walked**	**Number of walkers**	**Transport mode**	**Fitness / cardio-respiratory fitness/ VO2 max**	**Physical activity (including recommendations**	**Blood pressure**	**Heart rate**	**Adherence / Participation/ Awareness**	**Weight**	**cholesterol**	**BMI**	**Waist circumference**	**Hip circumference**	**Change in diet**	**Depression Stress Anxiety Mood**	**Social support**	**Well-being / QoL**	**Behavioural change outcome**
Mutrie 2002	✓	✓																			
Napolitano 2006					✓																✓
Nies 2003		✓																			
Nies 2005		✓																			
NSW 2002								✓													
Parker 2011	✓																				
Perry 2007							✓												✓		
Prestwich 2010		✓						✓				✓									
Reger 2002		✓																			
Reger-Nash 2005		✓																			
Reger-Nash 2006		✓																			
Rissel 2010	✓	✓						✓													
Rowland 2003	✓				✓	✓															
Rovniak 2005		✓		✓			✓														✓
Ryder 2009		✓	✓	✓																	
Schofield 2005			✓				✓	✓						✓							
Sloman 2009	✓							✓													
Sloman 2011																					
Spence 2009			✓	✓																✓	✓
Staunton 2003	✓				✓	✓															
Steele 2007			✓					✓													
Sustrans 2008	✓																				
Telfer 2006	✓							✓													
TenBrick 2009	✓	✓				✓					✓										
TAPESTRY	2003				✓	✓															
Travel Smart 2005	✓	✓				✓															
TravelSmart 2011	✓	✓				✓															
Tully 2007		✓	✓	✓							✓	✓		✓	✓	✓	✓				
Vernon 2002			✓					✓			✓										
Warren 2010			✓																		
Wen 2005											✓										
Wen 2008						✓															
Wilbur 2003											✓										
Wilbur 2008		✓		✓			✓	✓		✓	✓				✓						

	Outcomes																			
Author, year	**Cycling**	**Walking time**	**Steps taken**	**Distance walked**	**Number of walkers**	**Transport mode**	**Fitness / cardio-respiratory fitness/ VO2 max**	**Physical activity (including recommendations**	**Blood pressure**	**Heart rate**	**Adherence / Participation/ Awareness**	**Weight**	**cholesterol**	**BMI**	**Waist circumference**	**Hip circumference**	**Change in diet**	**Depression Stress Anxiety Mood**	**Social support**	**Well-being / QoL**	**Behavioural change outcome**
Wimbush 1998		✓																			✓
Wray 2005																					✓
Zaccari 2003					✓	✓															
Total	**34**	**40**	**32**	**29**	**10**	**34**	**11**	**25**	**6**	**1**	**11**	**4**	**1**	**15**	**11**	**5**	**3**	**2**	**2**	**6**	**11**

8.4 Appendix 4: Included studies

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8.5 Appendix 5: Excluded studies

