# A REVIEW OF EFFECTIVENESS OF WORKPLACE HEALTH PROMOTION INTERVENTIONS ON PHYSICAL ACTIVITY AND WHAT WORKS IN MOTIVATING AND CHANGING EMPLOYEES' HEALTH BEHAVIOUR

## Draft Report

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## Executive Summary

## 1. Background

Physical activity levels among the UK population are low (DH, 2000). The benefits of a physically active lifestyle in health promotion and disease prevention are well-documented (DH, 2004b; Pate et al., 1995) but the more sedentary nature of work, alongside increasing use of the car when compared with methods of active transport suggests a decline in physical activity. The UK workforce tends to spend more hours at work than most other EU countries and have less paid leave/annum (The Work Foundation, 2005). Although, the workplace setting affords great potential as a setting for promoting physical activity, the UK has been slow to respond to these opportunities.

**Objectives**

The purpose of this review was to identify effective and motivating factors for interventions that were workplace based or initiated from the employer, that aimed to increase physical activity of employees, and were applicable to England.

**Methods**

The review followed the protocols set out by NICE[1]. Twelve electronic databases were searched for studies published since 1996. Screening of retrieved papers was two staged. Titles and abstracts were first screened. The full papers of those studies that passed this initial process were then screened. At both stages a 20% sample were screened by a second reviewer. Those studies included in the review went on to a data extraction process and quality assessment. Each study was given a rating of ++ (high) + or – (low) according to the definitions given within the protocol. Studies were categorised according to physical activity intervention type, delivery, setting and population, barriers, facilitators and motivators to providing and maintaining physical activity interventions. Within each of these categories

[1] Contained within NICE. 2006. Public Health Guidance: Development Process and Methods March 2006. London

evidence was provided using a narrative synthesis, supported by evidence tables, drawing out the key features of each study.

## Review of Effectiveness

This review identified 33 studies (38 publications). These were grouped into five key areas: systematic effectiveness reviews of workplace physical activity interventions; stair walking interventions; walking interventions; active travel; and other (including interventions such as counselling/motivational interviewing, health checks/screening, health promotion messages/information, led activity sessions, active travel or combinations of all of these (i.e. multi-component programmes)).

## Evidence of Effectiveness

### *Stair Walking*

Seven studies reported the promotion of workplace stair walking and aimed to assess how effective the use of health signs (posters); or health messages/information (written, email or doctor's email) were in increasing stair walking/climbing with respect to lift usage.

Overall the studies ranged in design and quality with four being before and after studies (Kerr et al., 2001 (+); Titze et al., 2001 (-); Auweele et al., 2005 (-); Eves et al., 2006 (-)); two controlled before and after studies (Adams and White et al., 2002 (+); Badland et al., 2005 (-)) and one an interrupted time series study (Marshall et al., 2002 (++). With the exception of one study (Badland et al, 2005) measurement consisted of behavioural observation of stair/lift usage in a worksite setting rather than objective tracking of individual physical activity behaviour. Three of the studies (Auweele et al, 2005; Eves et al, 2006, Titze et al, 2001) used overt rather than covert methods of observation in the form of, for example, a person sitting behind a desk. This may have influenced behaviour and therefore these studies have been given a (-) quality rating.

Baseline data varied widely with 158,350 observational counts for stair and lift usage being counted (as well as staff self reported data n=53) in the best quality study (Marshall et al., 2002(++)) with some of the smaller scale studies only having a few thousand observational counts for stair and lift usage (Titze et al., 2001 - 3,486 counts; Auweele et al., 2005 - 3,146 counts). Another methodological weakness was the lack of control over who entered the building during the observational periods and not being able to distinguish employees in the sample counts. Two studies (Adams and White et al., 2002; Marshall et al., 2002) reported including visitors and students as well as employees amongst their sample without being able to report the proportions of each who were appearing in the count. Two studies (Titze et al., 2001; Marshall et al., 2002) have attempted to use automatic counting devices on lifts and stairs (which may be less intrusive than direct observation) but there have been inconsistencies between these when correlated with observational data (Titze et al., 2001).

Two studies showed initial increase in stair walking that declined to baseline levels at follow up. Marshall et al., (2002 (++)) was characterised by having a much more extensive sample than the other included studies, a longer intervention period (12 weeks) and a comparator period within the study design. This study concluded that the intervention had an initial significant increase on stair walking (ascent and descent) (1.05 adjusted ORs, 1.01-1.10 CI, p=0.02) but declined back to baseline over the study period (12 weeks).

Similarly, Auweele et al., (2005) reported a significant increase in stair use, for female employees, when a health sign was used (Chi square (1) =12.97, p<.001) and with a follow up doctor's email (Chi square (1) =15.58, p<.001). However, as with Marshall et al's study, this increased stair usage declined back to baseline over the study period (7 weeks).

Two studies reported significant increases in stair use which were sustained between baseline and follow up - Titze et al, (2001)(p=0.028, follow up at two to three weeks after the four months intervention period ) and Eves et al., (2006) (follow up at two weeks after the six week intervention period). In the latter study, a significant effect on stair climbing (ascent) was seen (OR 1.12,

p<0.05) with a greater effect in the overweight, and a significant effect on stair descent (OR 1.15, p<0.005).

Kerr at al., (2001) reported no significant intervention effect for stair climbing but there was a significant increase in stair descent (OR 1.21, CI 1.07-1.37).

Two papers showed reductions in stair use/step count. Adams and White (2002) report an increase in stair use from 20.1% of all upward journeys at baseline to 20.6% at week one, followed by a decrease to 19.5% in week four. Neither of the changes are significant (p=0.77 (baseline and week one) and p=0.74 (baseline and week four)). Similarly Badland et al (2005) report that effect sizes for step counts ranged from trivial (0.04) to moderate (-0.79) (Cohen effect) with the majority of effect sizes being small and negative. When poster were visible in their worksites mean step counts decreased.

**Evidence statement 1**

**There is evidence from four studies [1,2,3,4] that the use of posters/signs can increase stair (instead of lift) use. However, in two of these studies stair usage declined back to baseline levels at follow up[1] or by the end of the study period[4] suggesting that the effectiveness of these posters is short term. In addition two studies [5,6]reported a decline in stair use/step count. Further study is required.**

[1] Marshall et al., 2002 (++ interrupted time series); [2] Kerr et al (+ before and after); [3]Eves et al., 2006; [4]Auweele et al., 2005 (both - before and after); [5] Adams and White, 2002 (+ control before and after); [6]Badland et al., 2005 (- control before and after)

***Walking Interventions***

Four studies, aiming to increase walking (step counts) in employees (but not as part of active travel) met the inclusion criteria for this review – two of which were UK based (Murphy et al., 2006; Gilson et al., 2007); one was based in Australia (Thomas et al., 2006) and one in Canada (Chan et al., 2004). Again all were considered to have applicability to UK workplace populations.

Overall, two studies used an RCT (individual) design (Murphy et al., 2006 (-); Gilson et al., 2007 (+)) and the other two were before and after studies (Chan et al., 2004 (+); Thomas et al., 2006 (-)). Three of the studies (Chan et al., 2004; Murphy et al., 2006; Gilson et al., 2007) measured physical activity objectively with pedometers (giving daily step counts of employees). However, all the studies relied on self-reported step counts/walking activity which could result in bias and over-estimation.

The study by Gilson et al., (2007) aimed to assess the impact of two different types of walking intervention (baseline participants n= 70). This study showed a significant intervention effect with both intervention groups compared with controls ($p<0.008$, $n2 = 0.17$ – walking on routes; $p<0.005$, $n2 = 0.17$ – walking in task). Small non-significant changes were reported in % body fat, waist circumference and blood pressure. Chan et al., (2004) reported an average daily step count increase from 7,029 ± 3,100 to a plateau of 10,480 ± 3,224 (steps per day were averaged weekly and the change in average number of steps over the 12 week programme modelled; the model allowed for an acclimatisation period where steps stabilised in to a plateau. The plateau reported was reached in a mean time of 3.96 ± 3.28 weeks). Significant decreases were reported in BMI, waist girth and resting heart rate ($p<0.001$ for all).

Murphy et al reported significantly more steps on days of prescribed walking compared to rest days ($p<0.001$) but the sample size is small (n=37) and it is not clear that the mean number of steps, say, per week has increased. Thomas et al report a 10% increase in the number of steps taken per day and a 25% increase in the average number of days that participants reached 10,000 steps. At follow up 63% of participants reported maintained or

increased levels of walking and 65% reported changes to routine to increase physical activity. However significance levels were not reported for this study.

**Evidence statement 2**

**There is evidence from studies in the public sector that work place walking interventions that focus on: facilitated goal setting[1, 3], diaries and self monitoring[1,2,3] and walking routes[4] can produce positive results, increasing step count.**

[1] Chan et al., 2004 (+ before and after study); [2] Murphy et al., 2006 (- individual RCT); [3] Thomas et al., 2006 (- before and after study); [4] Gilson et al., 2007 (+ individual RCT)

***Active Travel***

Three studies were identified for inclusion, all of which primarily aimed to increase the active travel of employees (Mutrie et al., 2002; Wen et al., 2005; Gatersleben and Appleton, 2007). Two were UK studies (Mutrie et al., 2002; Gatersleben and Appleton, 2007), and one was an Australian study (Wen et al., 2005). All were based within large public sector organisations.

Mutrie et al (2002), an individual RCT, was judged to be rated (+). The study was well designed and had an appropriate sample size (baseline participants n= 295). Wen et al's., (2005) study was a before and after design and was rated (-) as it lacked a comparator group, and also had a small sample at baseline (n=68). Gatersleben and Appleton's (2007) qualitative study on the motivators and barriers towards cycling to work, due to limited detail of data analysis, was only rated (-).

Mutrie et al's (2002) intervention to increase walking and cycling to work through the use of written health materials reported a significant effect with the intervention group (received pack), who were almost twice as likely to

report walking to work as the control (received pack at 6 months) after 6 months (OR 1.93, 95% CI 1.06-3.52). Twenty five percent of the intervention group were regularly, actively commuting at 12 month follow up, however the intervention had no significant effect on cycling. The authors concluded that the results may have limited generalisability as participants were mainly economically advantaged women.

Wen et al., (2005) assessed the impact of a social marketing campaign on active travel (walking and cycling) to work. Although no significant increase in reported active travel to work at 12 weeks was found, there was a significant reduction in the proportion of staff who reported driving to work 5 days/week (p=0.012). The final study by Gatersleben and Appleton, (2007) reported some important barriers to continued cycling to work such as dangerous roads and bad weather. However, such findings have previously been reported in the cycling literature and are not surprising.

**Evidence statement 3**

**There is evidence from one UK public sector workplace[1] that a walking and cycling to work campaign, through use of written health materials distributed to employees, can increase walking to work (but not cycling to work) in economically advantaged women.**

[1.] Mutrie et al., 2002 (+ individual RCT)

***Other - including multi-component programmes***

Sixteen studies[2] in this section included counselling/motivational interviewing, health checks/screening, health promotion messages/information, led activity sessions, active travel or combinations of all of these (i.e. multi-component programmes). Of these, three were from the UK (Pert, 1997; Hanlon et al., 1998; Addley et al., 2001); seven were from Europe (Perkio-Makela, 1999; Talvi et al., 1999; Titze et al., 2001; Proper et al., 2004; Aittasalo et al., 2004; Osteras and Hammer, 2006; Sjogren et al., 2006); three from Australia (Marshall et al., 2003; Rice and Saunders, 2001; Lee and White, 2006; two from Canada (O'Loughlin et al., 1996; Plotnikoff et al., 2005) and just one from New Zealand (Cook et al., 2001).

Only two studies scored the highest rating for quality (++) – an RCT (cluster) by Proper et al., (2003; 2004) which aimed to test the effectiveness of individual counselling at work on physical activity; and an RCT (individual) by Marshall et al., (2003) which assessed the effectiveness of health messages (delivered through different media) on physical activity and stage of readiness for physical activity. There were six others which scored (+) for quality – two randomised controlled trials (individual) (Cook et al., 2001; Aittasalo et al., 2004); an RCT (cluster) (Sjogren et al., 2006); two controlled before and after studies (O'Loughlin et al., 1996; Titze et al., 2001) and one qualitative study (Rice and Saunders, 2001). The rest were ranked (-) in terms of study quality. Although some had a large baseline sample (Addley et al., 2001; Plotnikoff et al., 2005) this did not translate into a high ranking for quality. For many studies in this section it was difficult to attribute intervention effects to any particular component of the intervention due to their complexity (multi-component). In several instances increasing physical activity was only one of the primary objectives of the intervention.

Six studies in this part of the review evaluate workplace health checks or screening. All reported increase physical exercise. In all studies the change in physical activity is self reported. O'Loughlin et al (1996) found that subjects

[2] Proper et al, 2003 and Proper et al 2004 report on the same study.

exposed to health screening significantly increased leisure time physical activity (p=0.05). However, it cannot be ascertained whether this change was sustained over time as the study period including follow up was only four months. Pert (1997) reports after health screening, physical assessment and interview with physiotherapist an increase in participants taking regular exercise but sample size is small (n=49 at baseline and n=29 at six month follow up) and lack of a more scientific approach compromises the validity of the study. Hanlon et al (1998) also reports positive results. In this study of workplace screening, groups receive different health information and feedback. Fifty six percent of those who received a health check and returned for the follow up reported one or more desired behaviour change, with an increase in physical activity being the most common. Addley et al (2001) report on a UK study of in which participants were given a health assessment. Following assessment participants were given healthy living literature and a printed personalised analysis of their performance with suggestions on how to make positive changes in those lifestyle areas requiring improvement. Participants self-reported physical activity/exercise per week. The findings show an increase exercise rate of 62%. However, there may be a self selection bias and healthy worker effect.

Osteras and Hammer (2006) report on an intervention that contains health screening, a motivational interview and counselling. The findings showed that physical activity had increased significantly ($p<0.001$) from pre-post test, according to days per week that participants performed physical activity (exceeding 10 minutes) at moderate to high intensity (mean 2.5 days/week to mean 2.9 days/week). However, there was no documentation on the type, time and intensity of physical activity during experimental period. Another study to combine screening and counselling is Talvi et al (1999) who compare the effectiveness of screening and counselling versus screening and health promotion materials. The findings show that participants of both groups report exercising more vigorously post intervention (24% and 18% respectively); and a statistically significant difference between the groups (p=0.06).

Counselling was also the focus of two further studies, Aittasalo et al., (2004) and Proper et al., (2003; 2004). Proper et al report on the effectiveness of individual counselling at the worksite in increasing physical activity, fitness and health. The counsellor offered tailored information, advice and planning on physical activity and diet based on the individual's stage of change (the control group received written information on lifestyle). The findings showed a significant positive intervention effect for energy expenditure ($p=0.003$) and cardio-respiratory fitness where submax heart rate significantly declined in the intervention group (Proper et al, 2003) ($p=0.001$).

Aittasalo et al (2004) focussed on the long term effects of counselling on sedentary employees' leisure time physical activity and whether comprehensive fitness testing brings additional effects to counselling. The study found no statistically significant difference between the groups in any of the physical activity measures. There was a slight increase in LTPA energy expenditure at 12 month follow up in the whole group (including control) ($p=0.011$). There was a similar trend in fulfilment of FPA recommendation for the whole group at both follow ups ($p=0.034$ and $p=0.0003$) and in the fulfilment of HEPA recommendation at 12 month follow up ($p=0.049$).

One study (Titze et al., 2001), brought together many of the components included in the interventions described in this and the previous sections. The study aimed to increase the percentage of individuals who were regularly engaged in moderate-vigorous physical activity. The intervention itself was design by participants in each workplace (office) included in the study subject to their requirements. The interventions included written health and physical activity information, action days to encourage commuting or stair climbing, led walks, fitness testing and counselling. The results reported that control groups had significantly lower median of energy expenditure (1389 kcal vs. 1590 kcal, $p=0.046$).

**Evidence statement 4**

**a. There is evidence from six studies to suggest that work place health screening can have a positive impact on physical activity[1,2,3,4,5,6.] However, whilst all six studies included a health check or assessment, other components of the intervention differed; these included, for example, counselling[4,6], which makes it difficult to attribute effects to a single factor.**

**b. There is evidence from four studies[4,6,7,8] that suggests workplace counselling has positive effects on physical activity. Of the two studies[7,8] that focus solely on counselling, the first[7] shows positive effects on increasing physical activity compared to the control. The other, whilst showing positive improvements, shows no difference between groups receiving counselling, counselling and fitness testing or the control group[8]. Two other studies [4,6], are multi-component interventions that included counselling, motivational interview and health screening which make it difficult to attribute effects to a single factor.**

**c. Evidence from one study[9] suggests that employee designed interventions, that include written health and physical activity information, active commuting, stair climbing, led walks, fitness testing and counselling (all as required) can have a positive improvement on physical activity.**

[1] O'Loughlin et al., 1996 (+ controlled before and after); [2] Pert, 1997 (- before and after study); [3]Hanlon et al., 1998 (- cross sectional survey); [4]Talvi et al., 1999 (- controlled before and after); [5] Addley et al., 2001 (- cross sectional survey); [6] Osteras and Hammer, 2006 (- before and after study); [7] Proper et al., 2003 (++ cluster RCT); [8] Aittasalo et al., 2004 (+ individual RCT); [9]Titze et al., 2001 (+ control before and after)

Two studies explored the effect on physical activity of health information or messages. The first, Marshall et al (2003) evaluated how the promotion of physical activity interventions delivered by print (letters and leaflets) versus delivery by e-mail and a website campaign influence physical activity and progression through the stages of motivational readiness. The study found no significant differences between groups and, although there was an increase in physical activity participation in both groups at follow up there was no significant increases in total physical activity when analysed by intention to treat. They concluded that health messages had no intervention effect on physical activity although 26% of both groups (intervention and control) reported progressing through at least one stage of the stage of change model. The second study, Plotnikoff et al (2005) report on the efficacy of an e-mail intervention on the promotion of physical activity and nutrition in a workplace context. The results show that the intervention group (who received the e-mails) significantly increased their total activity levels at follow-up ($p=0.01$, whereas the control group significantly reduced their total activity levels at follow-up ($p=0.01$). Both groups engaged in higher physical activity levels at the workplace.

One further study, Cook et al (2001) sought to evaluate the effectiveness of a health promotion intervention targeting dietary behaviours and physical activity. Information was delivered to participants by way of workshop sessions. In addition there were nutritional displays in cafeteria. The results showed a significant increase in level of physical activity from baseline to 12 months in intervention group ($p<0.000$), whilst there was a significant decrease in physical activity in the control group over the same period ($p=0.002$).

**Evidence statement 5**

**a. There was conflicting evidence from two studies[1,2] regarding the effectiveness of health messages delivered by e-mail. The first study reported increases in participation in physical activity by those receiving information by print or electronically, but when analysed by**

**intention to treat there was no significant increase in total physical activity.; the second reported positive results on physical activity for health messages received by e-mail. Further study is required.**

**b. There is evidence from one study[3] that health information delivered by way of regular workshops increases participants' level of physical activity. However, further study is required as the ethnic composition of the sample may limit the applicability of the findings to the UK.**

[1]Marshall et al., 2003 (++ individual RCT); [2]Plotnikoff et al., 2005 (- controlled before and after); [3]Cook et al., 2001 (+ individual RCT)

Two studies reported on led group exercise sessions. Perkio-Makela (1999) report on group physical exercise (aerobic training: gymnastics: muscular strength, stretching and relaxation) and training of work plus lifting techniques delivered to a group of female farmers. The study found a short/medium term improvements in physical activity but this had decrease back to baseline levels within three years. Lee and White (2006) report on a minimal exercise programme for middle aged working women. The intervention comprised of weekly aerobic sessions over a twelve week period. The authors report positive feedback of the programme but no significant effects for physical activity.

Sjogren et al (2006) also reported on a physical exercise intervention but rather than led sessions this was non-supervised. The intervention consisted of light resistance training. The authors report that the physical activity did not have a significant effect on subjective physical well-being and no significant physical exercise intervention or light resistance training effects were found for psychosocial functioning or general subjective well being.

**Evidence statement 6**

**There is evidence in one study[1] to suggest that group led exercise sessions can bring positive improvements to physical activity levels for women, but these improvements are not sustained in the medium to long term. However the applicability and transferability of the intervention requires further study.**

[1] Perkio-Makela, 1999 (- individual RCT)

***Systematic Reviews***

A total of three reviews were identified for inclusion in the review of effectiveness. The reviews examined the effectiveness of workplace interventions which aimed to increase physical activity in employees. Two of these were of good quality (+). One (Dishman et al., 1998) concluded that workplace physical activity interventions have a small, non-significant positive effect on physical activity or fitness. The other (Proper et al., 2003) concluded that there was a significant intervention effect for physical activity but this was made on the basis of only two high quality studies. Both (Dishman et al., 1998, Proper et al., 2003) reported that the methodological quality of the published literature was poor, with many authors also using only self-reported physical activity to measure outcomes.

**Evidence statement 7**

**There is inconclusive, review-level evidence that workplace physical activity interventions have a significant effect on physical activity.**

**Workplace - Settings & Populations**

- *Does the type of workplace influence effectiveness?*

**Evidence Statement 8**
**No evidence was presented that indicates type of workplace influenced the effectiveness of physical activity interventions.**

- *What are the most effective and appropriate interventions for different sectors of the workforce such as men and women, younger and older workers, minority ethnic groups and temporary/casual workers?*

**Evidence Statement 9**
**No evidence was presented that physical activity interventions were more appropriate for different *sectors* of the workforce based on gender, ethnicity or for temporary/casual workers.**

One study reports differences in effectiveness across age groups (Pert, 1997). This intervention comprised of health screening, a physical assessment and interview with a physiotherapist. Effectiveness was found to be highest in those over 35 years but no details are given of statistical significance and the lack of a more scientific approach in implementation of the project compromises the validity of the study.