Paper	Reason
"Walking Works Pledge: Follow up summary. September 2010" and "Fitter for Walking: 2010 monitoring report. June 2011"	No outcome data
Backseat Children, May 2008, Living Streets. Available from Living Streets	No outcome data
Besser, L., Dannenberg, A. 2005 Walking to public transit. Steps to help meet physical activity recommendations, American Journal of Preventive Medicine, 29(4): 273-280.	Not effectiveness of intervention.
Brown 2006 {published data only} Austin G, Mummery K, Schofield G. The 10,000 Steps Rockhampton project: Using a community grant scheme to build community capacity for health related physical activity in Rockhampton. 2004 Australian Conference of Science and Medicine in Sport Hot topics from the Red Centre 2004:43.	http://www.10000steps.org.au/ Not effectiveness, refs below are.
Brown W, Eakin E, Mummery K, Trost S. 10,000 Steps Rockhampton: Establishing a multi-strategy physical activity promotion project in a community. Health Promotion Journal of Australia 2003;14(2):96–101.	Measures physical activity change overall, no direct measure of W/C
Brown WJ, Mummery K, Eakin E, Schofield G. 10,000 Steps Rockhampton: Evaluation of a whole community approach to improving population levels of physical activity. Journal of Physical Activity and Health 2006;1:1–14.	Measures physical activity change overall, no direct measure of W/C
Brownson, R.C. et al., 2009. Measuring the Built Environment for Physical ActivityState of the Science. American Journal of Preventive Medicine, 36(4), pp.S99-S123	Built environment, exclude. Not local.
Burton NW, Walsh A, Brown WJ. It just doesn't speak to me: midaged men's reactions to '10,000 Steps a Day'. Health Promotion Journal of Australia 2008;19(1):52–9.	Qual
Correlates of time spent walking and cycling to and from work: baseline results from the Commuting and Health in Cambridge study International Journal of Behavioral Nutrition and Physical Activity 2011, 8:124 doi:10.1186/1479-5868-8-124 (too new, I think) (http://www.ijbnpa.org/content/pdf/1479-5868-8-124.pdf HC)	Not effectiveness of intervention.
Dawson J, Hillsdon M, Boller I, Foster C. Perceived barriers to walking in the neighborhood environment: a survey of middle-aged and older adults. Journal of Aging and Physical Activity 2007; 15:318-35.	Qualitative not effectiveness
Dawson J, Hillsdon M, Boller I, Foster C. Perceived barriers to walking in the neighbourhood environment and change in physical activity levels over 12 months. British Journal of Sports Medicine 2007;41(9):562-8.	Qualitative not effectiveness
Ewing, R. & Cervero, R., 2010. Travel and the Built Environment. Journal of the American Planning Association, 76, pp.265-294.	Built environment, exclude. Not local.
Findorff MJ, Stock HH, Gross CR, Wyman JF. Does the Transtheoretical Model (TTM) explain exercise behavior in a community-based sample of older women? Journal of Aging	Not relevant

Paper	Reason
& Health 2007; 19(6):985-1003.	
Fitzsimons CF, Baker G, Wright A, Nimmo MA, Thompson CW, Lowry R et al. The 'Walking for Wellbeing in the West' randomised controlled trial of a pedometer-based walking programme in combination with physical activity consultation with 12 month follow-up: rationale and study design. BMC Public Health 2008; 8.	Methodology paper
Fjeldsoe BS, Miller YD, Marshall AL, Mobile Mums: a randomized controlled trial of an SMS-based physical activity intervention. Ann Behav Med 2010; 39(2):101-111.	Wrong population
Foot H.C., Thomson, J.A., Tolmie, A.K., Whelan, K.M., Morrison, S. & Sarvary, P. (2006). Children's Understanding of Drivers' Intentions. British Journal of Developmental Psychology, 24, 681-700.	Not relevant
Fraser S, Lock K 2011. Cycling for transport and public health: a systematic review of the effect of the environment on cycling Eur J Public Health 21(6): 738-743 http://eurpub.oxfordjournals.org/content/21/6/738.full.pdf+html	Environment, also not effectiveness. Check for qualitative review
Fujii S. 2007 Communication with non-drivers for promoting long-term pro-environmental travel behaviour, Transportation Research Part D 12: 99-102	Not effectiveness of intervention.
Fujii, S. 2003 What does a one month free bus ticket do to habitual drivers? unsure of journal (http://www.springerlink.com/content/p736732033370222/ I think – HC)	Changes in public transport use, not W+C
Galea MN. Barriers and facilitators for walking in individuals with intermittent claudication. [References]. Journal of aging and physical activity 2008; .16(1).	No outcome data
Graves BS, D'Angelo-Herold AM, Hartman MJ. Assessment of a university-based walking program using the Senior Fitness Test... 7th World Congress on Aging and Physical Activity. J AGING PHYS ACTIVITY 2008; 16:S179-S180.	Not enough information
Green J. (2009) 'Walk this way': public health and the social organization of walking. Social Theory and Health 7: 20-38	No outcome data
Hageman PA, Noble Walker S, Pullen CH. Tailored Versus Standard Internet-delivered Interventions to Promote Physical Activity in Older Women. J Geriatr Phys Ther ;2005; 28 (1): 28-33	Not relevant
Heesch KC, Brown WJ, Heesch KC, Brown WJ. Do walking and leisure-time physical activity protect against arthritis in older women? J Epidemiol Community Health 2008; 62(12):1086-1091.	No outcome data
http://www.thebmc.co.uk/Feature.aspx?id=3924	Not relevant
http://www2.dft.gov.uk/pgr/sustainable/cycling/	No outcome data

Paper	Reason
https://www.crow.nl/nl/Publicaties/publicatiedetail?code=REC25	Not relevant
Interim report of the CCT evaluation http://www.dft.gov.uk/publications/cycling-city-and-towns-programme-interim-report/	No outcome data
Is it safe to let our children walk to school? May 2010, Living Streets, Parentline plus. Copy available from Living Streets.	Not relevant
Jacobsen, P.L. (2003). Safety in Numbers: More walkers and bicyclists, safer walking and bicycling. Injury Prevention, 9, 205-209	Not relevant
Kerr J, McKenna J. A randomized control trial of new tailored walking campaigns in an employee sample. J Health Commun 2000; .5(3).	No outcome data
King AC, Friedman R, Marcus B, Castro C, Napolitano M, Ahn D, Baker L. Ongoing Physical Activity Advice by Humans Versus Computers: The Community Health Advice by Telephone (CHAT) Trial. Health Psychology 2007; 26(6): 718-727	Not relevant
Koizumi D, Rogers NL, Rogers ME, Islam MM, Kusunoki M, Takeshima N et al. Efficacy of an accelerometer-guided physical activity intervention in community-dwelling older women. J Phys Act Health 2009; 6(4):467-474.	Wrong population
Kolt GS, Oliver M, Schofield GM, Kerse N, Garrett N, Latham NK. An Overview and Process Evaluation of TeleWalk: A Telephone-Based Counseling Intervention to Encourage Walking in Older Adults. Health Promot Internation 2006; no. 3(pp. 200-208).	Primary care
Kriska AM, Bayles C, Cauley JA, LaPorte RE, Sandler RB, Pambianco G. A randomized exercise trial in older women: increased activity over two years and the factors associated with compliance. Medicine & Science in Sports & Exercise 1986;18(5): 557–62	Exclude date; pre 1990.
Kylie Ball, Anna Timperio, Jo Salmon, Billie Giles-Corti, Rebecca Roberts and David Crawford Personal, social and environmental determinants of educational inequalities in walking: a multilevel study, J. Epidemiol. Community Health 2007;61;108-114	Not effectiveness of intervention.
Landi F, Russo A, Cesari M, Pahor M, Liperoti R, Danese P et al. Walking one hour or more per day prevented mortality among older persons: results from ilSIRENTE study. Prev Med 2008; 47(4):422-426.	No outcome data
Le Masurier GC, Beighle A, Corbin CB, Darst PW, Morgan C, Pangrazi RP, et al. J Phys Act Health 2005; 2: 159-168.	Not relevant
Lusk, A.C., Furth, P.G., Morency, P., et al. (2011). Risk of Injury for Bicycling on Cycle Tracks Versus Streets. Injury Prevention, 17, 131-135.	Not relevant