- *Does effectiveness vary according to the type of job people do?*

**Evidence Statement 10**
**Three studies[1,2,3] suggest that workplace physical activity interventions are more effective for sedentary workers.**

[1]Titze et al., 2001 (- before and after); [2]Eves et al., 2006 (- before and after); [3]Thomas et al., 2006 (- before and after)

Eves et al (2006) study of a poster intervention to increase stair walking report a greater effect in people who are overweight. However, measurement of weight status is subjective and may be subject to error. Thomas et al (2006) report in their evaluation of a walking programme that those with the lowest step count at baseline achieved the greatest increase (on average 53%) but the study relies on self reported data. Similarly Titze et al (2001) report on a multi-component and found that participants with a low level of physical activity at baseline were seen to have a statistically significant greater increase in physical activity than those with higher baseline figures. However, the effectiveness refers only to those employees willing to complete a questionnaire at baseline. The sample is self-selected, relatively young and well educated therefore generalisability is limited.

**Intervention Design, Delivery, and Duration**

- *How does the way it (the intervention) is delivered influence effectiveness?*

**Evidence statement 11**

**Evidence from two walking interventions studies[1,2] and one active travel intervention[3] suggests self-directed interventions are effective.**

[1]Thomas et al, 2006 (- before and after); [2]Gilson et al, 2007 (+ individual RCT); [3]Mutrie et al 2002 (+ individual RCT)

- *Does the length and/or intensity of the intervention influence its impact?*

**Evidence Statement 12**

**Evidence for the influence on effectiveness of duration and intensity of physical activity of is inconclusive in stair walking, walking and active**

**travel interventions. However, evidence from five other studies[1,2,3,4,5] suggest a moderate effect of interventions of over 6 months duration.**

[1]Cook et al., 2001 (+ individual RCT); [2]Proper et al., 2004; 2003 (++ cluster RCT); [3]Plotnikoff et al., 2005 (- control before and after); [4]Osteras and Hammer, 2006 (- before and after); [5]Pert 1997 (- before and after)

- *Does the degree to which employees are involved in the planning, implementation and review of interventions influence their effectiveness?*

**Evidence statement 13**

**There is no evidence that involvement of employees in planning, implementation and review of the physical activity intervention influences the effectiveness of those interventions.**

**Barriers, Facilitators & Motivators**

- *What are the barriers and facilitators to implementation – for both employers and employees?*

**Evidence statement 14**

**Seven studies[1,2,3,4,5,6,7] reported employees perceived barriers to the implementation of work place physical activity interventions. Barriers fell into two categories: negative perceptions and physical barriers. These included time, physical fitness levels and expense. Physical barriers to cycling to work were particularly pertinent including state and lack of cycle paths, weather, pollution and cycle locking facilities. No factors were cited by the employers as barriers to the implementation of physical activity interventions.**

**Evidence statement 15**

**Nine studies[1,2,3,4,5,6,7,8,9] gave details of employees' cited facilitators to the implementation of interventions that focus on physical environment (improvements in facilities and convenience of location); incentive schemes and flexible work practices. In three stair walking studies employees found the poster interventions encouraged stair walking, were a good idea and thought provoking. No factors were cited by the employers as facilitators to the implementation of physical activity interventions.**

[1]Kerr et al, 2001 (- before and after); [2]Adams and White, 2002 (+ control before and after); [3]Eves et al, 2006 (- before and after); [4]Mutrie et al, 2002 (+ individual RCT); [5]Gatersleben and Appleton, 2007 (- qualitative); [6]Rice and Saunders, 2001 (+ qualitative); [7]Pert, 1997 (- before and after); [8]Thomas et al, 2006 (- before and after); [9]Lee and White, 2006 (- individual RCT).

- *What are the key components of the intervention that motivate individuals to become more physically active?*

**Evidence statement 16**

**One study[1] reported that a motivating factor for becoming more physically active cited by employees was that the intervention was worthwhile and enjoyable.**

[1]Thomas et al, 2006 (- before and after)

- *How can employers be encouraged to promote physical activity at work?*

**Evidence statement 17**

**There were no opinions given by employers that explained how employers could promote physical activity in the workplace.**

Some interesting evidence is presented on what are perceived to be the barriers and facilitators of implementing physical activity interventions in the workplace which may be valuable in identifying 'why' an intervention is successful or not. However, overall relatively little information was collected on such 'qualitative' aspects of the intervention studies, and the information that was collected came from employees only. The major gap identified in the included literature was regarding perspectives of the employer.

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### Included in the final review (n= 38)

### Number of studies (n=33)


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## *1. Background*

The National Institute for Health and Clinical Excellence (NICE) was requested by the Department of Health to produce intervention guidance on workplace health promotion with reference to physical activity and what works in motivating and changing employees' health behaviour.

The guidance will produce recommendations for good practice, based on the best available evidence of effectiveness, including cost effectiveness. It is aimed at professionals with public health as part of their remit working within the NHS, local authorities, workplaces and the wider public, private, voluntary and community sectors.

The guidance will support implementation of the preventive aspects of national service frameworks (NSFs) and a number of policy related documents. It has been commissioned as a response to rising costs of occupationally-related morbidity in England and increasingly sedentary lifestyles.

This is one of a series of reviews focusing on the effectiveness of physical activity interventions and programmes, within different target populations and settings.

### 1.1 Purpose of the review

The purpose of the review was to identify effectiveness, cost-effectiveness and motivating factors for interventions that were workplace based or initiated from the employer that aimed to increase physical activity of employees, and were applicable to England. The aim was to answer the following key questions:

- What is the aim/objective of the intervention?
- How does the content influence effectiveness?
- How does delivery mode influence effectiveness?
- Does the type of workplace setting influence effectiveness?

- Does the length and/or intensity of intervention influence impact/effectiveness?
- Does the effectiveness vary by socio-demographic characteristics of the target population?
- Does the effectiveness vary by job type of the target population?
- What are the barriers to implementation of the intervention?
- What are the key components of the intervention that motivate individuals to change with respect to physical activity behaviour?

Consequently this review will identify:

- Which types of workplace physical activity intervention are effective in changing behaviour (and other related outcomes) for different workforce sectors and types of work place.
- What aspects of design (length/intensity) and delivery (including employee involvement) contribute to effective workplace physical activity interventions
- The motivators, barriers and facilitators for employers and employees during the implementation of effective workplace physical activity interventions (i.e. during interventions that lead to increases in physical activity outcomes).

This review will include the general adult population of working age defined as “the age which people wish to work until, or State Pension Age, whichever is later” (Department of Work and Pensions, 2005). It will not cover self employed people, unemployed people, or adults who require specialist medical advice regarding physical activity. All types of workplace will be considered.

A range of intervention types will be considered as long as they are either workplace based (or endorsed by the employer) and their primary aim is to increase physical activity of employees (and are applicable to England) such as:

a) Health promotion/awareness campaigns that promote the use of existing facilities in the workplace for physical activity (e.g. onsite gyms, swimming pools, stairs)

b) Subsidised interventions to encourage physical activity – e.g. gym membership, physical activity incentive schemes (e.g. time allocation)

c) Active commuting (walking or cycling, part or all of the way to work).

d) Other exercise sessions/classes – e.g. aerobics, running

This review will not cover aspects such as awareness raising only - health checks/lifestyle assessments, newsletters, wellness days, lifestyle seminars, distribution of equipment e.g. pedometers with no evaluation programme (rationale - no direct physical activity outcomes measured) or the promotion and creation of built or natural environments that encourage and support physical activity (as this is being consider elsewhere by NICE).

## 1.2 Background context

### 1.2.1 Costs of sickness absence

The UK Government recently set out to promote health at work by "improving working conditions to reduce the causes of ill health related to work, and promoting the work environment as a source of better health" (DH, 2004a, p153). This was a response to escalating costs associated with sickness absence in the UK - £13bn in 2005, compared with £11.6bn in 2003 (Confederation of British Industry (CBI), 2006). Levels of sickness absence, particularly in the public sector, are of major concern, with the CBI (2005) asserting that that if the absence rate in the public sector could be reduced to the private sector average, absence would fall by more than 20 million days per annum and save the UK taxpayer £1.2bn per annum. The Health and Safety Executive (HSE) reported 609,000 cases of workplace ill health in (2003/4) of which stress-related cases contributed 42% and musculo-skeletal disorders 33%. In the same time period 29.8 M working days were lost to ill health (HSE, 2004). Government has subsequently introduced the

‘Government Setting Example’ programme, which aims to reduce the number of working days lost, through accidents and ill-health, in the civil service and wider public sector by 30%, by 2010 (HSE, 2005).

### 1.2.2 Impacts of sedentary behaviour in the UK

The cost of physical inactivity in England, including direct costs of treatment for the major lifestyle related diseases, and the indirect costs caused through sickness absence, has been estimated at £8.2 billion a year (DH, 2004b). The benefits of a physically active lifestyle in health promotion and disease prevention are well-documented (DH, 2004b; Pate et al., 1995). Despite such convincing evidence of physical activity levels among the UK population are low (DH, 2000). There is increasing recognition both globally and in the UK of the need to promote healthier lifestyles and improve physical activity levels in order to reduce preventable deaths from chronic diseases (United States Department of Health & Human Services, 1996; WHO, 2004; DH, 2004; Health Development Agency, 2004; House of Commons Health Committee, 2004; Wanless, 2004; DH, 2005). Targets for increasing population physical activity levels have been set (Department of Culture, Media and Sport [DCMS], 2002) however, knowledge around the design of effective interventions aimed at changing sedentary behaviour is still limited, especially in the U.K (McKay et al., 2003).

### 1.2.3 Physical activity in the workplace

In general, people in the UK increasingly work in sedentary occupations and even manual jobs are less physically demanding than they were previously due to increasing mechanisation of everyday processes (driven partly by demand for increased productivity at work but also by health and safety legislation). The Health Survey for England (2003) reported that men in the highest socio-economic group (managerial and professional) had lowest total physical activity, with only 26% taking the recommended amount of physical activity (at least 30 minutes moderate physical activity on 5 or more days/week) when compared with about 34% for the lowest socio-economic group (semi-routine and routine workers). This may be due to greater levels

of occupationally-related physical activity in the lowest socio-economic groups (i.e. higher manual components). However, sports participation had an inverse relationship to that previously described with the highest socio-economic group (managerial and professional) having the greatest participation in sport (46% men reported taking part in sport in the last four weeks). Only 25% of men in the lowest socio-economic group reported taking part in sport in the last four weeks (Health Survey for England, 2003).

### 1.2.4 Travelling to work

It is generally accepted that the most effective way of increasing physical activity is by incorporating it into daily lifestyle patterns. Interventions which encourage the daily commute to work to be physically active can make a significant contribution to daily levels of physical activity amongst the working population (Sustrans, 2005).

However, the trend towards more sedentary modes of travel is clear. In Great Britain the proportion of trips made by car increased from 61% to 64% between 1995/7 and 2005; the number of trips made on foot declined by 16% and trips by bicycle or motorcycle decline by 20% over the same period (Department of Transport, 2006). Unfortunately, the evidence suggests that active travel to work in the UK is also decreasing. Seventy one percent of people travelled to work by car; while only 11% travel by foot, 8% by bus, 4% by bicycle or motorcycle and 7% rail. This decrease in active travel is mirrored by those of school age. Between 1995/7 and 2005 the proportion of 5-10 year olds going to school by car increased from 38% to 43% whilst those walking decrease from 53% to 49% (Department for Transport, 2006).

### 1.2.5 Summary

The benefits of a physically active lifestyle in health promotion and disease prevention are well-documented (DH, 2004b; Pate et al., 1995) but the more sedentary nature of work, alongside increasing use of the car when compared with methods of active transport suggests a decline in physical activity. The UK workforce tends to spend more hours at work than most other EU countries and have less paid leave/annum (The Work Foundation,

2005). Although, the workplace setting affords great potential as a setting for promoting physical activity, the UK has been slow to respond to these opportunities.

## *2. Methodology*

This review has been carried out by a team from the Institute for Health and Social Care Research, the University of Salford, in collaboration with the School of Healthcare, the University of Leeds.

### 2.1 Literature search

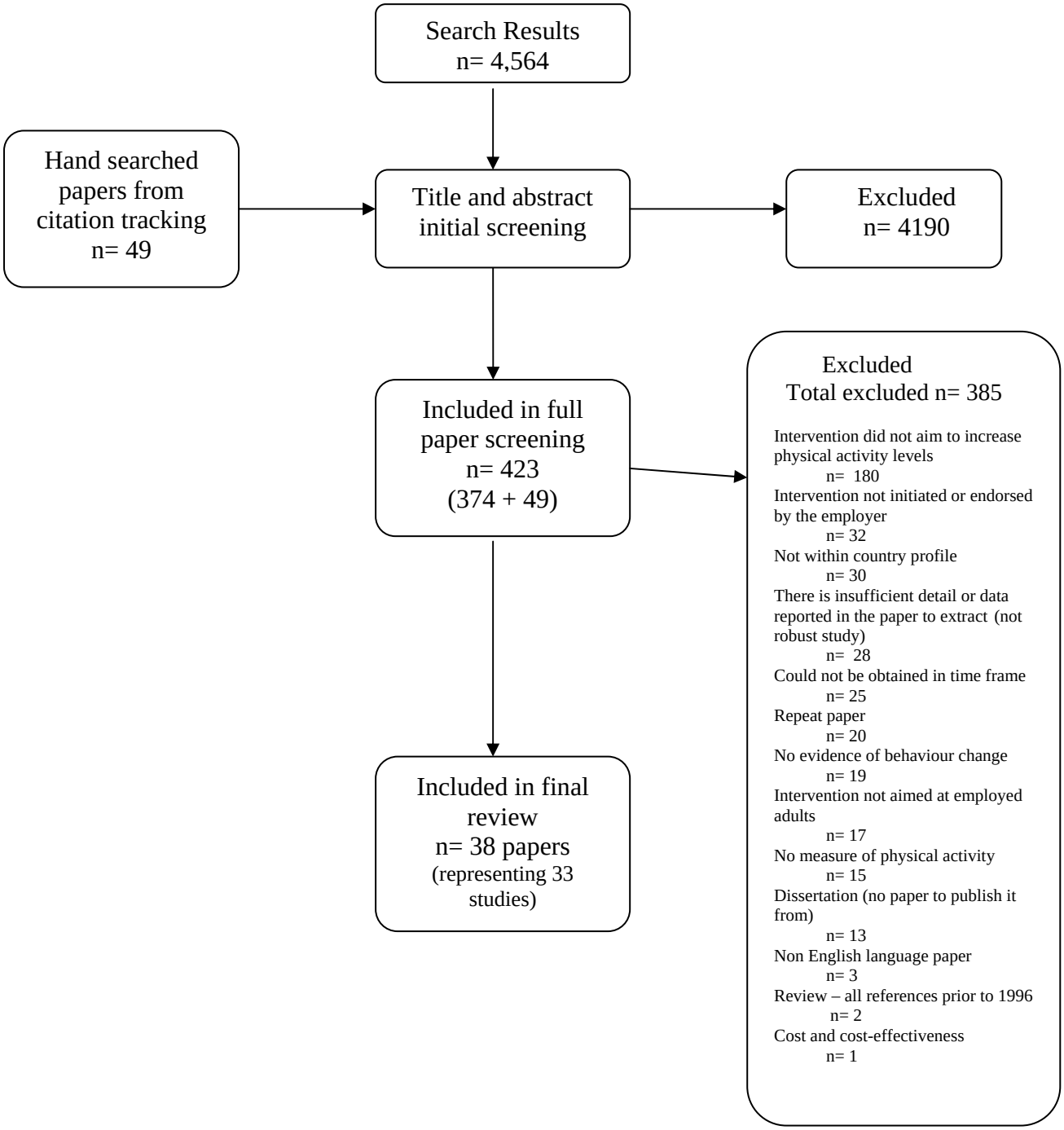
The search strategy was developed by the review team at the University of Salford, in collaboration with various members of the NICE project team (in London and Manchester). Literature searches of electronic databases and websites were then carried out by Information Specialists at Support Unit for Research Evidence (SURE), Cardiff University. Comprehensive searches of the following databases were carried out:

- ABI Inform
- ASSIA
- Cinahl
- CDSR
- CENTRAL
- DARE
- Embase
- Psycinfo
- Social Science Citation Index
- Social Policy and Practice
- SportsDISCUS
- Transport

These databases were selected to reflect the broad nature of the topic area of the review and covered health, sports, social policy and transport policy. The search strategies used can be found in Appendix 1. Searches of a range of web sites were performed to identify any further projects. The electronic searches were supplemented by hand checking the references of all the papers included at the screening full papers stage. An overview of the search

process and the results obtained at each stage can be found at Figure 1. The electronic searches identified 6780 references which were screened for duplicates resulting in 4564 references.

**Figure 1: Flow chart of review process**



## 2.2 Selection of studies for inclusion

Two stages of screening were used to determine which studies should be included in the review. Titles and abstracts of the 4564 electronic references were scanned by 1 of 5 members of the review team. To ensure inter-rater reliability, a 20% sample of abstracts were screened by a second reviewer. There were 45 discrepancies and these were discussed and agreed by the project team as a whole. This process resulted in a set of 374. Reference checking located a further 49 references bringing the total to 423.

Potentially relevant references, for which full papers were obtained and screened by 1 of 4 team members with a 20% sample reviewed by 2 members. There were 7 discrepancies which were discussed and agreed by all members of the project team. Studies were included in the review if they met all of the following inclusion criteria:

**Inclusion criteria**

1. The intervention aimed to increase physical activity
2. The intervention is aimed at employed adults
3. The intervention is initiated or endorsed by the employer
4. The outcome measures included a measure of physical activity
5. The study provides evidence of a change in behaviour relating to physical activity or measures change in behaviour relating to physical activity
6. The paper is in English
7. The paper was published in 1996 or later
8. Reviews including papers published in 1996 or later

**Exclusion criteria**

1. The intervention is aimed at self employed or unemployed adults
2. The intervention is a modification to the environment built/natural
3. There is no evidence/measure of behaviour change or physical activity
4. There is insufficient detail or data reported in the paper to extract (not a robust study)

5. Dissertations (unable to obtain within the time frame – however searches to identify papers published from the dissertation were performed and added where found)
6. Not obtainable within time frame
7. Costs or cost effectiveness papers

This process led to 68 papers eligible for inclusion in the review. In the time frame of this review it was unfeasible to extract data from this number of studies. It was therefore decided to exclude studies from the USA and Asia ). Studies were included if they were implemented in the UK, the rest of Europe, Australia, New Zealand and Canada. It was anticipated that studies located in these geographical areas were likely to be more applicable to the UK. A list of studies with their reasons for exclusion is included in the reference section (Appendix 2)[3]. A total of 38 papers representing 33 studies were then included in this review (Appendix 2).

## 2.3 Quality Appraisal, study categorisation and assessing applicability and synthesis

Data relating to the scope of this review was extracted from each study using the recommended data extraction template (NICE 2006). This was amended to reflect items in the scope document and can be found in Appendix 3. Methodological checklists (NICE 2006) were also applied to each study to determine the quality of each study. Each study was given a rating of ++ (high) + or – (low) according to the definitions given within the manual. The data extracted from each study and checklist was then transferred into an Excel spreadsheet in order to provide descriptive statistics. Studies were categorised according to physical activity intervention type, delivery, setting and population, barriers, facilitators and motivators to providing and maintaining physical activity interventions. Within each of these categories

[3] A total of 25 papers were not obtained in the time frame; this was either due to an incomplete reference meaning it was not possible to identify the paper or that the paper was not received in time to be included in the review.

evidence is provided using a narrative synthesis, supported by evidence tables, drawing out the key features of each study. Evidence is provided in a hierarchy with higher quality studies ranked first in the evidence tables.

Applicability of the included studies to UK populations and settings was assessed using the following statements (NICE Methods Manual, version 1, 2006):

A UK study;

B Non-UK study but very likely to be applicable to the UK;

C Non-UK study with limited applicability to the UK;

D Non-UK study unlikely to be generally applicable to a UK setting.

### 2.4 Economic appraisal

Details of the identified and excluded published economic evaluations were forwarded to the team at the University of York for inclusion in their economic review.

## *3. Review of Effectiveness*

### 3.1 Summary of identified studies

This review identified 33 studies (38 publications) which met the inclusion criteria. These were grouped into five key areas:

- **Work place stair walking interventions** (Kerr et al., 2001; Titze et al., 2001; Adams and White et al., 2002; Marshall et al., 2002; Auweele et al., 2005; Badland et al., 2005; Eves et al., 2006);
- **Walking interventions (other than active travel)** (Chan et al., 2004; Murphy et al., 2006; Thomas et al., 2006; Gilson et al., 2007);
- **Active travel** (Mutrie et al., 2002; Wen et al., 2005; Gatersleben and Appleton, 2007); and
- **Other**
    - Health screening/checks: O'Loughlin et al., 1996; Pert, 1997; Hanlon et al., 1998; Addley et al., 2001;
    - Health screening, motivational interview, counselling: Osteras and Hammer, 2006;
    - Health screening, health promotion, counselling: Talvi et al., 1999
    - Counselling: Proper et al., 2003, 2004;
    - Counselling and fitness testing: Aittasalo et al., 2004;
    - Counselling and fitness testing, written health and physical activity information, active travel, stair walking, led walking: Titze et al., 2001;
    - Methods of health information delivery: Marshall et al., 2003; Plotnikoff et al., 2005; Cook et al., 2001;

- Led activity sessions: Perkio-Makela, 1999; Lee and White, 2006;
- Non-supervised exercise sessions: Sjogren et al., 2006)

- **Systematic effectiveness reviews** of workplace physical activity interventions (Dishman et al., 1998; Proper et al., 2003; Badland et al., 2004); (see section 3.2)

Further details of the studies is included in overview tables 1 – 4 (77-84)

### 3.1.1 Stair walking interventions

**Included studies:** (see table 1, p77 for further details of these studies)

Kerr et al., 2001 (before and after study, +, A);

Titze et al., 2001 (before and after study, -, B);

Adams and White et al., 2002 (controlled before and after study, +, A);

Marshall et al., 2002 (interrupted time series,++, B) ;

Auweele et al., 2005 (before and after study, -, B);

Badland et al., 2005 (controlled before and after, -, B);

Eves et al., 2006 (before and after study, -, A)

Seven studies reported the promotion of stair walking and aimed to assess how effective the use of health signs (posters); or health messages/information (written, email or doctor's email) were in increasing stair walking/climbing with respect to lift usage. Three studies were UK based (Kerr et al., 2001; Adams and White et al., 2002; Eves et al., 2006), two were European (Titze et al., 2001; Auweele et al., 2005), one was based in Australia (Marshall et al., 2002) and one in New Zealand (Badland et al., 2005). All were considered to have applicability to UK workplace populations (A or B).