Paper	Reason
Mackett R L (2001) Policies to attract drivers out of their cars for short trips, Transport Policy, 8, 295-306.	Not relevant
Mackett R L (2003) Why do people use their cars for short trips? Transportation, 30, 329-349.	Not relevant
Mackett R L, Achuthan K and Titheridge H (2008) AMELIA: A tool to make transport policies more socially inclusive, Transport Policy, 15, issue 6, 372-378 doi:10.1016/j.tranpol.2008.12.007.	Not relevant
Mackett R L, Lucas L, Paskins J and Turbin J (2003) A methodology for evaluating walking buses as an instrument of urban transport policy, Transport Policy, 10, 179-186.	Not relevant
Mackett RL. Policies to attract drivers out of their cars for short trips. Transport Policy 2001; 8:295-306.	Not relevant
Mackey MG, Bohle P, Taylor P, Di Biase T, McLoughlin C, Purnell K. Walking to wellness in an ageing sedentary university community: Design, method and protocol. Contemp Clin Trials 2011; 32(2):273-279.	Methodology paper
Macmillen, J., Givoni, M. and Banister, D. (2010) Evaluating active travel: decision-making for sustainable city. Built Environment, 36(4): 519-536.	No outcome data
Making the case for investment in the walking environment, University of West of England and Cavil Associates, 2011, Living Streets. A copy of the full report and summary can be obtained from Living Streets. http://www.livingstreets.org.uk/index.php?cID=651	No outcome data
Manson JE, Greenland P, La Croix AZ, Stefanick ML, Mouton CP, Oberman A, et al. Walking compared with vigorous exercise for the prevention of cardiovascular events in women. New Engl J Med 2002; 347(10) : 716-725	Not relevant
Marcus BH, Emmons KM, Simkin-Silverman LR, Linnan LA, Taylor ER, Bock BC, et al. Evaluation of Motivationally Tailored vs. Standard Self-help Physical Activity Interventions at the Workplace. American Journal of Health Promotion 1998; 12(4): 246-253	Not relevant
Marcus BH, Lewis BA, William DM, Dunsiger S, Jakicic JM, Whiteley JA, et al. A Comparison of Internet and Print-Based Physical Activity Interventions. ARCH INTERN MED 2007; 167:944-949	Not relevant
Marcus BH, Napolitano MA, King AC, Lewis BA, Whitely JA, Albrecht A, et al. Telephone Versus Print Delivery of an Individualized Motivationally Tailored Physical Activity Intervention: Project STRIDE. Health Psychology 2007; 26(4): 401-409	Not relevant
Marshall AL, Bauman AE, Owen N, Booth ML, Crawford D, Marcus BH. Reaching Out to Promote Physical Activity in	Not relevant

Paper	Reason
Australia: A Statewide Randomized Controlled Trial of a Stage-targeted Intervention. American Journal of Health Promotion 2004; 18(4): 283-287	
Matthews CE, Jurj AL, Shu XO, Li HL, Yang G, Li Q et al. Influence of exercise, walking, cycling, and overall non exercise physical activity on mortality in Chinese women. Am J Epidemiol 2007; 165(12):1343-1350.	Not relevant
Merom D, Phongsavan P, Wagner R, Chey T, Marnane C, Steel Z et al. Promoting walking as an adjunct intervention to group cognitive behavioral therapy for anxiety disorders--a pilot group randomized trial. J Anxiety Disord 2008; 22(6):959-968.	Wrong population
Monness E, Sjolie AN. An alternative design for small-scale school health experiments: does daily walking produce benefits in physical performance of school children? Child Care Health Dev 2009; 35(6):858-867.	No outcome data
Moser, G., Bamberg, S. 2008 The effectiveness of soft transport policies : A critical assessment and meta-analysis of empirical evidence, J. of Environmental Psychology, 28: 10-26	Not effectiveness of intervention.
Mummery K, Brown W, Schofield G, Caperchione C, Austin G, Steele R. Multi-strategy approaches to the promotion of health related physical activity at the community level: examples from 10,000 Steps Rockhampton (Abstract). Journal of Science and Medicine in Sport 2004;7 Suppl(4):42.	Measures physical activity change overall, no direct measure of W/C
Mummery WK, Brown WJ. Whole of community physical activity interventions: easier said than done. British Journal of Sports Medicine 2009;43(1):39–43	Discussion piece, not effectiveness.
Nies MA, Chruscial HL, Hepworth JT. An Intervention to Promote Walking in Sedentary Women in the Community. Am J Health Behav 2003; .27(5).	Not relevant
Nishtar S, Badar A, Kamal MU, Iqbal A, Bajwa R, Shah T, et al.The Heartfile Lodhran CVD prevention project--end of project evaluation. Promotion & Education 2007;14(1):17–27.	Physical activity knowledge, not W/C
Ogilvie D, Bull F, Powell J, Cooper AR, Brand C, Mutrie N et al. An Applied Ecological Framework for Evaluating Infrastructure to Promote Walking and Cycling: The iConnect Study. Am J Public Health 2011; 101(3):473-481.	Protocol paper
Ogilvie D, Griffin S, Jones A, Mackett R, Guell C, Panter J et al. Commuting and health in Cambridge: a study of a 'natural experiment' in the provision of new transport infrastructure. BMC Public Health 2010; 10.	Methodology paper
Osborne, P., (2006) Bike It, in WHO, Collaboration between health and transport sectors in promoting physical activity: examples from European countries (CD Rom). Copenhagen: WHO	Not effectiveness