Kerr at al., using a before and after study design assessed the effectiveness of a poster prompt to increase stair use in two UK workplaces. A two week baseline period monitored stair use by hidden camera. Employees' movements were recorded for two hours in the morning and afternoon. Trained observers then coded the videotapes for gender, loads larger than a briefcase or medium sized bag, and entrance or exit from the staircase or elevator. An A1 poster with the message 'stay healthy use the stairs' was then placed at the entrance to the elevator and stair use was recorded for a two week intervention period. In total 14982 counts of stair and lift use were recorded. The study reported no significant intervention effect for stair climbing but there was a significant increase in stair descent (OR 1.21, CI 1.07-1.37). The intervention was simple and low cost. However, a weakness of the study was the lack of a control group and that individuals could not be identified for follow up purposes and demographic information.

The Titze et al study (2001), another before and after study with no control group, aimed to examine the effect of an intervention programme on behaviour change in stair use in the workplace. The intervention consisted of written information provided to employees about recent physical activity recommendations to achieve health benefits, and action days were arranged encouraging the use of stairs instead of lifts. Apples or other fruit were offered on the stairs and a game of chance was performed for stair users. Personal observation of stair use was carried out during one week (5 working days) for one hour each morning in each of four offices over a period of four months with a follow up at two to three weeks after the intervention period. At the same time as personal observation the data from automatic lift counters was registered. Using 3486 counts of stair and lift use, the study found a significant increase in stair use which was sustained between baseline and follow up ($p=0.028$). However, the magnetic switch for using the lift registered only the lift door opening and not the number of users. Also the number using the lift at any one time was not known. The data collected did not provide information on change of intention to use the stairs or trends in stair use over time. In addition the environmental differences between the four offices make cross comparison difficult.

Adams and White (2002) use a before and after type study but include a control group. The intervention consisted of 39 signs that were displayed next to the lift call buttons on each floor and in each lift. The signs included messages about burning calories, the longer time taken using the lift compared to the stairs, and using the stairs as a means of exercise. Other signs and floor directories were displayed within the stairwell in an attempt to improve the stairwell environment and provide motivational encouragement to stair users. The posters would be left in place for 12 weeks and data would be collected in four phases: at baseline, during intervention weeks one, four and 12. Observers counted stair use and lift use for one and three-quarter hours on each of five consecutive working days. No entirely comparable control group could be found so a retrospective control was used. The study was in fact terminated after four weeks. In total 5193 counts of stair and lift use were observed. The study reports an increase in stair use from 20.1% of all upward journeys at baseline to 20.6% at week one, followed by a decrease to 19.5% in week four. Neither of the changes are significant ($p=0.77$ (baseline and week one) and $p=0.74$ (baseline and week four). The authors noted that this was the first study to report a systematic approach to the development and evaluation of a stair promotion intervention. However, the project may have been unjustified in identifying stair use as a potentially important area for activity promotion due to the setting being utilised by mostly young and well-educated individuals (a university). The intervention was not maintained as planned due to the removal of posters and this may have accounted for the limited effect of the intervention. No attempt was made to conceal the observer's presence and observations were made from only one floor meaning some improvements in stair use may not have been detected. Finally, it was not possible to tell which participants were employees.

Marshall et al (2002) conducted an interrupted time series that aimed to evaluate whether a stair-promoting sign could increase the use of stairs over an elevator in a healthcare facility. The study comprised coloured signs mounted on the wall next to the elevator and stair areas, and vinyl footprints stuck to the floor which led people to the stairs. The intervention aimed to provide a 'point of choice' instant motivational prompt to encourage use of

stairs as an alternative to the elevator, and to improve health and fitness. Conducted over 12 weeks, data were collected three weeks before, during and after, displaying signs during weeks 4-5 and 8-9 using a motion-sensing device. Self reported data on stair use by employees were also collected. The objective measure of counting used was unobtrusive and provided a comprehensive rather than snapshot of who was using stairs. Whilst the data collection method also counted visitors, an attempt at validation was made by comparison with self-report data from staff only. Using 158350 counts for stair usage, the study concluded that the intervention had an initial significant increase on stair walking (ascent and descent) (1.05 adjusted ORs, 1.01-1.10 CI, p=0.02) but this declined back to baseline over the study period (12 weeks).

Auweele et al (2005) reports on a before and after study that evaluated the impact of two interventions: health signs followed by worksite doctor's e-mail on stair usage of female employees. This consisted of a large health sign (A3 size) by the elevators and stairs on every floor of the worksite, and an e-mail to all employees on the benefits of taking the stairs which also mentioned the signs. The study was carried out over a 7-week period (including follow-up) and observations of employee stair climbing was taken by students who sat behind a desk and registered stair climbing when employees entered the door to the stairwell. The observations were carried out at four points in time: week one (baseline), week two (signs only), week three (signs and e-mail), week seven (follow-up). The hours of observation were chosen to represent the start and end of the working day and to catch full- and part-time workers. Observations were pooled to obtain average observations per week. Studies on female employees are less common; however it was not possible to exclude female visitors from the observations. In addition, it was noted that observers may have influenced stair walking behaviour. Like the Marshal et al study, Auweele et al reported a significant increase in stair use, for female employees, when a health sign was used (Chi square (1) =12.97, p<.001) and with a follow up doctor's email (Chi square (1) =15.58, p<.001). However, as with Marshall et al's study, this increased stair usage declined back to

baseline over the study period (7 weeks). In total 3146 counts of stair and lift use were observed.

Badland et al (2005), was a controlled before and after study to assess the effectiveness of posters in professional worksites on stair use and objectively measure physical activity. There were two types of posters - A5 and banners - with a variety of different messages encouraging stair use. Participants from two worksites wore a sealed pedometer during all waking hours and another sealed pedometer during working hours for three days on four separate occasions. The study protocol was a crossover design with the first worksite receiving the treatment (posters) for three weeks, followed by a six-week washout period, then a three-week control. The second worksite received the control prior to the treatment period. Measurements were taken at the beginning and end of each three week block. The strength of this study lies in the use of an objective measure of outcome (sealed pedometers), however the small sample size (n=46) and lack of information of how representative the sample was means that caution should be applied to the interpretation of results. This is particularly pertinent given that 50% of the sample were based on the ground floor, meaning there was potentially less opportunity for stair walking compared with other employees located on higher floors. The study found that effect sizes for step counts ranged from trivial (0.04) to moderate (-0.79) Cohen Effect, with the majority of effect sizes being small and negative. When poster were visible in their worksites mean step counts decreased by 868 steps (for worksite physical activity) and by 1861 steps (for total physical activity).

Eves et al (2006) was a before and after study of the effectiveness of posters which aimed to encourage stair use. A poster was placed in the lobby and the same poster and six messages were affixed to the stair rises between floors. A point-of-choice prompt was placed at the elevators. Baseline data were collected over a two week period followed by six weeks during which the posters were displayed. Stair and elevator choices were videotaped and subsequently coded for direction of travel, traveller’s sex, and traveller’s load. Weight status was coded using silhouettes behind the computer monitor. A

follow up questionnaire was sent to employees two weeks after the monitoring was complete. Observations were carried out for two hours in the morning and afternoon, five days per week. In total there were 26806 counts for stair and lift usage. The study reports a significant effect on stair climbing (ascent) (OR 1.12, $p<0.05$) with a greater effect in the overweight, and a significant effect on stair descent (OR 1.15, $p<0.005$). The strength of the study lies in the observation method which facilitates the distinction between stair ascent and descent. However, the method by which weight status was coded can be seen to be subjective limiting the authors' claim that stair climbing may be an acceptable vigorous physical activity for those seeking to control their weight. In addition the follow up questionnaire was only completed by 19% of the workforce.

**Summary and evidence statement**

Overall the studies ranged in design and quality with four being before and after studies (Kerr et al., 2001 (+); Titze et al., 2001 (-); Auweele et al., 2005 (-); Eves et al., 2006 (-)); two controlled before and after studies (Adams and White et al., 2002 (+); Badland et al., 2005 (-)) and one an interrupted time series study (Marshall et al., 2002 (++). With the exception of one study (Badland et al, 2005) measurement consisted of behavioural observation of stair/lift usage in a worksite setting rather than objective tracking of individual physical activity behaviour. Three of the studies (Auweele et al, 2005; Eves et al, 2006, Titze et al, 2001) used overt rather than covert methods of observation in the form of, for example, a person sitting behind a desk. This may have influenced behaviour and therefore these studies have been given a (-) quality rating.

Baseline data varied widely with 158,350 observational counts for stair and lift usage being counted (as well as staff self reported data n=53) in the best quality study (Marshall et al., 2002(++)) with some of the smaller scale studies only having a few thousand observational counts for stair and lift usage (Titze et al., 2001 - 3,486 counts; Auweele et al., 2005 - 3,146 counts).

Another methodological weakness was the lack of control over who entered the building during the observational periods and not being able to distinguish employees in the sample counts. Two studies (Adams and White et al., 2002; Marshall et al., 2002) reported including visitors and students as well as employees amongst their sample without being able to report the proportions of each who were appearing in the count. Two studies (Titze et al., 2001; Marshall et al., 2002) have attempted to use automatic counting devices on lifts and stairs (which may be less intrusive than direct observation) but there have been inconsistencies between these when correlated with observational data (Titze et al., 2001).

Two studies showed initial increase in stair walking that declined to baseline levels at follow up. Marshall et al., (2002 (++)) was characterised by having a much more extensive sample than the other included studies, a longer intervention period (12 weeks) and a comparator period within the study design. This study concluded that the intervention had an initial significant increase on stair walking (ascent and descent) (1.05 adjusted ORs, 1.01-1.10 CI, p=0.02) but declined back to baseline over the study period (12 weeks).

Similarly, Auweele et al., (2005) reported a significant increase in stair use, for female employees, when a health sign was used (Chi square (1) =12.97, p<.001) and with a follow up doctor's email (Chi square (1) =15.58, p<.001). However, as with Marshall et al's study, this increased stair usage declined back to baseline over the study period (seven weeks).

Two studies reported significant increases in stair use which were sustained between baseline and follow up - Titze et al, (2001)(p=0.028, follow up at two to three weeks after the four months intervention period ) and Eves et al., (2006) (follow up at two weeks after the six week intervention period). In the latter study, a significant effect on stair climbing (ascent) was seen (OR 1.12, p<0.05) with a greater effect in the overweight, and a significant effect on stair descent (OR 1.15, p<0.005).

Kerr at al., (2001) reported no significant intervention effect for stair climbing but there was a significant increase in stair descent (OR 1.21, CI 1.07-1.37).

Two papers showed reductions in stair use/step count. Adams and White (2002) report an increase in stair use from 20.1% of all upward journeys at baseline to 20.6% at week one, followed by a decrease to 19.5% in week four. Neither of the changes are significant (p=0.77 (baseline and week one) and p=0.74 (baseline and week four). Similarly Badland et al (2005) report that effect sizes for step counts ranged from trivial (0.04) to moderate (-0.79) Cohen Effect with the majority of effect sizes being small and negative. When the posters were visible in worksites the mean step counts decreased.

**Evidence statement 1**

**There is evidence from four studies [1,2,3,4] that the use of posters/signs can increase stair (instead of lift) use. However, in two of these studies stair usage declined back to baseline levels at follow up[1] or by the end of the study period[4] suggesting that the effectiveness of these posters is short term. In addition two studies [5,6]reported a decline in stair use/step count. Further study is required.**

[1] Marshall et al., 2002 (++ interrupted time series); [2] Kerr et al (+ before and after); [3]Eves et al., 2006; [4]Auweele et al., 2005 (both - before and after); [5] Adams and White, 2002 (+ control before and after); [6]Badland et al., 2005 (- control before and after)

### 3.1.2 Walking interventions

**Included studies:** (see table 2, p78 for further details of these studies)

Chan et al., 2004 (before and after study, +, B);

Murphy et al., 2006 (individual RCT, -, A);

Thomas et al., 2006 (before and after study, -, B);

Gilson et al., 2007 (individual RCT, +, A)

Four studies, aiming to increase walking (step counts) in employees (but not as part of active travel) met the inclusion criteria for this review – two of which

were UK based (Murphy et al., 2006; Gilson et al., 2007); one was based in Australia (Thomas et al., 2006) and one in Canada (Chan et al., 2004). Again all were considered to have applicability to UK workplace populations.

Chan et al (2004), a before and after study, examined the effects of a pedometer based physical activity intervention (Prince Edward Island First Step Programme) on activity and specific health indices in sedentary workers. The intervention had two phases – the adoption phase (four weeks, whereby participants met with a facilitator for 30 to 60 minutes each week during a lunch break) and an adherence phase (eight weeks). The participants (n=177 at baseline) were led through a curriculum which explained cognitive (knowing the benefits of becoming more active), psychomotor (learning to initiate behaviours to achieve new activity goals) and affective learning (learning strategies for overcoming relapse) tasks. 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. Data was collected for waking hours every day for 12 weeks using personal calendars and/ or a specially designed website. Subjects acted as their own controls. The findings reported an average daily step count increase from 7,029 ± 3,100 to a plateau of 10,480 ± 3,224 (steps per day were averaged weekly and the change in average number of steps over the 12 week programme modelled. The model allowed for an acclimatisation period where steps stabilised in to a plateau. The plateau reported was reached in a mean time of 3.96 ± 3.28 weeks). Significant decreases were reported in BMI, waist girth and resting heart rate ($p<0.001$ for all). The study suggests it is feasible for reasonably health adults to attain approximately 10,000 steps per day. The authors suggest that there may be possible over-estimation of baseline during three-day blinded assessment and individuals participating in other ‘wellness’ initiatives were not excluded from the study. Whilst the paper says that a follow up was conducted the results are not reported.

Murphy et al (2006) report on a randomised controlled trial that examined the effects of 45 minutes self paced walking two days per week in previously sedentary workers. Subjects were randomly assigned to either two 45 minute

walks per week (walking group) or no training (control group). Step counts were measured at baseline and during weeks four and eight of in the intervention using a pedometer worn during all waking hours. Steps were recorded at the end of each working day in a training diary. In addition during weeks four and eight those assigned to the walking group recorded their step count before and after each walking session in their training diary. The findings reported significantly more steps on days of prescribed walking compared to rest days ($p<0.001$). The authors state that the study is the first to use a low frequency walking programme with adults under 60 years of age. The walking intervention was well tolerated by the employees and compliance was high while attrition was low. However, there was little information about recruitment; and no information on differences between intervention and control group that could have influenced results. The sample size was small (n=37); there was no follow-up, no information about where walks were carried out or the facilities available and the randomisation process is not discussed.

Thomas et al (2006), a before and after design study, report on a pedometer based workplace physical activity promotion programme aiming to encourage 10,000 steps per day. Participants (n=927 at baseline) were given subsidised pedometers and a progressive walking programme that included goal setting; e-mail support was also provided. The programme was run over a six week period – a four week intervention and two weeks used to organise training on data collection. Participants were followed up three months after completion of the programme. Participants wore the pedometer for four weeks and recorded the number of steps taken each day in the step diary provided. During the four week programme regular e-mails were sent to all participants to remind them of the goal for each week. The study reported a 10% increase in the number of steps taken per day and a 25% increase in the average number of days that participants reached 10,000 steps. At follow up 63% of participants reported maintained or increased levels of walking and 65% reported changes to routine to increase physical activity. Significance levels were not reported. The intervention was conducted on a large sample and was successful in recruiting a wide range of people and, according to self reported measures,

achieved its goals. However, there weren't any attempts to determine why people didn't participate or why the intervention was more popular with certain sectors (e.g. women and country workers).

Gilson et al (2007) report a randomised controlled trial which assessed the impact of two walking interventions on the workday step counts of university employees. Participants were allocated to one of three groups: the control group maintained normal behaviour; the first intervention group used walking routes along the grounds of the worksite; and the second group accumulated steps between occupational tasks. Weekly group e-mails were sent. The walking group employed prescribed walks and participants were asked to complete at least 15 minutes continuous brisk walking every workday. The accumulated steps group, rather than using prescribed routes, used the office, lectures and seminars as contexts where tasks were completed standing and walking. The duration of the study was 10 working weeks. Step counts were self-reported at three points – week one, five and ten - using readings from a pedometer. This study showed a significant intervention effect with both intervention groups compared with controls ($p<0.008$, $n2 = 0.17$ – walking on routes; $p<0.005$, $n2 = 0.17$ – walking in task). Small non-significant changes were reported in percentage body fat, waist circumference and blood pressure. Although the study presents preliminary evidence of the value of refining and promoting physical activity through walking, the sample size was relatively small (n=70), there was no longer term follow-up, and the applicability of these findings may be limited to women employees due to the small number of men who took part in the study.

**Summary and evidence statement**

Overall, two studies used an RCT (individual) design (Murphy et al., 2006 (-); Gilson et al., 2007 (+)) and the other two were before and after studies (Chan et al., 2004 (+); Thomas et al., 2006 (-)). Three of the studies (Chan et al., 2004; Murphy et al., 2006; Gilson et al., 2007) measured physical activity objectively with pedometers (giving daily step counts of employees). However,

all the studies relied on self-reported step counts/walking activity which could result in bias and over-estimation.

The study by Gilson et al., (2007) aimed to assess the impact of two different types of walking intervention (baseline participants n= 70). This study showed a significant intervention effect with both intervention groups compared with controls ($p<0.008$, $n2 = 0.17$ – walking on routes; $p<0.005$, $n2 = 0.17$ – walking in task). Small non-significant changes were reported in percentage body fat, waist circumference and blood pressure. Chan et al., (2004) reported an average daily step count increase from 7,029 ± 3,100 to a plateau of 10,480 ± 3,224 (steps per day were averaged weekly and the change in average number of steps over the 12 week programme modelled; the model allowed for an acclimatisation period where steps stabilised in to a plateau. The plateau reported was reached in a mean time of 3.96 ± 3.28 weeks). Significant decreases were reported in BMI, waist girth and resting heart rate ($p<0.001$ for all).

Murphy et al reported significantly more steps on days of prescribed walking compared to rest days ($p<0.001$) but the sample size is small (n=37) and it is not clear that the mean number of steps, say, per week has increased. Thomas et al report a 10% increase in the number of steps taken per day and a 25% increase in the average number of days that participants reached 10,000 steps. At follow up 63% of participants reported maintained or increased levels of walking and 65% reported changes to routine to increase physical activity. However significance levels are not reported for this study.

**Evidence statement 2**

**There is evidence from studies in the public sector that work place walking interventions that focus on: facilitated goal setting[1, 3], diaries and self monitoring[1,2,3] and walking routes[4] can produce positive results, increasing step count.**

[1] Chan et al., 2004 (+ before and after study); [2] Murphy et al., 2006 (- individual RCT); [3] Thomas et al., 2006 (- before and after study); [4] Gilson et al., 2007 (+ individual RCT)

### 3.1.3 Active Travel

**Included studies:** (see table 3, p79 for further details of these studies)

Mutrie et al., 2002 (individual RCT, +, A);

Wen et al., 2005 (before and after study, -, B);

Gatersleben and Appleton, 2007 (qualitative study, -, A)

Three studies were identified for inclusion, all of which primarily aimed to increase the active travel of employees (Mutrie et al., 2002; Wen et al., 2005; Gatersleben and Appleton, 2007). Two were UK studies (Mutrie et al., 2002; Gatersleben and Appleton, 2007), and one was an Australian study (Wen et al., 2005). All were based within large public sector organisations.

Mutrie et al (2002), an individual randomised controlled trial, reported on a self-help intervention delivered via interactive materials designed to increase active commuting behaviour (walking and cycling). The intervention consisted of a pack entitled “Walk in to Work Out”. It contained a booklet with written interactive materials based on the transtheoretical model of behaviour change, local information about distances and routes, and safety information. The pack also included an activity diary in the form of a wall chart, a

workplace map, distances from local stations, local cycle retailers and outdoor shops, contacts for relevant organisations, local maps and reflective safety accessories. Invitations to participate in the study were posted electronically, by internal mail and via paycheques to employees in three city workplaces. Participants were randomly assigned to the intervention or control group. The control group was not given the pack until the six-month post-intervention stage. Those who progressed over the first six months in stage of change for active commuting were compared with those who did not progress or regressed. Participants completed a questionnaire at baseline and at six and 12 months. Focus groups were conducted after the six months questionnaires were returned to determine barriers and motivators for active commuting. The findings reported a significant effect with the intervention group (received pack), who were almost twice as likely to report walking to work as the control (received pack at six months) after six months (OR 1.93, 95% CI 1.06-3.52). Twenty five percent of the intervention group were regularly, actively commuting at 12 month follow up, however the intervention had no significant effect on cycling. It should be noted that the majority of participants were economically advantaged women which limits the generalisability of the findings. In addition the findings are dependent on self-report measures and 44% of participants were lost to follow-up.

Wen et al (2005), a before and after study, reported on a social marketing campaign to modify behaviour in relation to active transport. The campaign used employee focus groups to develop marketing materials (events , posters – exhibited during events, e-mail newsletters promoting events, fridge magnets used in staff kitchens, transport access guide and individualised marketing strategy) to promote active transport. Individualised marketing strategy included individual interviews to gather information about employee's situation and transport habits to aid development of a travel plan for the employee. Participants were selected randomly from staff lists. The duration of the intervention was 12 months. Data collection was by way of a pre and post intervention survey that was interview administered. The assessed the impact of a social marketing campaign on active travel (walking and cycling) to work. Although no significant increase in reported active travel to work at 12

weeks was found, there was a significant reduction in the proportion of staff who reported driving to work five days/week (p=0.012). The strength of the study/intervention lies in the involvement of employees in planning the campaign and planning their own travel. However, the design lacks a control group and the individual strategies are difficult to separate in terms of effect. There is also a lack of generalisability as the changes may be due to improved access to public transport. It should also be noted that the study measured reduction in car use/increase in active travel not an actual increase in physical activity.

Unlike the two previous studies Gatersleben and Appleton focus only on cycling as a form of active travel. It is a qualitative study that seeks to find what motivates/impedes cycling to work for people who have never cycled before. From an initial survey, 20% of respondents indicated that they would like to participate in a cycle study. These respondents were contacted again after four months. To encourage participation, participants were able to win one of ten bicycles. However, very few members of staff were willing to try and therefore the study was re-advertised and some students were included in the sample. For two weeks, respondents were asked to write down in their diaries how they had travelled to and from work, how pleasurable they rated their journey and what the most and least pleasurable experience had been. Interviews were also held with all respondents before and after the two-week study period. In the first interview, respondents were asked how they usually travelled to work and why; why they wanted to participate in the study and what their expectations were of the cycling trial. In the second interview they were asked how they had experienced the study and whether for what reasons they intended to continue cycling or not. The study reported some important barriers to continued cycling to work such as dangerous roads and bad weather. However, such findings have previously been reported in the cycling literature and are not surprising. It is however limited because of the small sample, some of whom are students rather than employees

**Summary and Evidence Statement**

Mutrie et al (2002), an individual RCT, was rated (+). The study was well designed and had an appropriate sample size (baseline participants n= 295). Wen et al's., (2005) study was a before and after design and was rated (-) as it lacked a comparator group, and also had a small sample at baseline (n=68). Gatersleben and Appleton's (2007) qualitative study on the motivators and barriers towards cycling to work due to limited detail of data analysis this study was only rated (-).

Mutrie et al's (2002) intervention to increase walking and cycling to work through the use of written health materials reported a significant effect with the intervention group (received pack), who were almost twice as likely to report walking to work as the control (received pack at six months) after six months (OR 1.93, 95% CI 1.06-3.52). Twenty five percent of the intervention group were regularly, actively commuting at 12 month follow up, however the intervention had no significant effect on cycling. The authors concluded that the results may have limited generalisability as participants were mainly economically advantaged women.

Wen et al., (2005) assessed the impact of a social marketing campaign on active travel (walking and cycling) to work. Although no significant increase in reported active travel to work at 12 weeks was found, there was a significant reduction in the proportion of staff who reported driving to work 5 days/week (p=0.012). The final study by Gatersleben and Appleton, (2007) reported some important barriers to continued cycling to work such as dangerous roads and bad weather. However, such findings have previously been reported in the cycling literature and are not surprising.

**Evidence statement 3**

**There is evidence from one UK public sector workplace[1] that a walking and cycling to work campaign, through use of written health materials distributed to employees, can increase walking to work (but not cycling to work) in economically advantaged women.**

[1.] Mutrie et al., 2002 (+ individual RCT)

### 3.1.4 Other - including multi-component programmes

**Included studies:** (see table 4, p80 for further details of these studies)

O'Loughlin et al., 1996 (controlled before and after, +, B);

Pert, 1997 (before and after study, -, A);

Hanlon et al., 1998 (cross sectional survey, -, A);

Perkio-Makela, 1999 (individual RCT, -, B);

Talvi et al., 1999 (controlled before and after, -, B);

Addley et al., 2001 (cross sectional survey, -, A);

Cook et al., 2001 (individual RCT, +, B);

Rice and Saunders, 2001 (qualitative, +, B);

Titze et al., 2001 (controlled before and after, +, B);

Marshall et al., 2003 (individual RCT, ++, B);

Proper et al., 2003 (cluster RCT, ++, B);

Aittasalo et al., 2004 (individual RCT, +, B);

Proper et al., 2004 (cluster RCT, -, B);

Plotnikoff et al., 2005 (controlled before and after, -, B);

Lee and White, 2006 (individual RCT, -, B);

Osteras and Hammer, 2006 (before and after study, -, B);

Sjogren et al., 2006 (cluster RCT, +, B)

Sixteen studies[4] in this section included counselling/motivational interviewing, health checks/screening, health promotion messages/information, led activity sessions, active travel or combinations of all of these (i.e. multi-component

[4] Proper et al, 2003 and Proper et al 2004 report on the same study.

programmes). Of these, three were from the UK (Pert, 1997; Hanlon et al., 1998; Addley et al., 2001); seven were from Europe (Perkio-Makela, 1999; Talvi et al., 1999; Titze et al., 2001; Proper et al., 2004; Aittasalo et al., 2004; Osteras and Hammer, 2006; Sjogren et al., 2006); 3 from Australia (Marshall et al., 2003; Rice and Saunders, 2001; Lee and White, 2006; two from Canada (O'Loughlin et al., 1996; Plotnikoff et al., 2005) and just one from New Zealand (Cook et al., 2001).

O'Loughlin et al (1996), a controlled before and after study, report on the impact of a community based screening delivered in the workplace (schools), among other factors they examine the short terms effect on leisure time exercise. The screening process involved assessment of leisure time exercise behaviour which measured the number of times during a normal seven-day period the subject engaged in each of strenuous, moderate, and mild exercise. A total weekly score in arbitrary units was calculated by summing the reported weekly frequency of participation at each of the three intensity levels multiplied by the corresponding metabolic equivalent tasks (MET) value [(9 x strenuous) + (5 x moderate) + (3 x light)]. The exercise behaviour score ranged between 0 and 195, with lower scores indicating lower levels of leisure time exercise behaviour. Screening was widely advertised at staff meetings and on bulletin boards. All teaching and non-teaching staff received a notice and the school nurse actively encouraged all staff members to participate. Questionnaires were distributed by the school nurse to all currently employed staff. Participants self completed the questionnaires two weeks before and four months after screening. Following completion of the initial questionnaire, participants who needed a lifestyle change were encouraged to set personal behaviour change objectives in one or two areas. Participants were urged to select objectives that they felt were achievable. Simple, graded steps to achieve these objectives were described by the screening counsellor, and educational material was provided to support the desired behaviour change. Screening took place in eight schools. Comparison schools, in which participants did not receive screening but completed the questionnaires, were selected by individually matching them to intervention schools according to language spoken at home by students and the socioeconomic status of

students in the school. Participants in the study significantly increased their levels of physical activity (leisure time physical activity MET minutes per week p=0.05). However the study was conducted in the context of a larger research and demonstration project, and therefore it was not possible to attribute the observed results to the screening alone with certainty. However, the intervention did not have any effect on other variables (fat consumption and smoking), only physical activity which means it could be an optimal intervention to increase physical activity. Several baseline characteristics were unbalanced between the intervention and control groups. Only a minority of eligible staff were included in the analyses, therefore limiting the generalisability of results. Measurement error might have accounted for some of the results due to self-report. Behaviour change over time is not known.

Pert (1997), a before and after study, reports on a workplace intervention in a NHS trust that aims to influence sedentary employees to become more physical active. The intervention was carried out as part of the 'Health of the Nation: Health at Work' initiative and comprised a health screening questionnaire, a physical assessment using an exercise bicycle and a semi-structured interview with a physiotherapist or Health Promotion Officer (HPO). The bicycle assessment and interviews were repeated six months after the first session. Physical activity diary sheets were used to recall activity in previous seven days, the distance between Underground stations and workplace was measured to allow people to record walking time in miles per hour. Individuals were helped to identify where changes could be made and were encouraged to set their own goals. All were encouraged to work faster and to use the stairs rather than the lift. A diary sheet was sent monthly to each participant to help maintain interest and raise awareness. Verbal and written information was given on safety aspects of exercising and on local sports and leisure facilities. A poster and leaflet display encouraged health living such as smoking cessation and healthy eating. Specialist advice by a dietician was offered to anyone seriously concerned about weight. Following the intervention, more people reported taking regular physical activity, fewer people identified motivational and time barriers to exercise with an overall decrease in barriers of 17%. There was no overall change in walking speed

and no significant increase in time taken to reach 70% and 85% of $HR_{max}$,[5].Trends in the data indicated that those over 35 showed the greatest change; 76% of participants said their attitude towards physical activity had changed as a result of the intervention. The intervention was perceived by the authors as an opportunity to raise awareness; they conclude that many of the perceived barriers to physical activity can be addressed with relatively little effort and cost to the individual and the organisation. However sample size was small (n=49) and it was not known whether respondents to the questionnaire attended baseline or post-intervention sessions and this lack of a more scientific approach in implementation of the project compromises the validity of the study.

Like the previous two studies, Hanlon et al (1998) also reports on a workplace health screening intervention. The study, a cross sectional survey, aims to find out what characterises those individuals who made one or more behaviour changes. The study was carried out in a Glasgow factory. Individuals were randomly allocated to one of five groups each receiving different information and feedback (health education without feedback on cholesterol level or risk score; health education with feedback on cholesterol level but without feedback on risk score; health education with feedback on risk score but not cholesterol level; full health check, health education with feedback on cholesterol level and on risk score; internal control group – delayed intervention). All groups were seen at enrolment, after six months and after 12 months at the completion of the study. The study's authors did not deliver the above intervention but tracks participants at the 12-month follow-up stage to determine their risk level and whether they changed any of the health behaviours (changed from being a current smoker to a non-smoker; changed from the recommended safe levels of weekly alcohol consumption to below these levels; changed from taking less than 20mins of aerobic exercise three times per week to at least this level; complied with dietary advice given during the health check). Those who changed behaviour were compared with those who didn't and using demographic variables, membership of these groups was predicted. Fifty six percent of those individuals who received the

[5] Time taken to reach 70%-85% of maximum heart rate.

health check and returned for follow-up reported one or more of the desired behaviour changes, with an increase in physical activity being the most common. In comparison with those who made none of the desired changes, the responders tended to perceive their own health to be poorer and their risk of CHD to be greater and they were more likely to have perceived the health check as threatening. Responders were more likely to be married or living as married, but no other socio-demographic variables were associated with behaviour change. Whilst the results showed that the health check was successful in bringing out behaviour change in employees which was sustained after a 12-month period the data was self-reported rather than observed.

Perkio-Makela et al. (1991) conducted a before and after study report on exercise focussed group activities for female farmers. The intervention consisted of group physical exercise (aerobic training: gymnastics: muscular strength, stretching and relaxation) and training of work plus lifting techniques. In addition participants attended lectures on work conditions, work methods, personal protective equipment, nutrition, weight-reduction, musculoskeletal disorders and control of life. The groups met at local municipal health centres (five) once or twice a week over a period of 2.5 months total duration of meetings was 12-20 hours. Instructors included a physiotherapist, occupational health nurse, occupational physician, psychologist and an agricultural advisor. Follow up was carried out at 12 and 36 months. The results reported that leisure time physical activity increased significantly post intervention (2.5 months) in both the intervention ($p<0.000$) and the control group ($p=0.001$) but the increment was larger in the intervention group ($p=0.001$). Leisure time physical activity in the intervention group, at one year follow up, was still significantly raised ($p=0.001$). By the three year follow up leisure time physical activity had decreased to pre-intervention level. However, there was a large drop out by the three year follow up that may have been because participants were unaware that there would be a follow up at this time. In addition clarification is needed over what self report questions were asked and how randomisation of subjects was achieved.

Talvi et al (1999) conducted a before and after study to evaluate a health promotion intervention for oil refinery employees and examine the effect health promotion counselling had on physical activity. Participants were allocated to one of two groups. The first (group A) received screening and counselling from health staff. An assessment of needs and meeting took place between participant and physician to decide on two priorities for health promotion action. If physical activity was identified then the participant met with a physical exercise instructor who selected appropriate activities for the individual. Phase one, the physical activity programme, which took place over 10 weeks consisted of 60-70% max cardiovascular performance capacity, 30 minutes of one or two different types of activity walking, swimming, cycling etc plus 15 minutes of muscle training/stretching, three times per week. Phase two, again over 10 weeks comprised of 70-85% max cardiovascular performance capacity, 30 minutes of activity four times/week plus 20 minutes muscle training/stretching, three times per week. Both phases were followed by a fitness test. After Phase two was completed, the participant received a personal recommendation for further training with a fitness test approx every six months. Group B received screening plus health promotion materials relevant to individual needs given in written format. Optional fitness tests were available every six months and a follow up was conducted after three years.

Twenty four percent of participants in group A and 18% participants in group B had crossed the threshold for physical activity, i.e. self reported that they were now exercising vigorously for two or more times/week at 3 year follow up. The difference between the two groups was statistically significant ($p=0.06$). Using stepwise logistic regression analysis the study reported that participation in the counselling programme (group A) as a statistically significant variable for physical activity ($p=0.06$). Other statistically significant explanatory variables were basic education ($p=0.02$) and value of tending health ($p=0.04$). However, target groups in some of the special areas of health counselling were small which may have impacted on statistical power of variables and counselling for physical activity was delivered by a professional (physical exercise instructor) from outside the normal occupational health unit and it is likely delivery of counselling support would have differed from the rest

of the team indicating a need to establish more standardised agreement about intensity of counselling. The sample was skewed towards males and there was regression to the mean of results in follow up studies. Measurement of physical activity was self-report which may weaken the validity of the findings.

Addley et al (2001) use a cross section survey to evaluate a workplace lifestyle and physical activity intervention. The intervention is a nurse-run programme with a lifestyle and physical activity assessment carried out on a full-time basis in the occupational health department of the Northern Ireland Civil Service. Participation was voluntary, and employees attended from all over Northern Ireland having been given time off work to do so by their employing departments. Following their assessment participants were given healthy living literature and a printed personalised analysis of their performance with suggestions on how to make positive changes in those lifestyle areas requiring improvement. Participants self-reported physical activity/exercise per week. This was categorised into inactive (very sedentary lifestyle), slightly active (no regular exercise, but active lifestyle), moderately active (30 minutes of exercise 3-4 times per week), very active (1h vigorous exercise 3-4 times per week), extremely active (1h strenuous exercise 5+ times per week). The results reported an increased exercise rate of 62%, with the overall rate of non-attempted change based on average being one in five; tried and failed represented almost one in three; and successful maintenance after six months occurred in nearly one-half. However the results may have been affected by self-selection bias and the healthy worker effect because physical inactivity at baseline was found to be less than that in the general reference population. The use of a questionnaire to evaluate the impact of the intervention may have led to reporting bias. A third of those invited to participate in the follow-up did not do so.

The randomised controlled trial conducted by Cook et al (2001) sought to evaluate the effectiveness of a health promotion intervention targeting dietary behaviours and physical activity. The study was carried out in two worksites; within the first worksite study participants attended 30 minute workshop sessions once a month for six months on different topics (nutrition and non-

communicable disease risk, safe use of alcohol and benefits of physical activity. In addition there were nutritional displays in cafeteria. It was intended that the same intervention would be delivered to the second control site six months later. However, due to production pressures only one workshop was delivered to only 40% of participants. The authors do note that there was also improvement of cafeteria food and all employees received leaflets on healthy eating. Follow up took place at 12 months from baseline. The results showed a significant increase in level of physical activity from baseline to 12 months in intervention group ($p<0.000$), whilst there was a significant decrease in physical activity in the control group over the same period ($p=0.002$). The study has a comparatively high respondent rate and low drop out rate. However measures of nutrition and physical activity are self reported and the high proportion of participants who are Maori (12.1% intervention, 29.7% control) or Pacific (56.1% and 28.1%) may limit the generalisability to the UK.

Rice and Saunders (2001) adopt a qualitative approach to gain insight into the motivating factors and satisfaction gained from taking part in a worksite health/active life style programme. The study took place at a university in Australia. The aim of the intervention was to increase moderate physical as part of a healthy lifestyle and comprised of a nine week, pre-post interview, pre-post fitness assessment, individual review to establish the most suitable programme for the individual: exercise sessions, lunch-n-learn lectures, dine-out and a bushwalk. All participants had to complete the fitness assessment, interviews and individualised review but attendance at other activities was optional. There was no comparator group. Using unstructured interviews pre-post and field notes/observations during programme the study reports on emerging concepts relevant to participation. These were: Exercise setting, personal characteristics, learned values and physical environment. The authors conclude that motivation towards and satisfaction in physical activity remains unique to the individual. Each individual brings personal characteristics to the task of exercise uptake and then learned values and the environment can greatly influence the sustainability of physical activity behaviour inferring that successful interventions are more likely to be process-centred than outcome based. The study provides detailed in-depth views of

participants sought in an ongoing manner throughout programme but the sample size is small (n=10) and there are few men in study.

In a study base in six Swiss Federal Administration offices, Titze et al (2001) evaluated the impact a lifestyle physical activity intervention had on stages of change and energy expenditure in sedentary employees. The primary aim was to increase the percentage of individuals who were regularly engaged in moderate-vigorous physical activity in each office, reaching an energy expenditure of at least 1000kcal/week. Each office had the freedom to design the intervention according to their requirements. Each formed a steering committee with 3-5 reps from office and this committee met with project manager, the evaluator, and the exercise professional to discuss roll-out. The interventions consisted of:

1. Written information about recent physical activity recommendations to achieve health benefits, suggestions on how to increase physical activity, stretching exercises at the photocopier, nearby sports facilities etc. Lectures were given to employees re relaxation/nutrition according to their wishes.
2. Action days arranged by the exercise professionals – encouraging active commuting or stair climbing.
3. Led walks during lunch breaks.
4. Some specialist sessions such as fitness testing and hiking days.
5. One to one counselling support for exercise where desired.

Acceptability of programme components were evaluated constantly and feedback was given to steering committees. Data were collected before and after a four month intervention period. In addition to the six offices in the intervention group were two offices that formed a control group. The results reported showed that control groups had significantly lower median of energy expenditure (1389 kcal vs. 1590 kcal, p=0.046) and significantly fewer participants in stages of action and maintenance (35.7% vs. 49.3%, p=0.034). The authors note that one of the strengths of this study is that it is one of few formally controlled studies in the workplace which has attempted to develop a diverse programme which translates current physical activity recommendations into health promotion messages for employee groups in a

real world setting. Behavioural change was measured using a simple tool consisting of five statements from which participants chose one. This simple measurement tool shows apparent relationship with energy expenditure and may be useful to use (as a proxy indicator) in future studies. The weakness of the study is that the effectiveness refers only to those employees willing to complete a questionnaire at baseline.

Marshall et al (2003) compare the effectiveness of print versus website physical activity interventions. The study, conducted in an Australian university evaluates how the promotion of physical activity interventions delivered by print, e-mail and a website campaign influence physical activity and progression through the stages of motivational readiness. The study took the form of a randomised controlled trial in which the intervention group received an active living booklet based on transtheoretical model of behaviour change and additional behavioural reinforcement letters every two weeks. Over the eight week intervention period participants received four letters with specific advice to encourage them to initiate activity and use the Active Living booklets. The control group could access an active living website, which was modelled on the above booklets. The website included animations and quizzes, features on goal setting, activity planning and a physical activity readiness questionnaire. Personalised, stage based reinforcement e-mails were sent to participants every two weeks. In total four e-mails were sent at two week intervals over the eight week period with physical activity related information and links to the website. These were similar in content to print letters but included hyperlinks to website. The website was password protected to reduce cross contamination. For both groups follow up took place ten weeks post baseline. The authors report that half print group and two thirds of the web group recalled the materials. A modest number of participants had read more than half print materials. There was a trend for both groups to participate in more physical activity at ten weeks but no statistically significant differences within or between groups and no significant increase in total reported physical activity ($F[1,653]=0.41$, $p=0.52$) when analysed by intention to treat. Approximately 26% of both groups progressed forward at least one stage through the stage of change model. This is a well

designed and well reported study that shows only minor cross contamination between groups, data collection was by trained telephone interviewers blinded to allocation and therefore more likely to be free of bias. They report higher and more representative response rates than previous trials. There is however reliance on self reported physical activity and a relatively short period of follow up (10 weeks after baseline).

Aittasalo et al (2004) evaluate the effectiveness of physical activity counselling using a randomised controlled trial design. The study's focus is the long term effects of counselling on sedentary employees' leisure time physical activity and whether comprehensive fitness testing brings additional effects to counselling. The study is based in occupational health care units in Finland. Participants are randomised separately in each company into one of three groups. The first group receive counselling based on the PRECEDE-PROCEED model and transtheoretical model of behavioural change. The counselling comprises of an in-depth conversation with an occupational health nurse and individual goals are set for leisure time physical activity, each participant is given a written weekly physical activity plan and physical activity diary. The physical activity plan was modified to suit at follow up. Emphasis was placed on participant's ability to follow the plan (self efficacy). The second group comprised of counselling (as above) and fitness testing. After the first conversation (baseline), and at the six and 12 month follow up participants performed fitness tests from Health-related Fitness test battery (UKK Institute) (the reliability, validity and safety of which has been tested). Tests were: BMI, one-leg standing (static postural control), side-bending of trunk, modified push up (muscular endurance of upper body) one leg squat (leg extensor strength) and the UKK 2km Walk test (predicted max Oxygen uptake). Testing was conducted by physiotherapists qualified to undertake the above battery of tests. The duration of the first test was 90 minutes and follow ups took 60 minutes. After testing results were discussed with participants against norm-based reference values classified in five categories (1-5). Fitness profiles illustrating strengths and weaknesses were drawn up for participants and the physical activity plan from the occupational health nurse was modified according to need. The third group received no intervention. The study found

no statistically significant difference between the groups in any of the physical activity measures. However there was a slight increase in leisure time physical activity energy expenditure at 12 month follow up in the whole group (inc control) (p=0.011). There was a similar trend in fulfilment of health enhancing physical activity (HEPA) recommendation at 12 month follow up (p=0.049). In respect of the self-reported changes, 33% of participants in the two intervention groups felt that it had improved their habits with respect to lone leisure time physical activity 58% had experienced some improvement but 10% had experienced no improvement. There was no statistically significant differences between groups (p=0.23). Similarly 82% said that counselling had influenced the quantity/quality of their leisure time physical activity but there was no statistically significant difference between groups (p=0.60).