Paper	Reason
Palmer LK. Effects of a walking program on attributional style, depression, and self-esteem in women. Percept Mot Skills 1995; 81(3 Pt 1):891-898.	No outcome data
Pereira MA, Kriska AM, Day RD, Cauley JA, LaPorte RE, Kuller LH. A randomized walking trial in postmenopausal women: effects on physical activity and health 10 years later. ARCH INTERN MED 1998; 158(15):1695-1701.	No outcome data
Perry CK, Bennett JA. Promoting walking in rural women through motivational interviewing and group support. [References]. J Cardiovasc Nurs 2007; .22(4).	Not relevant
Rebecca B. Naumann , Ann M. Dellinger, Melissa L. Anderson, Amy E. Bonomi, Frederick P. Rivara, Robert S. Thompson Preferred modes of travel among older adults: What factors affect the choice to walk instead of drive? Journal of Safety Research (2009)	Not effectiveness of intervention.
Reinhardt-Rutland, A. H. (2011). The Effectiveness of Dedicated Cycling Facilities: Perceived and objective risk. Injury Prevention, 17, 216.	Not relevant
Resnick B. Testing the effect of the WALC intervention on exercise adherence in older adults. Journal of Gerontological Nursing 2002; 28(6):40–9.	Falls prevention. Exclude
Rhodes RE, Warburton D, Coble J. Effect of interactive video bikes on exercise adherence and social cognitive expectancies in young men: A pilot study. Ann Behav Med 2008; 35:S62.	No enough information
Riley-Jacome M, Gallant M, Riley-Jacome Mmae, Gallant MP. Enhancing community capacity to support physical activity: The development of a community-based indoor-outdoor walking program. [References]. The journal of primary prevention 2010; .31(1-2).	No outcome data
Ronckers ET, Groot W, Steenbakkers M, Ruland E, Ament A. Costs of the ’Hartslag Limburg’ community heart health intervention. BMC Public Health 2006;6(51):1–10.	Economic exclude from effectiveness.
Ronda G, van AP, Ruland E, Steenbakkers M, Brug J. The Dutch Heart Health Community Intervention ’Hartslag Limburg’: Design and results of a process study. Health Education Research 2004;19(5):596–607. http://her.oxfordjournals.org/content/19/5/596.full	Not about effectiveness of interventions.
Ronda G, Van Assema P, Candel M, Ruland E, Steenbakkers M, Van Ree J, et al.The Dutch Heart Health community intervention ’Hartslag Limburg’: results of an effect study at individual level. Health Promotion International 2004;19(1):21–31 http://heapro.oxfordjournals.org/content/19/1/21.full	Measures effect on dietary fat and overall physical activity, not W+C
Ronda G, Van Assema P, Ruland E, Steenbakkers M, Van Ree J, Brug J. The Dutch heart health community intervention ’Hartslag Limburg’: results of an effect study at organizational level. Public Health 2005;119(5):353–60.	Healthy eating, smoking and overall PA, not W+C