The study was rigorous using a holistic yet pragmatic approach. Attrition is low (only two participants dropped out). However, Finland already has a high level of awareness of health benefits of regular physical exercise and this may in part explain why the intervention did not have statistically significant effect. Indeed 28% of baseline participants were already active above HEPA recommendations which may have weakened the statistical power of study.

Proper et al (2003; 2004) reported on a cluster randomised controlled study that evaluated the effectiveness of individual counselling at the worksite in increasing physical activity, fitness and health. The study is based in three municipal services in the Netherlands. Participants were randomised by cluster into the intervention of control group. Over a nine months period the intervention group were offered seven 20 minute counselling sessions during work time using standardised protocols (PACE) and stages of behaviour change as a guide. Stage of change was determined during baseline assessment and then checked during the first consultation. During first two consultations the results were discussed and the counsellor offered tailored information and advice on physical activity and diet based on the individual's stage of change. A plan to improve behaviour was then drawn up. Progression according to the plan was discussed during the next five sessions

– the number of consultations was decided by the experienced counsellor in agreement with the municipal service. Written information on lifestyle – physical activity, diet, alcohol, smoking work stress and musculoskeletal symptoms was given to all participants. The control group only received this written information on lifestyle. The findings showed a significant positive intervention effect for energy expenditure (p=0.003) and cardio-respiratory fitness where submax heart rate significantly declined in the intervention group (Proper et al, 2003) (p=0.001). No statistically significant intervention effect as observed on the proportion of subjects meeting the public health recommendation for moderate intensity physical activity. OR=1.46; 95% CI, CI=0.76-2.79 (Proper et al, 2003). The prevalence of upper extremity symptoms decreased in both intervention (17.9%) and control groups (6.2%), but no significant effect was found. Physical activities in leisure time did not appear to change for either group. The study's strength lies in a robust study design, large sample sizes and breadth of health related outcomes measures. However, physical activity is self reported.

Plotnikoff et al (2005) reported on the efficacy of an e-mail intervention or the promotion of physical activity and nutrition in a workplace context. The before and after study with control was conducted in five large workplaces in Canada over a twelve week period. The intervention consisted of twelve messages about active living and twelve messages about healthy eating. These were developed through a multistage, modified Delphi technique in conjunction with the study's ten-member national advisory panel with expertise in physical activity and nutrition promotion. The paired physical activity and nutrition messages focussed on a specific underlying weekly theme (e.g. time, cost constraints). A weekly e-mail was sent to all registered participants with reference to Health Canada's current guidelines on physical activity and nutrition, and a resource file for additional information and relevant websites was made available. The control group completed the same questionnaires but did not receive e-mail messages. Participants within each of the sites were randomized to one of the two groups with the ratio of 3:1 in favour of the intervention. The results show that the intervention group significantly increased their total activity levels at follow-up (p=0.01, whereas the control

group significantly reduced their total activity levels at follow-up (p=0.01). Both groups engaged in higher physical activity levels at the work place. The intervention group reported increased confidence and higher intention with relation to physical activity, whereas the control group reported decreased confidence and lower intention. The intervention group perceived more pros and fewer cons of physical activity participation, whereas the control group reported no change in these variables. The intervention group perceived greater threat from the health consequences of physical inactivity at both time periods, and that both groups perceived greater threat at follow up compared to baseline. The authors note that effect sizes are small, indicating limited clinical significance of the results. The presentation of e-mail messages was limited. E-mail being received during work time might mean that respondents were not as receptive to the intervention and messages were generic rather than tailored. The short intervention period does not allow long-term changes to be identified and individuals without the technology are excluded. The measure of physical activity is self reported.

Lee and White (2006) evaluated a minimal exercise programme for middle aged working women in their randomised controlled trial carried out in a university in Australia. The aim of the intervention was to encourage regular physical exercise in a group who traditionally found it difficult to exercise. The intervention comprises of aerobic sessions (one per week for 12 weeks) provided by what is described as *friendly, informal fitness leaders* aged 35-40 years at the worksite. Weekly meetings also included education component advising on two additional activities per week (walking or exercise to music) and a booklet with information about an exercise programme. Pre screening for intervention was carried out by physician and required completion of a medical questionnaire and including body composition, flexibility, cardio vascular measures, serum lipids, demographic data, medical history and self reported physical activity. Further assessment was at 12 and 24 weeks. The control group were invited to join the exercise class after 24 weeks. For both groups there was a follow up at 48 weeks. The authors report positive feedback of the programme. Participants attended a mean of 9.6 out of 12 sessions and majority rated programme as good or excellent. The authors

note that there were no significant effects for changes in physical activity levels although there was a significant effect for increased level of exercise knowledge ($F_{9,90}=3.34$, $p=0.01$), however it is not clear to which time frame this relates to. Whilst the study had a longer term follow up the small sample size (n=37) means that any conclusions drawn should be treated with caution.

Osteras and Hammer (2006) evaluated the effectiveness of a worksite physical activity programme. The before and after study was conducted in Norway. The intervention consisted of a half hour interview to investigate the obstacles to physical activity. At the end of each interview the participant was provided with a personalised physical activity plan that aimed to increase physical activity level over the next six months. Participants were also offered follow up counselling or reconsiderations of the initial plan. Physical activity was measured using the international physical activity questionnaire (IPAQ) and collected per and post intervention. The findings showed that physical activity had increased significantly ($p<0.001$) from pre-post test, according to days per week that participants performed physical activity (exceeding 10 minutes) at moderate to high intensity (mean 2.5 days/week to mean 2.9 days/week). Days/week with at least a 10 minute walk did not increase significantly. The study suffers from the limitations associated with no control group and, in addition, there was no documentation on the type, time and intensity of physical activity during experimental period. The lack of information about where intervention was performed limits how generalisable the findings are.

The final study, Sjogren et al (2006) examines the effects of a physical exercise intervention on subjective physical well-being, psychosocial functioning and general well-being among office workers using a cluster randomised cross-over design. Participants were office workers drawn from four city departments in Finland. The department was the unit of randomisation. The intervention consisted of non-supervised light resistance training comprising of six dynamic symmetrical movements (upper extremity extension and flexion, trunk rotation right/left, knee extension/flexion). During weeks 1-5 the training was carried out once each working day (six minutes

per day). In weeks 6-15 this was increased to once/twice a day (eight minutes per day). Training resistances were controlled twice during the intervention period and a physiotherapist gave group sessions on how to train and guidance on postural/movement control. Participants were entitled to take time out during the working day to train in the department's training facilities. The study found that light resistance training time significantly increased subjective physical well-being (regression co-efficient 0.03253). The physical activity intervention – ignoring the time spent on light resistance training – did not have a significant effect on subjective physical well-being and no significant physical exercise intervention or light resistance training effects were found for psychosocial functioning or general subjective well being. The study is well designed with, the authors note, careful documentation of training dose and control of other physical activity and confounding factors such as department, learning and seasonal effects. However there are ceiling effects due to middle-aged health volunteers reporting high levels of psychosocial functioning or general subjective well being at baseline.

**Summary and Evidence Statements**

Only two studies scored the highest rating for quality (++) – an RCT (cluster) by Proper et al., (2003; 2004) which aimed to test the effectiveness of individual counselling at work on physical activity; and an RCT (individual) by Marshall et al., (2003) which assessed the effectiveness of health messages (delivered through different media) on physical activity and stage of readiness for physical activity. There were six others which scored (+) for quality – two randomised controlled trials (individual) (Cook et al., 2001; Aittasalo et al., 2004); an RCT (cluster) (Sjogren et al., 2006); two controlled before and after studies (O'Loughlin et al., 1996; Titze et al., 2001) and one qualitative study (Rice and Saunders, 2001). The rest were ranked (-) in terms of study quality. Although some had a large baseline sample (Addley et al., 2001; Plotnikoff et al., 2005) this did not translate into a high ranking for quality. For many studies in this section it was difficult to attribute intervention effects to any particular component of the intervention due to their complexity (multi-component). In several instances increasing physical activity was only one of the primary objectives of the intervention.

Six studies in this part of the review evaluate workplace health checks or screening. All reported increased physical exercise. In all studies the change in physical activity is self reported. O'Loughlin et al (1996) found that subjects exposed to health screening significantly increased leisure time physical activity ($p=0.05$). However, it cannot be ascertained whether this change was sustained over time as the study period including follow up was only four months. Pert (1997) reports after health screening, physical assessment and interview with physiotherapist an increase in participants taking regular exercise but sample size is small ($n=49$ at baseline and $n=29$ at six month follow up) and lack of a more scientific approach compromises the validity of the study. Hanlon et al (1998) also reports positive results. In this study of workplace screening, groups receive different health information and feedback. Fifty six percent of those who received a health check and returned for the follow up reported one or more desired behaviour change, with an increase in physical activity being the most common. Addley et al (2001) report on a UK study of in which participants were given a health assessment. Following assessment participants were given healthy living literature and a printed personalised analysis of their performance with suggestions on how to make positive changes in those lifestyle areas requiring improvement. Participants self-reported physical activity/exercise per week. The findings show an increase exercise rate of 62%. However, there may be a self selection bias and healthy worker effect.

Osteras and Hammer (2006) report on an intervention that contains health screening, a motivational interview and counselling. The findings showed that physical activity had increased significantly ($p<0.001$) from pre-post test, according to days per week that participants performed physical activity (exceeding 10 minutes) at moderate to high intensity (mean 2.5 days/week to mean 2.9 days/week). However, there was no documentation on the type, time and intensity of physical activity during experimental period. Another study to combine screening and counselling is Talvi et al (1999) who compare the effectiveness of screening and counselling versus screening and health promotion materials. The findings show that participants of both groups report

exercising more vigorously post intervention (24% and 18% respectively); and a statistically significant difference between the groups (p=0.06).

Counselling was also the focus of two further studies, Aittasalo et al., (2004) and Proper et al., (2003; 2004). Proper et al report on the effectiveness of individual counselling at the worksite in increasing physical activity, fitness and health. The counsellor offered tailored information, advice and planning on physical activity and diet based on the individual's stage of change (the control group received written information on lifestyle). The findings showed a significant positive intervention effect for energy expenditure (p=0.003) and cardio-respiratory fitness where submax heart rate significantly declined in the intervention group (Proper et al, 2003) (p=0.001).

Aittasalo et al (2004) focussed on the long term effects of counselling on sedentary employees' leisure time physical activity and whether comprehensive fitness testing brings additional effects to counselling. The study found no statistically significant difference between the groups in any of the physical activity measures. There was a slight increase in leisure time physical activity energy expenditure at 12 month follow up in the whole group (including control) (p=0.011). There was a similar trend in the fulfilment of health enhancing physical activity (HEPA)recommendation at 12 month follow up (p=0.049).

One study (Titze et al., 2001), brought together many of the components included in the interventions described in this and the previous sections. The study aimed to increase the percentage of individuals who were regularly engaged in moderate-vigorous physical activity. The intervention itself was design by participants in each workplace (office) included in the study subject to their requirements. The interventions included written health and physical activity information, action days to encourage commuting or stair climbing, led walks, fitness testing and counselling. The results reported that control groups had significantly lower median of energy expenditure (1389 kcal vs. 1590 kcal, p=0.046).

**Evidence statement 4**

**a. There is evidence from six studies to suggest that work place health screening can have a positive impact on physical activity[1, 2, and 3,4,5,6.] However, whilst all six studies included a health check or assessment, other components of the intervention differed; these included, for example, counselling[4,6], which makes it difficult to attribute effects to a single factor.**

**b. There is evidence from four studies[4,6,7,8] that suggests workplace counselling has positive effects on physical activity. Of the two studies[7,8] that focus solely on counselling, the first[7] shows positive effects on increasing physical activity compared to the control. The other, whilst showing positive improvements, shows no difference between groups receiving counselling, counselling and fitness testing or the control group[8]. Two other studies [4,6], are multi-component interventions that included counselling, motivational interview and health screening which make it difficult to attribute effects to a single factor.**

**c. Evidence from one study[9] suggests that employee designed interventions that include written health and physical activity information, active commuting, stair climbing, led walks, fitness testing and counselling (all as required) can have a positive improvement on physical activity.**

[1] O'Loughlin et al., 1996 (+ controlled before and after); [2] Pert, 1997 (- before and after study); [3]Hanlon et al., 1998 (- cross sectional survey); [4]Talvi et al., 1999 (- controlled before and after); [5] Addley et al., 2001 (- cross sectional survey); [6] Osteras and Hammer, 2006 (- before and after study); [7] Proper et al., 2003 (++ cluster RCT); [8] Aittasalo et al., 2004 (+ individual RCT); [9]Titze et al., 2001 (+ control before and after).

Two studies explored the effect on physical activity of health information or messages. The first, Marshall et al (2003) evaluated how the promotion of physical activity interventions delivered by print (letters and leaflets) versus delivery by e-mail and a website campaign influence physical activity and progression through the stages of motivational readiness. The study found no significant differences between groups and, although there was an increase in physical activity participation in both groups at follow up no significant increases in total physical activity when analysed by intention to treat. They concluded that health messages had no intervention effect on physical activity although 26% of both groups (intervention and control) reported progressing through at least one stage of the stage of change model. The second study, Plotnikoff et al (2005) report on the efficacy of an e-mail intervention on the promotion of physical activity and nutrition in a workplace context. The results show that the intervention group (who received the e-mails) significantly increased their total activity levels at follow-up ($p=0.01$, whereas the control group significantly reduced their total activity levels at follow-up ($p=0.01$). Both groups engaged in higher physical activity levels at the workplace.

One further study, Cook et al (2001) sought to evaluate the effectiveness of a health promotion intervention targeting dietary behaviours and physical activity. Information was delivered to participants by way of workshop sessions. In addition there were nutritional displays in cafeteria. The results showed a significant increase in level of physical activity from baseline to 12 months in intervention group ($p<=0.000$), whilst there was a significant decrease in physical activity in the control group over the same period ($p=0.002$).

**Evidence statement 5**

**a. There was conflicting evidence from two studies[1,2] regarding the effectiveness of health messages delivered by e-mail. The first study reported increases in participation in physical activity by those receiving information by print or electronically, but when analysed by intention to treat there was no significant increase in total physical activity.; the second reported positive results on physical activity for health messages received by e-mail. Further study is required.**

**b. There is evidence from one study[3] that health information delivered by way of regular workshops increases participants' level of physical activity. However, further study is required as the ethnic composition of the sample may limit the applicability of the findings to the UK.**

[1]Marshall et al., 2003 (++ individual RCT); [2]Plotnikoff et al., 2005 (- controlled before and after); [3]Cook et al., 2001 (+ individual RCT)

Two studies reported on led group exercise sessions. Perkio-Makela (1999) report on group physical exercise (aerobic training: gymnastics: muscular strength, stretching and relaxation) and training of work plus lifting techniques delivered to a group of female farmers. The study found a short/medium term improvements in physical activity but this had decrease back to baseline levels within three years. Lee and White (2006) report on a minimal exercise programme for middle aged working women. The intervention comprised of weekly aerobic sessions over a twelve week period. The authors report positive feedback of the programme but no significant effects for physical activity.

Sjogren et al (2006) also reported on a physical exercise intervention but rather than led sessions this was non-supervised. The intervention consisted of light resistance training. The authors report that the physical activity did not have a significant effect on subjective physical well-being and no significant

physical exercise intervention or light resistance training effects were found for psychosocial functioning or general subjective well being.

**Evidence statement 6**

**There is evidence in one study[1] to suggest that group led exercise sessions can bring positive improvements to physical activity levels for women, but these improvements are not sustained in the medium to long term. However the applicability and transferability of the intervention requires further study.**

[1] Perkio-Makela, 1999 (- individual RCT);

**Table 1. Stair Walking Interventions Overview**

| Author, Year | Study Design & Quality | Research Question | Worksite Type | Baseline Participants | Duration Of Study | Main Results | Applicable to UK |
|---|---|---|---|---|---|---|---|
| Marshall et al., 2002 | Interrupted time series ++ | Do signs promote the use of stairs in a health care facility? | Australian health care facility, stairs used by staff and visitors | 158 350 counts for stair usage, 53 staff self report | 12 weeks no follow up | Initial significant increase in stair walking (1.05 Adj OR, 1.01-1.10 CI, p=0.02); but decline back to baseline over study period. | Yes B |
| Adams & White, 2002 | Control before and after + | Do signs designed by employees, left in place long-term, have long-term effects on stair climbing? | Large public sector , UK stairs used by staff and visitors | 5,193 counts of stair and lift use | 4 weeks (study initially planned for 12 weeks but terminated after 4) | Non significant increase in stair climbing (retrospective control) (p=0.77, baseline to week 1) Non significant decrease in stair climbing (p=0.74, baseline to week 4) | Yes A |
| Kerr et al., 2001 | Before and after study + | Can posters prompt stair use in a worksite environment? | Private sector, UK | 14, 982 counts of stair and lift use | 4 week | No significant effect of poster for stair climbing, but there was for stair descent, an increase in 25%-30% (OR 1.21, CI 1.07-1.37). | Yes A |
| Auweele et al., 2005 | Before and after study _ | Do health signs followed by a worksite doctor's email increase stair usage of female employees? | Socio-cultural organisation, Belgium | 3,146 counts of stair and lift use | 7 weeks | Stair use increased significant with use of health sign (Chi square (1) =12.97, p<.001) and with doctors email plus health sign (Chi square (1) =15.58, p<.001). In follow up decline back to baseline. | Yes B |
| Badland et al., 2005 | Control before and after - | Do posters increase stair use and objectively measured PA ? | Public sector, New Zealand | n= 46 | Approx 4 months | Effect size sizes for step counts ranged from trivial (0.04) to moderate (-0.79) Cohen Effect with the majority of effect sizes being small and negative. When poster were visible in their worksites mean step counts decreased by 868 steps (worksite PA) and 1861 (total PA) | Yes B |
| Eves et al., 2006 | Before and after study - | Do posters increase ascent and descent in stair climbing? | Public sector, UK | 26, 806 counts for stair and lift usage | 8 weeks (6 weeks intervention, 2 week follow up). | A significant effect on stair climbing (OR 1.12, p<0.05) greater effect in the overweight. Also, significant effects on stair descent (OR 1.15, p<0.005). | Yes A |
| Titze et al., 2001 | Before and after study - | Does provision of written material on health benefits encourage stairs use cf lift use? | Large, public sector (6 offices), Switzerland | 3, 486 counts of stair and lift use n= 253 (baseline questionnaire) | Approx 5 months (4 month intervention period plus follow-up). | Significant increase in stair use (p=0.028) was found between baseline and follow-up, from observational data. | Yes B |

**Table 2. Walking Interventions Overview**

| Author, Year | Study Design & Quality | Research Question | Worksite Type | Baseline Participants | Duration Of Study | Main Results | Applicable to UK |
|---|---|---|---|---|---|---|---|
| Chan et al 2004 | Before and after study + | What are the effects of a pedometer based physical activity intervention on activity and specific health indices | Public Sector, Canada | 177 | 12 weeks | Average daily step count increase from 7029±3100 to a plateau of 10480±3224 modelled. Plateau was reached in a mean time of 3.96±3.28 weeks. Reductions in waist girth and heart rate were significantly related to the increase in steps per day (p=0.0073, p=0.023). | Yes B |
| Gilson et al 2007 | RCT: individual + | What are the impacts of two different types of walking intervention on work day step counts and health status? | Large Public Sector, UK | 70 | 10 weeks | A significant increase in step count in both intervention groups p<0.008, n2= 0.17 (walking routes) and p<0.005, n2=0.17 (walking in task groups). | Yes A |
| Murphy et al 2006 | RCT: individual - | Can individuals achieve health benefits from outdoor walking with minimal time investment? | Large Public Sector, UK | 37 | 10 weeks | Significantly more steps on days of prescribed walking compared to rest days (p<.001). | Yes A |
| Thomas et al 2006 | Before and after study - | Can individuals increase their walking to achieve 10,000 steps per day using a pedometer based PA activity programme? | Large Public Sector, Australia | 927 | 4 months (4 week intervention period + follow up) | 10% increase in the number of steps taken per day; increase of 25% in the average number of days that participants reached 10,000 steps. At follow up 63% reported maintained or increased levels of walking. 65% reported changes to routine to increase PA. Significance not reported | Yes B |

## Table 3. Active Travel Overview

| Author, Year | Study Design & Quality | Intervention Type | Research Question | Worksite Type | Baseline Participants | Duration Of Study | Main Results | Applicable to UK |
|---|---|---|---|---|---|---|---|---|
| Mutrie et al., 2002 | RCT: individual + | Walking/ cycling | Does a self-help intervention increase active commuting? | Large, public sector, UK | n= 295, 88.6% of invited | 12 months | Intervention group was almost twice as likely to increase walking to work as the control group at six months (OR 1.93, 95% CI 1.06-3.52). 25% of the intervention group were regularly actively commuting at 12-month follow-up. The intervention was not successful in increasing cycling. | Yes A |
| Gatersleben & Appleton, 2007 | Qualitative study - | Cycling | What motivates/ impedes cycling to work for people who have never cycled before? | Large, public sector, UK | n=22 | 2 weeks | 8 said they would continue to cycling to work. 4 others cited reasons for not continuing - dangerous roads, prefer bus and moving to new job. 10 said they would continue in good weather. | Yes A |
| Wen et al., 2005 | Before and after study - | Walking/ cycling | Does a social marketing campaign modify behaviour in relation to active transport? | Large, public sector, Australia | n=68 (response rate 81%) | 12 months | No significant increase in staff who reported using active transport as their usual mode of transport to work. Significant reduction (20%) in proportion of staff who reported driving to work 5 days per week (p=0.012). | Yes B |