Paper	Reason
http://www.ncbi.nlm.nih.gov/pubmed/15780322	
Rosenberg D, Kerr J, Sallis JF, Patrick K, Moore DJ, King A. Feasibility and outcomes of a multilevel place-based walking intervention for seniors: A pilot study. Health Place 2009; 15(1):173-179.	Wrong population
Rowland RM, Fisher KJ, Green M, Dunn AM, Pickering MA, Li F. Recruiting Inactive Older Adults to a Neighborhood Walking Trial: The SHAPE Project. Journal of Aging Studies 2004; no. 3(pp. 353-368).	Protocol paper
Schofield G, Steele R, Mummery K, Brown. Engaging a local council to promote physical activity: the case of dog walking in the 10,000 Steps Rockhampton project. Health Promotion Journal of Australia 2004;15:78–81	Not effectiveness of intervention.
Schuit AJ, Wendel-Vos GCW, Verschuren WMM, Roncker ET, Ament A, Van Assema P, et al.Effect of 5-year community intervention Harstlag Limburg on cardiovascular risk factors. American Journal of Preventive Medicine 2006;30(2):237–42. http://www.ncbi.nlm.nih.gov/pubmed/16476640	Not W+C: Body mass index (BMI), waist circumference, blood pressure, serum glucose (nonfasting), and serum total and high-density lipoprotein (HDL) cholesterol
Siegel PZ, Brackbill RM, Heath GW. The epidemiology of walking for exercise: implications for promoting activity among sedentary groups. Am J Public Health 1995; 85(5):706-710.	No outcome data
Sjolie AN. Access to Pedestrian Roads, Daily Activities, and Physical Performance of Adolescents. SPINE 2000; 25 (15): 1965-1972	Not relevant
Sonkin B, Edwards P, Roberts I and Green J. (2006) Walking, cycling and transport safety: an analysis of child road deaths. Journal of the Royal Society of Medicine 99: 402-5	No outcome data
Stein J. Pedometers nudge people to walk more: students in a study who received the devices increased the number of steps taken daily. Los Angeles Times -- Southern California Edition (Front Page) 2004;F7.	Not enough information
Steinbach R, Green J, Datta J, and Edwards P (2011) Cycling and the city: a case study of how gendered, ethnic and class identities can shape healthy transport choices Social Science and Medicine 72: 1123-1130	No outcome data
Stepping Out - Lucy Angley, Tina Watkins http://www.walk21.com/paper_search/results_detail.asp?Paper=29	No outcome data
Stewart AL, Verboncoeur CJ, McLellan BY, Gillis DE, Rush S, Mills KM, et al. Physical activity outcomes of CHAMPS II: a physical activity promotion program for older adults. Journals of Gerontology Series A-Biological Sciences & Medical Sciences 2001;56 (8):M465–70.	General physical activity not reported as walking/cycling
Sullivan, C., O'Fallon, C. 2008 Increasing cycling and	Not effectiveness of