## Table 4. (1) Other Interventions Including Multi-Component Interventions Overview

| Author, Year | Study Design & Quality | Intervention Type | Research Question | Worksite Type | Baseline Participants | Duration Of Study | Main Results | Applicable to UK |
|---|---|---|---|---|---|---|---|---|
| Marshall et al 2003 | RCT: individual ++ | Health promotion information | Does promotion of physical activity programmes delivered by print ,email and a website change PA and influence progression through the stages of motivational readiness? | Large public sector, Australia | n=655 | 10 weeks (8 weeks intervention follow up at 10 weeks) | Increase in both groups to participation in PA at 10 follow up but no statistically significant differences within or between groups and no significant increase in total reported physical activity (F[1,653]=0.41, p=0.52) when analysed by intention to treat. Approx 26% of both groups progressed forward at least one stage through the stage of change model. | Yes B |
| Proper et al., 2003 | RCT: cluster ++ | Counselling/ motivational interview, Other | How effective is an individual counselling intervention at the worksite on physical activity, fitness and health using PACE protocols? | Public sector, Netherlands | n=299 | 9 months | A significant positive intervention effect was observed for energy expenditure (p=0.003) and cardio-respiratory fitness where submax heart rate significantly declined in the intervention group (p=0.001) (ANCOVA) No statistically significant intervention effect on the proportion of subjects meeting the public health recommendation for moderate intensity physical activity. (OR=1.46; 95% CI, CI=0.76-2.79). | Yes B |
| Proper et al ., 2004 | RCT: cluster ++ | Counselling/ motivational interview, Other | How effective is an individual counselling intervention at the worksite on physical activity, fitness, health and sick leave? | As above | As above | As above | For both groups the mean sick leave rate increased during the intervention period. After the intervention period the control group increased even more (22.9 days to 27.6 days) whereas the intervention group decreased slightly (21.5 to 20.5 days). No statistically significant intervention effect was found. The intervention had no significant effect on mean rate of sick leave. | Yes B |

## Table 4. (2) Other Interventions Including Multi-Component Interventions Overview

| Author, Year | Study Design & Quality | Intervention Type | Research Question | Worksite Type | Baseline Participants | Duration Of Study | Main Results | Applicable to UK |
|---|---|---|---|---|---|---|---|---|
| Aittasalo et al., 2004 | RCT: individual + | Counselling, motivational interview, health checks/ screening | Does counselling have long term effects on sedentary employees' leisure time PA (LTPA)? Does comprehensive fitness testing bring additional effects to counselling on LTPA? | Range of private and public sector companies, Finland | 155 | 12 months (follow ups at six and 12 months) | No significant differences between the groups (counselling; counselling plus fitness testing, control) in any of the PA measures at follow ups. Significant improvement in a number of measures in all groups at 12 follow up: increased energy expenditure (p=0.011); fulfilment of FPA recommendation at six and 12 months follow ups (p=0.034 and p=0.0003); fulfilment of HEPA recommendation at 12 month follow up (p=0.049). | Yes B |
| Cook et al., 2001 | RCT: individual + | Health promotion workshops and literature | Can a relatively low intensity workplace intervention with male hourly paid workers could significantly improve dietary behaviours, increase PA and reduce blood pressure and body weight? | Large, public sector, New Zealand | n=253 | 12 months (workshop 6 months, follow up 12 months) | Significant increase in time spent in PA (p=0.0005) from baseline to 12 months in intervention group, whilst decreasing in control (p=0.002). | Yes B |
| O'Loughlin et al., 1996 | Control before and after + | Health check/ screening | What is the short-term impact of school-based screening on LTPA and CVD risk factors of staff? | Public sector, Canada | n=386 | 4 month (including follow up) | Screening significantly increased their level of physical activity - LTPA MET mins week (p=0.05). | Yes B |
| Rice & Saunders, 2001 | Qualitative /extended interview + | Led sessions, Walking programme, fitness assessment, and health information | What are the motivating factors, and satisfaction gained, from taking part in a worksite health/active lifestyle programme? | Large, public sector, Australia | n=10 | 9 weeks | Emergent concepts relevant to participation: Exercise Setting. Independence/dependence – degree to which the participant was autonomous in their ability to exercise. Preference for a social environment Exercise Personal Characteristics Challenge –degree the participant was able to put in effort to achieve improvement during the exercise session. Self image Learned values. Physical well being, Psychological benefits of exercise Concern with health. Ability to manage conflicting priorities. Physical Environment. Attractiveness of exercise setting. Location. | Yes B |

## Table 4. (3) Other Interventions Including Multi-Component Interventions Overview

| Author, Year | Study Design & Quality | Intervention Type | Research Question | Worksite Type | Baseline Participants | Duration Of Study | Main Results | Applicable to UK |
|---|---|---|---|---|---|---|---|---|
| Sjogren et al., 2006 | RCT: cluster + | Light resistance training | What are the effects of a workplace physical exercise intervention on subjective physical well-being, psychosocial functioning and general well-being of office workers? (To increase % of individuals regularly engaged in moderate-vigorous PA) | Large, public sector, Finland. | n=90 | 30 weeks | Light resistance training time significantly increased subjective physical well-being. (Regression co-eff: 0.03253). No significant physical exercise intervention or light resistance training effects were found for psychosocial functioning or general subjective well being. | Yes B |
| Titze et al 2001 | Control before and after + | Active travel – cycling / walking, Counselling/ motivational interview, Health checks/screening, Health promotion, Led sessions, Stair walking, Subsidies/ incentives, Walking programme, | What impact does a lifestyle PA intervention have on stages of change and energy expenditure in sedentary employees? | Large, public sector, Switzerland. | n=598 | 4 month | Intervention groups included components of the activities outlined, control group (no intervention).Control groups had significantly lower median of energy expenditure (1389 kcal vs. 1590 kcal, p=0.046) and significantly fewer participants in stages of action and maintenance (35.7% vs 49.3%, p=0.034) cf intervention offices. | Yes B |
| Addley et al., 2001 | Cross sectional (survey) - | Health check/ screening, | Does a workplace lifestyle and PA activity programme influence the adoption of positive healthy lifestyle behaviours? | Large public sector, UK | n=2595 | 6 months (initial health assessment and 6 month follow up) | Increased exercise rate of 62% (n=626). Overall rate of non-attempted change on average being one in five; tried and failed one in three; and successful maintenance after 6 months in nearly 50%. | Yes A |
| Hanlon et al., 1998 | Cross sectional (survey) - | Health check/ screening | Does attendance at workplace health check change health behaviour? | Large private sector, UK | n=868 | 12 months, (with 6 and 12 month follow ups) | 56% of those individuals who received the health check and returned for follow-up reported one or more of the desired behaviour changes, with an increase in physical activity being the most common. | Yes A |

## Table 4. (4) Other Interventions Including Multi-Component Interventions Overview

| Author, Year | Study Design & Quality | Intervention Type | Research Question | Worksite Type | Baseline Participants | Duration Of Study | Main Results | Applicable to UK |
|---|---|---|---|---|---|---|---|---|
| Lee & White, 2006 | RCT: individual - | Led sessions low impact aerobic exercise combined with weekly activity (walking or exercise to music) and education session. | Does a minimal exercise programme impact on physical activity in middle-aged women? | Large, public sector, Australia | n=37 | 48 weeks (12 week intervention follow up at 24 and 48 weeks) | No significant effects were reported for physical activity ~ significant effects for exercise knowledge (F9,90=3.34, p=0.01), | Yes B |
| Osteras & Hammer, 2006 | Before and after study - | Counselling, motivational interview, health checks/ screening | Can physical activity levels be increased through a workplace physical activity programme? | Large and midsized private sector, Norway | n=131 | 6 months | Physical activity increased significant (p<0.001) in the experimental group from pre-post test, according to days per week that participants performed PA (exceeding 10 mins) at moderate to high intensity. (mean 2.5 days/week to mean 2.9 days/week). Days/week with at least a 10 minute walk did not increase significantly. | Not clear B |
| Perkio-Makela, 1999 | RCT: individual - | Led sessions, Group physical exercise, lectures on lifting, musculo-skeletal disorders | What is the effect of exercise focused group activities on female farmers' physical activity, functional capacity, and work ability over a period of three years? | Private, Finland | n=126 | 3 years (intervention 2.5 months, follow up at 12 and 36 months). | LTPA increased significantly post intervention (2.5 months) in both the intervention (p=.000) and the control group (p=.001) but the increment was larger in the intervention group (p=.001). LTPA in the intervention group, at 1 year follow up, was still significantly raised (p=.001).By 3 year follow up LTPA had decreased to pre-intervention level. | Not clear B |
| Pert, 1997 | Control before and after - | Health promotion, Health check, | Can sedentary employees be influenced into becoming more physically active? | Medium, public, UK | n=49 | 6 months | Following the intervention, more people reported taking regular physical activity, fewer people identified motivational and time barriers to exercise with an overall decrease in barriers of 17%, there was no overall change in walking speed, there was no significant increase in time taken to reach 70% and 85% of HRmax, trends in the data indicated that those over 35 showed the greatest change, 76% of participants said their attitude towards physical activity had changed as a result of the intervention. | Yes A |

## Table 4. (5) Other Interventions Including Multi-Component Interventions Overview

| Author, Year | Study Design & Quality | Intervention Type | Research Question | Worksite Type | Baseline Participants | Duration Of Study | Main Results | Applicable to UK |
|---|---|---|---|---|---|---|---|---|
| Plotnikoff et al., 2005 | Control before and after<br>- | Email messages re active living | Does a 12-week workplace email intervention promote physical activity and nutrition behaviour? | Large, Private and Public, Canada. | n=2,121 | 12 week | The intervention group significantly increased their total activity levels at follow-up (p= 0,.01), whereas the control group significantly reduced their total activity levels at follow-up (p=0.01), although the effect size was small. | Yes<br>B |
| Talvi et al 1999 | Control before and after<br>- | Counselling/ motivational interview,<br>Health checks/ screening | What were the long term health effects of a workplace health promotion programme on oil refinery employees? What effect did health promotion counselling have on PA? | Large, private sector, Finland | n=885 | 3 years (2 phases 10 weeks each plus optional fitness test at 6 monthly intervals, follow up 3 years) | Participation in the counselling programme (group A) remained in the model (logistic regression analysis)as a statistically significant variable for PA. 24% of participants in Group A and 18% participants in Group B had crossed the threshold for PA – i.e. self reported that they were now exercising vigorously for two or more times/week at 3 year follow up. | Yes<br>B |

## 3.2 Systematic Reviews

### 3.2.1 Overview of evidence identified

Three systematic reviews were identified (Tables 5 & 6 p88-89) that examined the effectiveness of workplace interventions which aimed to increase physical activity in employees (Dishman et al. (+, B), 1998; Proper et al., 2003 (+, B); Badland et al., 2004 (-, B). Of these, two explicitly examined fitness and health outcomes also.

### 3.2.2 Reviews of Workplace Physical Activity Interventions

Dishman et al., (1998) aimed to provide a quantitative synthesis of the literature (from 1972-1997) examining the effectiveness of workplace interventions intended to increase physical activity or physical fitness (including those that had a comprehensive training regime within them) and included 26 studies in their review. Proper et al., (2003) undertook a review (from 1980-2000) to assess effectiveness of workplace physical activity programmes with respect to physical activity, fitness and health and included 26 relevant studies (29 publications). Finally, Badland et al., (2004) examined the workplace physical activity literature (date range of review not stated) in order to assess which interventions were transferable to the New Zealand setting and identified only 7 relevant studies.

The systematic review by Dishman et al., (1998) was generally well conducted and contained a meta analytic review however, the search strategy was limited (and so some evidence may have been missed), and the data extraction process was not clear hence the study was coded (+). Proper et al., (2003) had a well documented methodology for their review, with 2 reviewers independently evaluating the methodological quality of each study using a checklist based on the Cochrane Collaboration quality checklist. Conclusions drawn by authors were based on two high quality randomised controlled trials only, and these two studies measured very different programmes, types of employee and different outcomes. Hence the conclusion that there “is strong evidence that worksite physical activity programmes increase physical activity” was misleading and it would have been more accurate to state that

two high quality studies demonstrated a positive trend, consequently this review was coded as (+). The final review included was Badland et al., however the methodological quality for this was relatively poor with no study inclusion criteria stated, the names of databases searched were not listed and there was lack of clarity regarding data extraction. Furthermore, there was no explanation of the method of analysis and so the review was coded as (-).

Dishman et al., (1998) reviewed a range of workplace physical activity interventions including counselling, health checks/health screening, health promotion campaigns, subsidised schemes and led physical activity sessions, in different types of workplaces with the primary outcomes being physical activity or fitness. Dishman reported that the quantitative analysis carried out *does not clarify features of the interventions that were associated with greater success* (moderators of intervention effects (r) weighted by sample size: health education/risk appraisal r=0.06, exercise prescription r=0.14, behaviour modification r=0.34, combination 0.13). Overall, Dishman concluded that workplace physical activity interventions have a small, non-significant positive effect on physical activity or fitness. There was insufficient strength of evidence to conclude that workplace interventions were an effective mechanism for increasing physical activity due to the poor quality of study designs in this field.

In the review by Proper et al., (2003) the conclusions were based on two studies only, which measured different outcomes. The first examined individually focused physical activities over 2 years in a sample of manufacturing workers, using self-report in regular exercise as a measure. The second reported a moderate, unsupervised, aerobic exercise programme (with diet and weight monitoring). Although Proper et al., concluded that the there was strong evidence of intervention effect on physical activity outcomes it would have been more accurate to state that two high quality studies demonstrated a significant effect on physical activity and secondary outcomes such as reduction in body mass index (BMI); and improvement in symptoms of musculoskeletal disorders (e.g. back pain). Proper et al., similarly to Dishman et al., concluded that the methodological quality of the published

literature was poor, with many authors also using self-reported physical activity only to measure outcomes.

Badland et al., (2003) also, concluded that there was insufficient evidence to claim a significant effect for workplace physical activity interventions. Studies were characterised by poor design, small sample sizes and high attrition rates. Also, many conclusions from this review were related to New Zealand which probably limits their applicability to the UK.

### 3.2.3 Summary and evidence statements

A total of three reviews were identified for inclusion in the review of effectiveness. The reviews examined the effectiveness of workplace interventions which aimed to increase physical activity in employees. Two of these were of good quality (+). One (Dishman et al., 1998) concluded that workplace physical activity interventions have a small, non-significant positive effect on physical activity or fitness. The other (Proper et al., 2003) concluded that there was a significant intervention effect for physical activity but this was made on the basis of only two high quality studies. Both (Dishman et al., 1998, Proper et al., 2003) reported that the methodological quality of the published literature was poor, with many authors also using self-reported physical activity only to measure outcomes.

**Evidence statement 7**

**There is inconclusive, review-level evidence that workplace physical activity interventions have a significant effect on physical activity.**

**Table 5:- Key Characteristics of included systematic reviews (including at least one RCT).**

| Author, Year | Overall assessment of the review | Research Question | Years covered | Search terms used | Databases searched | No of studies reviewed |
|---|---|---|---|---|---|---|
| Dishman et al., 1998 | + Applicability B | To provide a quantitative synthesis of the literature examining the effectiveness of worksite interventions intended to increase physical activity or physical fitness | 1972-1997 | | MEDLINE, Psychinfo, current contents, Biosis, citation tracking, contacting experts in field | 26 |
| Proper et al., 2003 | + Applicability B | To critically review the literature with respect to the effectiveness of worksite PA programs on PA, fitness and health | 1980-2000 | A combination of concepts regarding type of study, study population, intervention , and outcome measure | MEDLINE, Embase, SPORTSDiscus, CINAHL, Psychlit, citation tracking and personal databases | 26 studies (29 publications) |
| Badland et al., 2004 | – Applicability B | To examine the worksite PA intervention literature and discuss whether the findings are applicable to New Zealand worksite environments | Not stated | Physical activity, intervention, worksite, workplace, health promotion | Health databases - names not listed, citation tracking | 7 |

**Table 6:- Systematic Review – Conclusions**

| Author, Year | Overall assessment | Inclusion criteria | Exclusion criteria | Conclusions |
|---|---|---|---|---|
| Dishman et al., 1998 | + Applicability B | Dependent variable was a measure of PA or a standard measure of physical fitness; worksite intervention; dependent variable quantified in a way that permitted change after the intervention to be calculated and compared with a change in a comparison group not receiving the intervention; an effect size could be expressed as a Pearson correlation coefficient r, permitting the calculation of effect sizes from frequencies, graphs, t-tests and chi square and f-tests in studies that did not report means and standard deviations | Worksite studies on retired populations; studies with pre-experimental designs, papers with information redundant to the results used in the analysis; effects derived from unstandardised measures of muscular strength or endurance, studies with insufficient information for calculating effect sizes using standard methods | Many of studies subject to serious design flaws and that the review reveals little basis for confidence that worksite interventions are currently an effective means for increasing PA. Part of this conclusion is based on the poor research designs of studies included.. |
| Proper et al., 2003 | + Applicability B | English language; RCT or non randomized controlled trial, involved a healthy working population, intervention was a worksite program aimed at enhancing levels pf PA, exercise and/or fitness, outcome measure included pa, health related fitness or health | Not stated | Conclusions based on 2 out of 8 studies that examined very different programmes/measured different outcomes/different types of workers. One examined individually focused PA activities over 2 years (sample of manufacturing workers) using self reported participation in regular exercise as a measure. The second examined a moderate unsupervised aerobic exercise program and diet and weight monitoring in a sample of workers in a business corporation using, estimated kcals, body weight and body composition. These are not representative of all worksite PA programmes and therefore it is misleading to say that there is strong evidence that worksite PA programmes increases PA. It is more accurate to state that 2 high quality studies demonstrated a positive trend or there is strong evidence for certain types of programmes. Concluded that the design of many of the studies were flawed |
| Badland et al., 2004 | – | Not stated | Not stated | Many of conclusions are related to New Zealand so not necessarily relevant in UK context. Main conclusion is that studies comprise serious design flaws but these illustrate the complexity of the topic area and provide direction for future interventions. |

### 3.3 Workplace - Settings & Populations

This section of the report addresses the following key questions from the scope:

- *Does the type of workplace influence effectiveness?*
- *What are the most effective and appropriate interventions for different sectors of the workforce such as men and women, younger and older workers, minority ethnic groups and temporary/casual workers?*
- *Does effectiveness vary according to the type of job people do?*

(See Tables 7-10 p96-104).

#### 3.3.1 Stair Walking Interventions

The seven studies promoting stair use were carried out in a range of public and private sector settings. These included office blocks (Titze et al, 2001; Auweele et al, 2005; Kerr at al, 2001; Badland et al, 2005) and public buildings such as a health care facility (Marshall et al, 2002) and a university (Adams & White, 2002). For four studies these settings were in urban areas (Marshall et al, 2002; Adams & White, 2002; Titze et al, 2001; Badland et al, 2005) whilst for the remainder it is unclear. The type of workplace was judged not to influence the effectiveness of interventions promoting use of stairs rather than lifts.

The design of many of the studies, which focussed on head counts, meant that little demographic data was available to determine if the interventions were more effective for different sectors of the population. None of the studies gave details of ethnicity. Gender was generally mixed with the exception of the Auweele et al study (2005) which only included female employees. Titze et al (2001), using observational data, report a slightly higher proportion of stair use by women at baseline (62.6%) than by men (61.3%) which increased to 66.7% post intervention (67.3% for men). Only two studies report age at

baseline (Marshall et al 2002; Titze et al, 2001) but neither report on differences in effectiveness between age groups. Eves et al (2006) report a greater effect in the overweight but measurement of weight status was subjective (from observation) rather than actual measurement and, as acknowledged by the authors, may be subject to error.

### 3.3.2 Walking Interventions

All walking programmes were initiated in large public sector organisations in primarily urban settings (Thomas et al., 2006) includes urban, suburban and rural settings). Three focus on white collar sedentary workers; the remaining study (Thomas et al, 2006) includes a range of workers but no difference in the effectiveness of the programme between job types is reported. Whilst both women and men participated in all programmes three studies report a higher proportion of women than men participating in the programme (Thomas et al 2006; Murphy et al, 2006; Gilson et al, 2007). Thomas et al also report a high proportion of participants from rural areas. In this study both proportions are higher than those in the staff population. No details are given in any of the studies of the ethnicity of study participants. The mean age of participants in three of the studies is very similar (41.4 – 43 years). Thomas et al., report the range 25 – 55 years, however 51.3% fall in the aged 30-49 years category. No differences in the effectiveness of the intervention are reported between gender, ethnicity or age. However, Thomas et al state that those with the lowest step count at baseline achieved the greatest increase (on average 53%).

### 3.3.3 Active Travel

The three active travel interventions included in the review took place in large/medium public sector organisations. Two were in urban areas (Mutrie et al., 2002; Wen et al., 2005) but for the third the setting was unclear (Gatersleben & Appleton, 2007). All the studies included both male and females but none reported the ethnicity of participants. Overall the type of workplace or was judged not to influence the effectiveness of interventions

For the Mutrie et al. study it was clear that a range of both active and sedentary workers (those who we thinking about, or doing some irregular, walking or cycling to work) were included and that the majority (76%) were social economic class 1 and 2. The average age of the participants was 38 years. No differences in age and gender were noted in the study. Gatersleben & Appleton report on a trial in which participants cycled to work (the University) over a two week period. Whilst the mean age of participants was lower (34 years) this is not likely to be representative given that students were included in the study as the authors were unable to recruit sufficient staff. The study participants totalled 22 and no differences in age, gender or ethnicity were reported. Similarly Wen et al (2005) do not report differences in age, gender or ethnicity.

### 3.3.4 Other Interventions – including multi-component programmes

The 16 studies identified in this category took place in the public, private sectors or both and across a range of different sized organisations, although the majority were large (employing 250+ employees). Again the type of workplace was judged not to influence the effectiveness of interventions. However, for many of the programmes included in this category the applicability to smaller workplaces is likely to be limited by resource issues. For example, Lee & White (2006) report on a weekly exercise class run on the employers premises (a university campus). Participants also undertook physical tests carried out by qualified fitness leaders and completed medical screening forms. The resources required for his programme include not only the cost of staff to administer the intervention but also the available space to carry out the weekly classes.

The interventions are aimed at a range of workers including white and blue collar workers. Gender mix on the programmes ranged from female only programmes, predominantly females, equal mix of male and females, predominantly male, to male only. One the whole this appeared to reflect the composition of gender in the workplace. For example, the two studies that

were predominantly male were carried out in an oil refinery in Finland (Talvi et al, 1999) and a factory in Glasgow (Hanlon et al, 1998). Both workplaces were male dominated. Where the mean age of participants was given this ranged from 38 years (Pert, 1997) to 48.4 years (Lee & White, 2006). Whilst the latter study was in fact aimed at *middle aged women,* typically the interventions were aimed at the entire workforce. Only two studies reported on the ethnicity of participants. In one study all participants were Caucasian (Talvi et al, 1999), in the other there was a mix of Maori, European, Pacific and *other* (Cook et al, 2001). However none of the studies reported differences in the effectiveness of the intervention based on gender or ethnicity. Only one study reports differences in effectiveness across age groups. Pert (1997) evaluates a health promotion intervention in which participants complete a health screening questionnaire, a physical assessment using a static bicycle and attend an interview in which a physical activity diary sheet was completed and participants were helped to identify where changes could be made. The bicycle assessment and interviews were repeated at six months after the first session. The change in times to reach 70% and 85% of $HR_{max}$ at these two assessments was found to be highest in those over 35 years (sample range 18-59 years, mean 38 years) but no details are given of whether this change was statistically significant. Titze et al (2001) reported on a multi-component intervention that include information, actions for daily life activities, fitness lessons and counselling and found that participants with a low level of physical activity at baseline were seen to have a statistically significant greater increase in physical activity than those with higher baseline figures; concluding that the programme was more effective for this group of sedentary participants.

- *Does the type of workplace influence effectiveness?*

**Evidence Statement 8**

**No evidence was presented that indicates type of workplace influenced the effectiveness of physical activity interventions.**

- *What are the most effective and appropriate interventions for different sectors of the workforce such as men and women, younger and older workers, minority ethnic groups and temporary/casual workers?*

**Evidence Statement 9**

**No evidence was presented that physical activity interventions were more appropriate for different *sectors* of the workforce based on gender, ethnicity or for temporary/casual workers.**

One study reports differences in effectiveness across age groups (Pert, 1997). This intervention comprised of health screening, a physical assessment and interview with a physiotherapist. Effectiveness was found to be highest in those over 35 years but no details are given of statistical significance and the lack of a more scientific approach in implementation of the project compromises the validity of the study.

- *Does effectiveness vary according to the type of job people do?*

**Evidence Statement 10**

**Three studies[1,2,3] suggest that workplace physical activity interventions are more effective for sedentary workers.**

[1]Titze et al., 2001 (- before and after); [2]Eves et al., 2006 (- before and after); [3]Thomas et al., 2006 (- before and after)

Eves et al (2006) study of a poster intervention to increase stair walking report a greater effect in people who are overweight. However, measurement of

weight status is subjective and may be subject to error. Thomas et al (2006) report in their evaluation of a walking programme that those with the lowest step count at baseline achieved the greatest increase (on average 53%) but the study relies on self reported data. Similarly Titze et al (2001) report on a multi-component and found that participants with a low level of physical activity at baseline were seen to have a statistically significant greater increase in physical activity than those with higher baseline figures. However, the effectiveness refers only to those employees willing to complete a questionnaire at baseline. The sample is self-selected, relatively young and well educated therefore generalisability is limited.

**Table 7. (1) Stair Walking Interventions – Settings and Populations**

| Author, Year | Study Design | Study Quality | Research Question | Worksite type | Setting | Population: Gender | Population: Age | Population: Active/ Sedentary | Population : Type of Worker | Population: Ethnicity |
|---|---|---|---|---|---|---|---|---|---|---|
| Marshall et al., 2002 | Interrupted time series | ++<br>B | Do signs promote the use of stairs in a health care facility? | Australian health care facility, stairs used by staff and visitors | Urban | Both | Mean 43 years | All | Not clear | Not stated |
| Adams & White, 2002 | Control before and after | +<br>A | Do signs designed by employees, left in place long-term, have long-term effects on stair climbing? | Large public sector , UK stairs used by staff and visitors | Urban | Both | Range (all people in building - student, staff and visitors) | All | Not clear | Not stated |
| Kerr et al., 2001 | Before and after study | +<br>A | Can posters prompt stair use in a worksite environment? | Private sector, UK | Not clear | Both | No details given | Sedentary | White collar | Not stated |
| Auweele et al., 2005 | Before and after study | –<br>B | Do health signs and a worksite doctor's email increase stair usage of female employees? | Socio-cultural organisation, Belgium | Not clear | Female | No details given | Not clear | White collar | Not stated |

**Table 7. (2) Stair Walking Interventions – Settings and Populations**

| Author, Year | Study Design | Study Quality | Research Question | Worksite type | Setting | Population: Gender | Population: Age | Population: Active/ Sedentary | Population : Type of Worker | Population: Ethnicity |
|---|---|---|---|---|---|---|---|---|---|---|
| Badland et al., 2005 | Control before and after | – B | Do posters increase stair use and objectively measured PA ? | Public sector, New Zealand | Urban | Both | No details given | All | All | Not stated |
| Eves et al., 2006 | Before and after study | – A | Do posters increase ascent and descent in stair climbing? | Public sector, UK | Not clear | Both | No details given | NA | NA | Not stated |
| Titze et al., 2001 | Before and after study | – B | Does provision of written material on health benefits encourage stairs use rather than lifts use? | Large, public sector (6 offices), Switzerland | Urban | Both | Intervention: mean 41.9 years (SD 9.4) Control: mean 41 years (SD 9.4) | All | White collar | Not stated |

**Table 8. Walking Interventions – Settings and Populations**

| Author, Year | Study Design | Study Quality | Research Question | Worksite type | Setting | Population: Gender | Population: Age | Population: Active/ Sedentary | Population : Type of Worker | Population: Ethnicity |
|---|---|---|---|---|---|---|---|---|---|---|
| Chan et al 2004 | Before and after study | + B | What are the effects of a pedometer based physical activity intervention on activity and specific health indices | Public Sector, Canada | Urban | Both | Mean 43 years | Sedentary | White collar | Not stated |
| Gilson et al 2007 | RCT: individual | + A | What are the impacts of two different types of walking intervention on work day step counts and health status? | Large Public Sector, UK | Urban | Both | Mean 42 years | Sedentary | White collar | Not stated |
| Murphy et al 2006 | RCT: individual | – A | Can individuals achieve health benefits from outdoor walking with minimal time investment? | Large Public Sector, UK | Urban | Both | Mean 41.5 years | Sedentary | White collar | Not stated |
| Thomas et al 2006 | Before and after study | – B | Can individuals increase walking to 10k steps per day using a pedometer based PA programme? | Large Public Sector, Australia | Range: Urban, suburban, rural | Both | 25-55 years | Sedentary | Range | Not stated |

**Table 9. Active Travel – Settings and Populations**

| Author, Year | Study Design | Study Quality | Intervention Type | Research Question | Worksite type | Setting | Population: Gender | Population: Age | Population: Active/ Sedentary | Population : Type of Worker | Population: Ethnicity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mutrie et al., 2002 | RCT: individual | + A | Walking/ cycling | Does a self-help intervention increase active commuting? | Large, public sector, UK | Urban | Both | 19 to 69 years (mean 38 years) | Range | Range | Not stated |
| Gatersleben & Appleton, 2007 | Qualitative study | – A | Cycling | What motivates/ impedes cycling to work for people who have never cycled before? | Large, public sector, UK | Not clear | Both | 34 Mean | Not clear | Not clear | Not stated |
| Wen et al., 2005 | Before and after study | – B | Walking/ cycling | Does a social marketing campaign modify behaviour in relation to active transport? | Large, public sector, Australia | Urban | Both | Mean 38.3, median 38, mode 30 | Not clear | Not clear | Not stated |

## Table 10. (1) Other Interventions – Including Multi-Component Interventions – Setting and Populations

| Author, Year | Study Design | Study Quality | Intervention Type | Research Question | Worksite type | Setting | Population: Gender | Population: Age | Population: Active/ Sedentary | Population : Type of Worker | Population: Ethnicity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Marshall et al 2003 | RCT: individual | ++ B | Health promotion information | Does promotion of physical activity programmes delivered by print email and a website change PA and influence progression through the stages of motivational readiness? | Large public sector, Australia | Urban | Both | Mean 43 years | Not clear | Not clear | Not stated |
| Proper et al., 2003<br><br>Proper et al., 2004 | RCT: cluster | ++ B | Counselling / motivational interview, Other | How effective is an individual counselling intervention at the worksite on physical activity, fitness and health using PACE protocols?<br><br>How effective is an individual counselling intervention at the worksite on physical activity, fitness, health and sick leave? | Public sector, Netherlands | Urban | Both | intervention mean age 43.8 years (SD8.1) control mean age 43.7 years (SD9.3) | All | White collar | Not stated |

## Table 10. (2) Other Interventions – Including Multi-Component Interventions – Setting and Populations

| Author, Year | Study Design | Study Quality | Intervention Type | Research Question | Worksite type | Setting | Population: Gender | Population: Age | Population: Active/ Sedentary | Population : Type of Worker | Population: Ethnicity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aittasalo et al ., 2004 | RCT: individual | + B | Counselling, motivational interview, health checks / screening | Does counselling have long term effects on sedentary employees' leisure time PA (LTPA)? Does comprehensive fitness testing bring additional effects to counselling on LTPA? | Range of private and public sector companies, Finland | Urban | Both | Mean 44 years | Sedentary | Range | Not stated |
| Cook et al., 2001 | RCT: individual | + B | Health checks/ screening, Health promotion workshops and literature | Can a relatively low intensity workplace intervention with male hourly paid workers could significantly improve dietary behaviours, increase PA and reduce blood pressure and body weight? | Large, public sector, New Zealand | Urban | Male | Not stated | Not clear | Blue collar | Yes: Maori, European, Pacific, Other |
| O'Loughlin et al., 1996 | Control before and after | + B | Health check/ screening | What is the short-term impact of school-based screening on LTPA and CVD risk factors of staff? | Public sector, Canada | Urban | Both | Man 45.7 years (SD8.5) | Sedentary | White collar | Not stated |

**Table 10. (3) Other Interventions – Including Multi-Component Interventions – Setting and Populations**

| Author, Year | Study Design | Study Quality | Intervention Type | Research Question | Worksite type | Setting | Population: Gender | Population: Age | Population: Active/ Sedentary | Population : Type of Worker | Population: Ethnicity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Rice & Saunders, 2001 | Qualitative /extended interview | + B | Led sessions, Walking programme, fitness assessment, and health information | What are the motivating factors, and satisfaction gained, from taking part in a worksite health/active lifestyle programme? | Large, public sector, Australia | Suburban | Both | 29-66, mean age 42 years. | Not clear | White collar | Not stated |
| Sjogren et al., 2006 | RCT: cluster | + B | Light resistance training | What are the effects of a work- place physical exercise intervention on subjective physical well-being, psycho - social functioning and general well-being of office workers? | Large, public sector, Finland. | Urban | Both | 45.7 years SD8.5 | Sedentary | White collar | Not stated |
| Titze et al 2001 | Control before and after | + B | Active travel – cycling, walking, Counselling/ interview, Health checks/ screening, promotion, Led sessions, Stair walking Subsidies /incentives, Walking | What impact does a lifestyle PA intervention have on stages of change and energy expenditure in sedentary employees? | Large, public sector, Switzerland. | Urban | Both | Mean 42.9 yrs (SD 10) | All | White collar | Not stated |

**Table 10. (4) Other Interventions – Including Multi-Component Interventions – Setting and Populations**

| Author, Year | Study Design | Study Quality | Intervention Type | Research Question | Worksite type | Setting | Population: Gender | Population: Age | Population: Active/ Sedentary | Population: Type of Worker | Population: Ethnicity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Addley et al., 2001 | Cross sectional (survey) | – A | Health check/ screening, | Does a workplace lifestyle and PA activity programme influence the adoption of positive healthy lifestyle behaviours? | Large public sector, UK | Not clear | Both | 89% over 35 years | Not clear | Range | Not stated |
| Hanlon et al., 1998 | Cross sectional (survey) | – A | Health check/ screening | Does attendance at a workplace health check change health behaviour? | Large private sector, UK | Urban | Both | Not stated | Not clear | Blue collar | Not stated |
| Lee & White, 2006 | RCT: individual | – B | Led sessions low impact aerobic exercise combined with weekly activity (walking or exercise to music) and education session. | Does a minimal exercise programme impact on physical activity in middle-aged women? | Large, public sector, Australia | Not clear | Female | 40 to 61, mean 48.4 | Sedentary | Both | Not stated |
| Osteras & Hammer, 2006 | Before and after study | – B | Counselling, motivational interview, health checks/screening | Can physical activity levels be increased through a workplace physical activity programme? | Large and midsized private sector, Norway | Not clear | Both | Men mean 41.2 years (SD 9.5), women mean 41.6 years (SD 9.1) | Sedentary | Range | Not stated |

**Table 10. (5) Other Interventions – Including Multi-Component Interventions – Setting and Populations**

| Author, Year | Study Design | Study Quality | Intervention Type | Research Question | Worksite type | Setting | Population: Gender | Population: Age | Population: Active/ Sedentary | Population: Type of Worker | Population: Ethnicity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Perkio-Makela, 1999 | RCT: individual | – B | Led sessions, Group physical exercise, lectures on lifting, musculoskeletal disorders | What is the effect of exercise focused group activities on female farmers' physical activity, functional capacity, and work ability over a period of three years? | Private, Finland | Rural | Female | 25-45 years old | Not clear | Blue collar | Not stated |
| Pert, 1997 | Before and after study | – A | Health promotion, Health check, | Can sedentary employees be influenced into becoming more physically active? | Medium, public, UK | Urban | Both | 18 to 59 years (mean age 38 years) | Sedentary | Both | Not stated |
| Plotnikoff et al., 2005 | Control before and after | – B | Email messages re active living | Does a 12-week workplace email intervention promote physical activity and nutrition behaviour? | Large, Private and Public, Canada. | Not clear | Both | Intervention mean 44.88 years Control mean 44.96 years | Not clear | White collar | Not stated |
| Talvi et al 1999 | Control before and after | – B | Counselling/ motivational interview, Health checks/screening | What were the long term health effects of a work- place health promotion programme on oil refinery employees? What effect did health promotion counselling have on PA? | Large, private sector, Finland | Not clear | Both | Group A; men mean 42.6 years; women 42.1 years. Group B: men 40.4 years; women 41.1years | Not clear | Both | No: all participants were Caucasian |

### 3.4 Intervention Design, Delivery, and Duration

This section of the report addresses the following key questions from the scope:

- *How does the way it (the intervention) is delivered influence effectiveness?*
- *Does the length and/or intensity of the intervention influence its impact?*
- *Does the degree to which employees are involved in the planning, implementation and review of interventions influence their effectiveness?*

(See Tables 11-14, p109-120).

#### 3.4.1 Stair Walking Interventions

All but one of the included stair walking interventions featured health promotion messages as the primary delivery mode (signs, posters). Titze et al (2001) uses written material (Titze et al., 2001). Other studies use a combination of methods, e.g. health signs and doctor's email (Auweele et al., 2005). Two studies involved employees in the design of the posters (Adams and White, 2002; Eves et al., 2006) and Titze et al., (2001) involved employees as part of a steering committee to design a more complex stair climbing intervention involving various incentives as well as posters. The duration of the included studies ranged from 2 weeks – 4 months. Only three studies included a follow up within that period (Kerr et al., 2001; Titze et al., 2001; Auweele et al., 2005). The intensity of stair walking may be considered as vigorous.

Of the three studies that involved employees in delivery and design, two report significant effects (Eves et al., 2006 Titze et al., 2001) but both were judged to be rated as (-). The other reported no significant effect (Adams & White, 2002, rated (+)).

The duration of the study did not make a discernible difference. Those of longer duration (including follow up) reported mixed results. Marshall et al (2002) report initial increases which decline back to baseline at follow up

whilst Titze et al (2001) report a significant increase in stair use over a corresponding period.

### 3.4.2 Walking Interventions

Delivery varied from more intensive facilitated sessions (led by nurses) (Chan et al., 2004) which taught participants about the processes of behaviour change, to self-directed programmes which relied on health information, guidance as to amounts of walking needed and, in two studies, email support was also sent to employees (Thomas et al., 2006; Gilson et al., 2007). Whilst all four studies showed an increase in step count post intervention, only the self-directed interventions (Murphy et al., 2006; Gilson et al., 2007) reported a significant increase in steps. Significance was not reported in the other two studies.

Intensity was moderate for all studies. Duration ranged from 4 to 12 weeks, but it was not possible to conclude an intervention effect influenced by duration. (Shortest duration/4 weeks: Thomas et al., 2006 – longest duration/12 weeks: Chan et al., 2004 do not report significance). Similarly only Thomas et al., (2006) involved employees in delivery by way of peer education but no conclusion can be drawn on the influence of effectiveness.

### 3.4.3 Active Travel

Two of the three studies were self-directed (Mutrie et al., 2002; Gatersleben and Appleton, 2007) and one was a health promotion (combined social and individualised marketing) campaign. As only Mutrie et al., (2002) reported an increase in physical activity no conclusions can be drawn.

These interventions were all moderate to vigorous. The duration of two studies was 12 months (Mutrie et al., 2002; Wen et al., 2005) and one other was 2 weeks (Gatersleben and Appleton, 2007). Again given the paucity of significant results no conclusions can be drawn regarding the influence of duration on intervention effectiveness.

Employees were involved in the intervention design of two studies (Wen et al., 2005; Gatersleben and Appleton, 2007). As before, the volume and quality of evidence was too limited to allow conclusions to be drawn about effectiveness.

### 3.4.4 Other interventions – including multi-component programmes.

Of the 16 interventions in this grouping, 8 involved delivery in part or in full by a health professional (Pert, 1997; Hanlon et al., 1998; Perkio-Makela, 1999; Talvi et al., 1999; Addley et al., 2001; Proper et al., 2003; Aittasalo et al., 2004; Lee and White, 2006). These included nurse, physiotherapist, counsellors, exercise professional, occupational physician and psychologist. Only two of these reported significant effects on physical activity (Perkio-Makela, 1999; Proper et al., 2003). Proper et al., (2003) focused on individual counselling in order to provide a tailored plan of behaviour change for physical activity (all intensities of activity) whereas Perkio-Makela (1999) focused on led group sessions, for moderate exercise. Perkio-Makela had an all female sample whereas for Proper et al., both genders were included in the study. Two studies reported delivery by e-mail/web and both reported increased participation in physical activity (Marshall et al., 2003; Plotnikoff et al., 2005). Plotnikoff et al., reported significant differences ($p=0.01$). However Marshall et al report no significant increase in total reported physical exercise when analysed by intention to treat.

A range of intervention intensities (light, moderate, vigorous) and durations (8 weeks-12 months (with one study following up at 36 months)) were exhibited in this group of studies. 6 studies had a duration of six months or greater, 5 of which (approx 84% studies) showed increase in physical activity measures 4 of which were shown to be significant (Cook et al., 2001; Proper et al., 2004; Plotnikoff et al., 2005; Osteras and Hammer, 2006). 10 studies had a duration of less than six months of which 6 (60%) were shown to be significant (O'Loughlin et al., 1996; Perkio-Makela, 1999; Talvi et al., 1999; Titze et al., 2001; Plotnikoff et al., 2005; Sjogren et al., 2006). This evidence suggests a moderate effect of intervention length on intervention effectiveness.

Employee involvement occurred in 2 studies only (Pert, 1997; Titze et al., 2001). Titze et al., involved employees as part of a steering committee in the design of incentives and Pert involved employees at a pilot stage of the intervention development. Titze et al., were rated (+) and Pert only a (-) for study quality. Again, the evidence was limited and inconclusive regarding influence of employee involvement on intervention effectiveness.