Paper	Reason
walking: an analysis of readiness to change. Land Transport: New Zealand	intervention.
Toole T, Thorn JE, Panton L, Toole Ttfe. Effects of a 12-month pedometer walking program on gait, body mass index, lower extremity function in obese women. [References]. Perceptual and Motor Skills 2007; .104(1).	Not relevant
Tudor-Locke C, Myers AM, Bell RC, Chan CB, McCargar L, Speechley M Rodger W. Effectiveness of the First Step Program Delivered by Professionals Versus Peers. J Phys Act Health 2009; 6:456-462.	Wrong population
Tully MA, Cupples ME, Young IS. Evaluating a community-based walking intervention for hypertensive older people in Taiwan: a randomized controlled trial. Prev Med 2007; 44(5):466.	Not relevant
Tully MA. "Evaluating a community-based walking intervention for hypertensive older people in Taiwan: A randomized controlled trial": Comment. Preventive Medicine: An International Journal Devoted to Practice and Theory 2007; .44(5).	Not relevant
Utley R, Downs D. The HEAD FIRST helmet safety program for kids. J Emerg Nurs 2010; 36(5):489-491.	No outcome data
Van Bekkum, J.E., Williams, J.M., Morris, P.G. (2011) Cycle commuting and perceptions of barriers: stages of change, gender and occupation, Health Education; 111: 476-97.	Not effectiveness of intervention.
Van Dyck, D. et al., 2009. Neighbourhood walkability and its particular importance for adults with a preference for passive transport. Health & Place, 15, pp.496-504.	Qualitative not effectiveness
Van HR, Van HJ, Malenfant JE. Impact of a comprehensive safety program on bicycle helmet use among middle-school children. J Appl Behav Anal 2007; 40(2):239-247.	No outcome data
VanSwearingen JM, Perera S, Brach JS, Cham R, Rosano C, Studenski SA et al. A randomized trial of two forms of therapeutic activity to improve walking: effect on the energy cost of walking. J Gerontol A Biol Sci Med Sci 2009; 64(11):1190-1198.	No data
Vaughn AE, Ball SC, Linnan LA, Marchetti LM, Hall WL, Ward DS et al. Promotion of walking for transportation: a report from the Walk to School day registry. J Phys Act Health 2009; 6(3):281-288.	No outcome data
Wagner A, Simon C, Ducimetiere P, Montaye M, Bongard V, Yarnell J et al. Leisure-time physical activity and regular walking or cycling to work are associated with adiposity and 5 y weight gain in middle-aged men: the PRIME Study. Int J Obes Relat Metab Disord 2001; 25(7):940-948.	Not relevant
Wanner M, Martin DE, Braun FC, Bauer G, Martin BW. Effectiveness of active-online, an individually tailored physical activity intervention, in a real-life setting: randomized	Not relevant

Paper	Reason
controlled trial. J Med Internet Res 2009; 11:e23.	
Wendel-Vos GCW, Dutman AE, Verschuren WMM, Ronckers ET, Ament A, van Assema P, et al.Lifestyle factors of a five-year community-intervention program: the Hartslag Limburg intervention. American Journal of Preventive Medicine 2009;37(1): 50–6.	Exclude as above.
Wener, R., Evans, G. 2007 A morning stroll. Levels of Physical Activity in Car and Mass Transit Commuting, Environment and Behaviour, 39(1): 62-74	Not effectiveness of intervention.
Wide Area 20 mph Limits Encourage Cycling and Walking" Briefing http://www.20splentyforus.org.uk/.	Not relevant
Wilbur J, Vassalo A, Chandler P, McDevitt J, Miller AME-MA. Midlife Women's Adherence to Home-Based Walking During Maintenance. [References]. Nurs Res 2005; .54(1).	No outcome data
Wilbur J, Zenk S, Wang E, Oh A, McDevitt J, Block D et al. Neighborhood characteristics, adherence to walking, and depressive symptoms in midlife African American women. J Womens Health (Larchmt) 2009; 18(8):1201-1210.	No outcome data
Wong CH, Wong SF, Pang WS, Azizah Y, Dass MJ. Habitual walking and its correlation to better physical function: Implications for prevention of physical disability in older persons. The Journals of Gerontology: Series A: Biological Sciences and Medical Sciences 2003; .58A(6).	Not relevant

8.6 Appendix 6: Search strategies

Search Strategies and Details of Evidence Sources

Databases searched:

Medline and Medline in Process via OVID SP

CINAHL via EBSCO

Sociological Abstracts via Proquest

Embase via OVID SP

ASSIA via Proquest

British Nursing Index and Archive via OVID SP

Cochrane Library databases (Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, Database of Abstracts of Reviews of Effects, Health Technology Assessment Database, NHS Economic Evaluation Database) via Wiley

Science Citation Index via Thomson ISI

Social Science Citation Index via Thomson ISI

PsycINFO via OVID SP

The Transport Database via OVID SP

Social Policy and Practice via OVID SP

EPPI Centre Databases – Bibliomap, Database of Promoting Health Effectiveness Reviews (DoPHER), Trials Register of Promoting Health Interventions (TRoPHI), The database on Obesity and Sedentary behaviour studies

http://eppi.ioe.ac.uk/cms/

Websites

Department for Transport

www.dft.gov.uk/

Transport Research Laboratory

www.trl.co.uk/

Institute for Road Safety Research (SWOV) http://www.swov.nl/index_uk.htm

Initial Search

```
Database: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations
and Ovid MEDLINE(R) <1948 to Present>
Search Strategy:
--------------------------------------------------------------------------------
1     Bicycling/ or walking/ (19931)
2     (walk$ or bike$ or bicycl$ or biking).ti. (16777)
3     Travel/ or transportation/mt (17205)
4     (active transport or travel mode or active travel or travelling
actively or multimodal transport or active commute or green commute
or green transport or green travel or ecological commute or
ecological transport or ecological travel or non-motori#ed or auto or
environmentally friendly transport or travel behavio?r or carbon
neutral transport).ti. (6184)
5     1 or 2 or 3 or 4 (53622)
6     Health promotion/mt (8996)
7     *Health behavior/ (12982)
8     (health behavio?r or health education or health promotion).ti.
(14386)
9     *Recreation/ (2189)
10     6 or 7 or 8 or 9 (35689)
11     5 and 10 (688)
12     ((recreation* or leisure or intervention or interventions or
inform* or educat* or promot* or encourage*or advice or advis* or
uptake or increas* or adhere* or aware* or encourage* or facilitat*
or habit or impact* or pattern* or program* or campaign* or project
or activit* or initiative* or scheme or start*) adj5 (Walk* or bike*
or bicycl* or biking or active travel or active commut* or modal
shift* or pedestrian* or non-motori?ed)).ti. (1317)
13     11 or 12 (1903)
14     limit 13 to (english language and humans and yr="1990 -
Current") (1395)
```

Specific Programmes and Phrases (conducted in Medline, Cinahl, Transport and Social Policy and Practice databases)

```
Database: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations
and Ovid MEDLINE(R) <1948 to Present>
Search Strategy:
--------------------------------------------------------------------------------
1     cycling demonstration towns.mp.(0)
2     travelsmart.mp.(1)
3     get walking keep walking.mp. (0)
4     sustainable travel town*.mp. (0)
5    ((cycling or walking) adj3 trail*).mp.(47)
6.    cycling proficiency.ti,ab. (1)
```

Study Filter Search (conducted in Medline, Cinahl, Transport and Social Policy and Practice databases)

```
Database: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations
and Ovid MEDLINE(R) <1948 to Present>
Search Strategy:
--------------------------------------------------------------------
------1     Bicycling/cl, ec, ed, es, hi, lj, px, st, sn, td
[Classification, Economics, Education, Ethics, History, Legislation &
Jurisprudence, Psychology, Standards, Statistics & Numerical Data,
Trends] (545)
2     randomized controlled trial.pt. or randomized.mp. or
placebo.mp. (509955)
3     non-randomised.ti,ab. (1518)
4     quasi-experimental.ti,ab. (3895)
5     exp intervention studies/ (5085)
6     2 or 3 or 4 or 5 (517528)
7     1 and 6 (27)
8     limit 7 to (english language and humans and yr="1990 -Current")
(27)
```