- *How does the way it (the intervention) is delivered influence effectiveness?*

**Evidence statement 11**

**Evidence from two walking interventions studies[1,2] and one active travel intervention[3] suggests self-directed interventions are effective.**

[1]Thomas et al, 2006; [2]Gilson et al, 2007; [3]Mutrie et al 2002

- *Does the length and/or intensity of the intervention influence its impact?*

**Evidence Statement 12**

**Evidence for the influence on effectiveness of duration and intensity of physical activity of is inconclusive in stair walking, walking and active travel interventions. However, evidence from five other studies[1,2,3,4,5] suggest a moderate effect of interventions of over 6 months duration.**

[1]Cook et al., 2001 (+ individual RCT); [2]Proper et al., 2004; 2003 (++ cluster RCT); [3]Plotnikoff et al., 2005 (- control before and after); [4]Osteras and Hammer, 2006 (- before and after); [5]Pert 1997 (- before and after)

- *Does the degree to which employees are involved in the planning, implementation and review of interventions influence their effectiveness?*

**Evidence statement 13**

**There is no evidence that involvement of employees in planning, implementation and review of the physical activity intervention influences the effectiveness of those interventions.**

**Table 11. (1) Stair Walking Interventions – Design Delivery and Duration**

| Author, Year | Study Design | Study Quality | Research Question | Description of Intervention | Delivery Mode/Provider | Employee involvement | Intensity/ duration | Main results |
|---|---|---|---|---|---|---|---|---|
| Marshall et al., 2002 | Interrupt-ed time series | ++ B | Do signs promote the use of stairs in a health care facility? | Signs and vinyl 'footsteps' leading people to stairs. | Health promotion messages /researchers | No | Vigorous / moderate PA 12 weeks no follow up | Initial significant increase in stair walking (1.05 Adj OR, 1.01-1.10 CI, p=0.02) but decline back to baseline over study period. |
| Adams & White, 2002 | Control before and after | + A | Do signs designed by employees, left in place long-term, have long-term effects on stair climbing? | Signs near lift, in lift and in stairwells | Health promotion messages /researchers | Yes | Vigorous / moderate PA study initially planned for 12 weeks but terminated after 4 | Non significant increase in stair climbing (retrospective control) (p=0.77, baseline to week 1) Non significant decrease in stair climbing (p=0.74, baseline to week 4) |
| Kerr et al., 2001 | Before and after study | + A | Can posters prompt stair use in a worksite environment? | Signs near lift entrance. | Health promotion messages /researchers | No | Vigorous / moderate PA 2 week (follow up after 1 week) | No significant effect of poster for stair climbing, but there was for stair descent, an increase in 25%-30% (OR 1.21, CI 1.07-1.37). |
| Auweele et al., 2005 | Before and after study | – B | Do health signs followed by a worksite doctor's email increase stair usage of female employees? | Week 1 health sign placed near lift and stairs on each floor Week 2 doctors email promoting health benefits of stair climbing. | Health promotion messages plus message from health professional/NA | No | Vigorous / moderate PA 2 weeks (follow up after 3 weeks) | Stair use increased significantly with use of health sign (Chi square (1) =12.97, p<.001) and with doctors email plus health sign (Chi square (1) =15.58, p<.001). In follow up decline back to baseline. |
| Marshall et al., 2002 | Interrupted time series | ++ | Do signs promote the use of stairs in a health care facility? | Signs and vinyl 'footsteps' leading people to stairs. | Health promotion messages /researchers | No | Vigorous / moderate PA 12 weeks no follow up | Initial significant increase in stair walking (1.05 Adj OR, 1.01-1.10 CI, p=0.02). but decline back to baseline over study period. |
| Badland et al., 2005 | Control before and after | – B | Do posters increase stair use and objectively measured PA ? | Posters | Health promotion messages/not clear | No | Vigorous / moderate PA 3 weeks | No significant increase |

**Table 11. (2) Stair Walking Interventions – Design Delivery and Duration**

| Author, Year | Study Design | Study Quality | Research Question | Description of Intervention | Delivery Mode/Provider | Employee involvement | Intensity/ duration | Main results |
|---|---|---|---|---|---|---|---|---|
| Eves et al., 2006 | Before and after study | – A | Do posters increase ascent and descent in stair climbing? | Health posters in lobby, fixed to stair rises and a point-of-choice prompt at lift. | Health promotion messages/ researchers | Yes | Vigorous / moderate 6 weeks | A significant effect on stair climbing (OR 1.12, $p<0.05$) greater effect in the overweight. Also, significant effect on stair descent (OR 1.15, $p<0.005$). |
| Titze et al., 2001 | Before and after study | – B | Does provision of written material on health benefits encourage stairs use rather than lifts use? | Written information re health benefits of stair climbing. Incentives to stair use/ Disincentives to lift use | Educational material and incentives/ workplace | Yes Steering committee involving employees | Vigorous / moderate 4 months | Significant increase in stair use ($p=0.028$) was found between baseline and follow-up, from observational data. |

**Table 12. (1) Walking Interventions - Design Delivery and Duration**

| Author | Study Design | Study Quality | Research Question | Description of Intervention | Delivery Mode/ Provider | Employee Involvement | Intensity/ duration of intervention | Main Results |
|---|---|---|---|---|---|---|---|---|
| Chan et al 2004 | Before and after study | + B | What are the effects of a pedometer based physical activity intervention on activity and specific health indices | Led through curriculum which explained health benefits, and taught strategies for behaviour change and maintenance. Pedometers used to help participants monitor behaviour. | Facilitated sessions during adoption phase/ Registered nurses and worksite wellness co-ordinators | No | Moderate 12 weeks | Average daily step count increase from 7029±3100 to a plateau of 10480±3224 modelled. Plateau was reached in a mean time of 3.96±3.28 weeks. Reductions in waist girth and heart rate were significantly related to the increase in steps per day (p=0.0073, p=0.023). |
| Gilson et al 2007 | RCT: individual | + A | What are the impacts of two different types of walking intervention on work day step counts and health status? | One group using promoted walk routes around grounds of worksite; the other group accumulating steps between occupational tasks. Weekly group emails sent. | Health information and email/ researchers | No | Moderate 10 weeks | A significant increase in step count in both intervention groups p<0.008, n2= 0.17 (walking routes) and p<0.005, n2=0.17 (walking in task groups). |
| Murphy et al 2006 | RCT: individual | – A | Can individuals achieve health benefits from outdoor walking with minimal time investment? | Progressive outdoor walking programme: 60 mins walking week 1 progressing to 90 mins in weeks 3-8. | Self directed/ researchers | No | Moderate 8 weeks | Significantly more steps on days of prescribed walking compared to rest days (p<.001). |

**Table 12. (2) Walking Interventions - Design Delivery and Duration**

| Author | Study Design | Study Quality | Research Question | Description of Intervention | Delivery Mode/ Provider | Employee Involvement | Intensity/ duration of intervention | Main Results |
|---|---|---|---|---|---|---|---|---|
| Thomas et al 2006 | Before and after study | – B | Can individuals increase their walking to achieve 10,000 steps per day using a pedometer based PA activity programme? | Subsidised pedometers, progressive walking programme to reach 10,000 steps/day, email support also given. | Peer education and health promotion campaign/not clear | Yes | Moderate 4 weeks | 10% increase in the number of steps taken per day; increase of 25% in the average number of days that participants reached 10,000 steps. At follow up 63% reported maintained or increased levels of walking. 65% reported changes to routine to increase PA. Significance not reported |

**Table 13. Active Travel - Design Delivery and Duration**

| Author | Study Design | Study Quality | Research Question | Description of Intervention | Delivery Mode/ Provider | Employee Involvement | Intensity/ duration of intervention | Main Results |
|---|---|---|---|---|---|---|---|---|
| Mutrie et al., 2002 | RCT: individual | +<br>A | Does a self-help intervention increase active commuting? | Walk in to Work Out pack containing written information on transtheoretical model of behaviour change plus local information (safety, routes etc) | Self directed/ Greater Glasgow Health Board | No | Moderate to vigorous<br><br>12 months | Intervention group was almost twice as likely to increase walking to work as the control group at six months (OR 1.93, 95% CI 1.06-3.52). 25% of the intervention group were regularly actively commuting at 12-month follow-up. The intervention was not successful at increasing cycling. |
| Gatersleben & Appleton, 2007 | Qualitative study | –<br>A | What motivates/ impedes cycling to work for people who have never cycled before? | Cycling scheme with free bike as prize | Self directed/ researchers | Yes | Moderate to vigorous<br><br>2 weeks | 8 said they would continue to cycling to work. 4 others cited reasons for not continuing - dangerous roads, prefer bus and moving to new job. 10 said they would continue in good weather. |
| Wen et al., 2005 | Before and after study | –<br>B | Does a social marketing campaign modify behaviour in relation to active transport? | Social marketing strategy | Range/ project workers | Yes | Moderate to vigorous<br><br>12 months | No significant increase in staff who reported using active transport as their usual mode of transport to work. Significant reduction (20%) in proportion of staff who reported driving to work 5 days per week (p=0.012). |

**Table 14. (1) Other interventions Including Multi-component - Design Delivery and Duration**

| Author | Study Design | Study Quality | Research Question | Description of Intervention | Delivery Mode/ Provider | Employee Involvement | Intensity/ duration of intervention | Main Results |
|---|---|---|---|---|---|---|---|---|
| Marshall et al 2003 | RCT: individual | ++ B | Does promotion of physical activity programmes delivered by print, email and a website change PA and influence progression through the stages of motivational readiness? | Health promotion information (Active Living booklet) on trans-theoretical model of behaviour change plus letters to reinforce messages in booklets. | Mail/ web/email | No | All/ 8 weeks , (follow up at 10 weeks) | Increase in both groups to participation in PA at 10 follow up but no statistically significant differences within or between groups and no significant increase in total reported physical activity (F[1,653]=0.41, p=0.52) when analysed by intention to treat. Approx 26% of both groups progressed forward at least one stage through the stage of change model. |
| Proper et al., 2003 | RCT: cluster | ++ B | How effective is an individual counselling intervention at the worksite on physical activity, fitness and health using PACE protocols? | 7 x 20 minute counselling sessions using PACE protocols to provide a tailored plan of behaviour change. | Written information plus counselling/ Active Living Papendal, a Dutch commercial company carried out the counselling intervention | No | 9 months | A significant positive intervention effect was observed for energy expenditure (p=0.003) and cardio-respiratory fitness where submax heart rate significantly declined in the intervention group (p=0.001) (ANCOVA) No statistically significant intervention effect on the proportion of subjects meeting the public health recommendation for moderate intensity physical activity. (OR=1.46; 95% CI, CI=0.76-2.79). |

**Table 14. (2) Other interventions Including Multi-component - Design Delivery and Duration**

| Author | Study Design | Study Quality | Research Question | Description of Intervention | Delivery Mode/ Provider | Employee Involvement | Intensity/ duration of intervention | Main Results |
|---|---|---|---|---|---|---|---|---|
| Proper et al ., 2004 | As above | As above | How effective is an individual counselling intervention at the worksite on physical activity, fitness, health and sick leave? | As above | As above | As above | As above | For both groups the mean sick leave rate increased during the intervention period. After the intervention period the control group increased even more (22.9 days to 27.6 days) whereas the intervention group decreased slightly (21.5 to 20.5 days). No statistically signif intervention effect was found. |
| Aittasalo et al ., 2004 | RCT: individual | + B | Does counselling have long term effects on sedentary employees' leisure time PA (LTPA)? Does comprehensive fitness testing bring additional effects to counselling on LTPA? | Group 1: Counselling/ motivational interview, Group 2: Counselling/ motivational interview plus health checks/screening | Counselling sessions with occ health/ Occ health nurses/units/ Physio for fitness testing | No | All/ 12 months (follow ups at six and 12 months) | No statistically signif diffs between the groups in any of the PA measures at follow ups. Statistically sig improvement in a number of measures in *both* groups at 12 follow up: increased energy expenditure in the whole group (inc control) (p=0.011); fulfilment of FPA recommendation at six and 12 months follow ups (p=0.034 and p=0.0003); fulfilment of HEPA recommendation at 12 month follow up (p=0.049). |

**Table 14. (3) Other interventions Including Multi-component - Design Delivery and Duration**

| Author | Study Design | Study Quality | Research Question | Description of Intervention | Delivery Mode/ Provider | Employee Involvement | Intensity/ duration of intervention | Main Results |
|---|---|---|---|---|---|---|---|---|
| Cook et al., 2001 | RCT: individual | + B | Can a relatively low intensity workplace intervention with male hourly paid workers could significantly improve dietary behaviours, increase PA and reduce blood pressure and body weight? | Health checks/screening, Health promotion workshops and literature | Key workers and health messages/ not clear | No | Moderate<br><br>6 month intervention (follow up 12 months) | Signif increase in time spent in PA (p=0.0005) from baseline to 12 months in intervention group, whilst decreasing in control (p=0.002). |
| O'Loughlin et al., 1996 | Control before and after | + B | What is the short-term impact of school-based screening on LTPA and CVD risk factors of staff? | Health check/screening plus multi-component programme of PA opportunities which were available, led by exercise professionals and supplemented with written materials | Peer education /National Health Research and Development Program, Health Canada, the Quebec Ministry of Health and Social Services, and the Quebec Heart and Stroke Foundation | No | 4 month (including follow up) | Subjects exposed to screening significantly increased their level of physical activity - LTPA MET mins week (p=0.05). |

**Table 14 (4) Other interventions Including Multi-component - Design Delivery and Duration**

| Author | Study Design | Study Quality | Research Question | Description of Intervention | Delivery Mode/ Provider | Employee Involvement | Intensity/ duration of intervention | Main Results |
|---|---|---|---|---|---|---|---|---|
| Rice & Saunders, 2001 | Qualitative/extended interview | + B | What are the motivating factors, and satisfaction gained, from taking part in a worksite health/active lifestyle programme? | Led sessions, Walking programme, fitness assessment, and health information | Not clear/ not stated | No | 9 weeks | Emergent concepts relevant to participation: Exercise Setting. Independence/dependence – degree to which the participant was autonomous in their ability to exercise. Preference for a social environment Exercise Personal Characteristics Challenge – the degree to which the participant was able to put in effort to achieve improvement during the exercise session. Self image Learned values. Physical well being, Psychological benefits of exercise Concern with health. Ability to manage conflicting priorities. Physical Environment. Attractiveness of exercise setting. Location. |
| Sjogren et al., 2006 | RCT: cluster | + B | What are the effects of a workplace physical exercise intervention on subjective physical well-being, psychosocial functioning and general well-being of office workers? | Light resistance training | Self led/ physio in on-site facility | No | Moderate/<br><br>15 weeks (flow up at 30 weeks) | Light resistance training time significantly increased subjective physical well-being. (Regression co-eff: 0.03253).<br>No significant physical exercise intervention or light resistance training effects were found for psychosocial functioning or general subjective well being. |

**Table 14. (5) Other interventions Including Multi-component - Design Delivery and Duration**

| Author | Study Design | Study Quality | Research Question | Description of Intervention | Delivery Mode/ Provider | Employee Involvement | Intensity/ duration of intervention | Main Results |
|---|---|---|---|---|---|---|---|---|
| Titze et al 2001 | Control before and after | +<br>B | What impact does a lifestyle PA intervention have on stages of change and energy expenditure in sedentary employees? | Active travel – cycling, Active travel – walking, Counselling/motivational interview, Health checks/ screening, Health promotion, Led sessions, Stair walking, Subsidies/ incentives, Walking programme | Led sessions, written material, health check/ project manager, the evaluator, and the exercise professional. | Yes<br><br>Employee steering committee | Moderate to vigorous<br><br>4 months | Control groups had signif lower median of energy expenditure (1389 kcal vs 1590 kcal, p=0.046) and signif fewer participants in stages of action and maintenance (35.7% vs 49.3%, p=0.034) cf intervention offices. |
| Addley et al., 2001 | Cross sectional (survey) | -<br>A | Does a workplace life - style and PA programme influence the adoption of positive healthy lifestyle behaviours? | Health check/screening carried out by occ health dept, tailored, written literature given post check in order to promote health behaviours, | Occ Health Nurse run/ Northern Ireland Civil Service | No | All/<br><br>6 months (initial health assessment and six month follow up) | Increased exercise rate of 62% (n=626). overall rate of non-attempted change on average being one in five; tried and failed one in three; and successful maintenance after 6 months in nearly 50%. |
| Hanlon et al., 1998 | Cross sectional (survey) | –<br>A | Does attendance at a workplace health check change health behaviour? | Health check/screening for cholesterol risk | Health education advice/ Trained counsellors | No | All/<br><br>12 months, (with 6 and 12 month follow ups) | 56% of those individuals who received the health check and returned for follow-up reported one or more of the desired behaviour changes, with an increase in physical activity being the most common. |
| Lee & White, 2006 | RCT: individual | –<br>B | Does a minimal exercise programme impact on physical activity in middle-aged women? | Screening plus self-directed low impact aerobic exercise with education session. | | No | Moderate/ 12 week intervention, (follow up at 24 and 48 weeks) | No significant effects were reported for physical activity ~ significant effects for exercise knowledge (F9,90=3.34, p=0.01), |

**Table 14. (6) Other interventions Including Multi-component - Design Delivery and Duration**

| Author | Study Design | Study Quality | Research Question | Description of Intervention | Delivery Mode/ Provider | Employee Involvement | Intensity/ duration of intervention | Main Results |
|---|---|---|---|---|---|---|---|---|
| Osteras & Hammer, 2006 | Before and after study | – B | Can physical activity levels be increased through a workplace physical activity programme? | Counselling, motivational interview, health checks/screening | Not clear/ not stated | No | All<br><br>6 months | Physical activity increased signif ($p<0.001$) in the experimental group from pre-post test, according to days per week that participants performed PA (exceeding 10 mins) at moderate to high intensity. (mean 2.5 days/week to mean 2.9 days/week). Days/week with at least a 10 minute walk did not increase significantly. |
| Perkio-Makela, 1999 | RCT: individual | – B | What is the effect of exercise focused group activities on female farmers' physical activity, functional capacity, and work ability over a period of three years? | Led sessions, Group physical exercise, lectures on lifting, musculoskeletal disorders | Led sessions/ local municipal health centres Instructors were a physiotherapist, occ health nurse, occ physician, a psychologist and an agricultural advisor. | No | Moderate/<br><br>2.5 months, (follow up at 12 and 36 months). | LTPA increased significantly post intervention (2.5 months) in both the intervention ($p=.000$) and the control group ($p=.001$) but the increment was larger in the intervention group ($p=.001$). LTPA in the intervention group, at 1 year follow up, was still significantly raised ($p=.001$).By 3 year follow up LTPA had decreased to pre-intervention level. |

**Table 14. (7) Other interventions Including Multi-component - Design Delivery and Duration**

| Author | Study Design | Study Quality | Research Question | Description of Intervention | Delivery Mode/ Provider | Employee Involvement | Intensity/ duration of intervention | Main Results |
|---|---|---|---|---|---|---|---|---|
| Pert, 1997 | Before and after study | – A | Can sedentary employees be influenced into becoming more physically active? | Health promotion, Health check on bicycle ergometer, | Physiotherapist and health promotion officer/ Staff from the physiotherapy and health promotion services of the workplace | Yes | Vigorous/ Health check (follow up repeat at 6 months) | Following the intervention, more people reported taking regular physical activity, fewer people identified motivational and time barriers to exercise with an overall decrease in barriers of 17%, there was no overall change in walking speed, there was no significant increase in time taken to reach 70% and 85% of HRmax, trends in the data indicated that those over 35 showed the greatest change, 76% of participants said their attitude towards physical activity had changed as a result of the intervention. |
| Plotnikoff et al., 2005 | Control before and after | – B | Does a 12-week workplace email intervention promote PA & good diet? | Email messages re active living | Email messages/ researchers | No | All/ 12 week | The intervention group significantly increased their total activity levels at follow-up (p,.01), whereas the control group significantly reduced their total activity levels at follow-up (p,.01), although the effect size was small. |
| Talvi et al 1999 | Control before and after | – B | What were the long term health effects of a work-place health promotion programme on oil refinery employees? What effect did health promotion counselling have on PA? | Health checks/screening Week 1-10 programme of PA at 60-70% HR max, 45 mins, 3 x week. Week 11-20 programme of PA at 70-85% HR max, 50 mins, 4 x week. | Other/ occupational health nurses, physicians and PE instructors | No | 2 phases 10 weeks each plus optional fitness test at 6 monthly intervals, (follow up 3 years) | Participation in the counselling programme (group A) remained in the model (logistic regression analysis)as a statistically significant variable for PA. 24% of participants in Group A and 18% participants in Group B had crossed the threshold for PA – i.e. self reported that they were now exercising vigorously for two or more times/week at 3 year follow up. |

### 3.5 Barriers, facilitators and motivators

Eight out of the 34 studies included in this review collected information which related to the following key questions:

- *What are the key components of the intervention that motivate individuals to become more physically active?*

- *What are the barriers and facilitators to implementation – for both employers and employees?*

- *How can employers be encouraged to promote physical activity at work?*

It is important to note that although two of the eight studies discussed in this section reported a significant increase in physical activity as a result of the intervention, none of the studies directly related or measured the effect that barriers, facilitators and motivators had on outcomes or results. Therefore, there is no evidence to be able to answer key question 1 above, and the information collected can only be interpreted as adding weight to the discussion or providing a further understanding of what might be the successful/unsuccessful components of an intervention.
(See Tables 15-18, p129-136).

#### 3.5.1 Stair Walking Interventions

**Barriers**

Three out of the seven studies promoting stair use included factors cited by the employees as barriers to the implementation of the intervention (Kerr et al, 2001; Adams & White, 2002; Eves et al, 2006). This information fell into two categories – negative perceptions of the intervention and physical barriers. It was reported in one study that 55% of employees who responded to a questionnaire (n=64) felt negative about the message included on the poster prompt (“stay healthy, use the stairs”), namely guilty and lazy. Time

constraints were also cited by 17% of employees (Kerr et al, 2001). Perceived time and fitness constraints; time pressure; the convenience of lifts; getting sweaty; and laziness were all factors cited in another study, along with a common theme that “the posters were good, but probably not effective” (Adams & White, 2002). The location of poster prompts was cited in another study, with 43% of employees who responded to a follow-up questionnaire (n=47) saying they did not feel encouraged to climb the stairs by posters in the elevators (Eves et al, 2006). The physical barriers cited to using the stairs were “being on a higher floor” (Kerr et al, 2001; Adams & White, 2002), and “injury or physical problems” (Adams & White, 2002).

Factors cited by the employers as barriers to the implementation of stair walking interventions were not collected in any of the seven studies.

**Facilitators**

Three studies out of the seven reported factors cited by the employees that facilitated the implementation of the intervention (Kerr et al, 2001; Adams & White, 2002; Eves et al, 2006). The information fell into the categories of positive perceptions of the intervention or certain components of the intervention, and strategies that could encourage stair use. For example, 64% of employees who responded to a follow-up questionnaire (n=47) agreed that they were encouraged to climb the stairs by messages on the stairs and posters in the lobby (Eves et al, 2006). Another study found that the majority of respondents to a follow-up questionnaire (72%, n=64) thought that poster prompts were a good idea (Kerr et al, 2001), and a common theme that “posters were informative and thought provoking” was identified in another study (Adams & White, 2002). The same study also identified commonly suggested strategies by the employee that could encourage stair use including “reducing the convenience of lifts, improving the stair environment and décor, and providing information on the health and weight control benefits of regular exercise”.

Although these suggested strategies have implications for the employer, factors cited by the employers as facilitators to the implementation of stair walking interventions were not collected in any of the seven studies.

### 3.5.2 Walking Interventions

#### Motivators

One of the four studies on walking interventions reported factors cited by the employees that indicated the motivating factors of the intervention, and facilitators to the implementation of the intervention (Thomas et al, 2006). Information collected from a follow up questionnaire (n=217) reported that 97% of the participants felt that participating in the programme was worthwhile, with 54% stating that the programme had increased their knowledge about the importance of physical activity and sufficient levels needed for good health. Many participants commented that they continued to use the stairs, added more walking to daily commuting, or made time for regular daily walks to allow them to continue to work towards or maintain the 10,000 steps per day target, and 43% of participants reported that they had purchased a pedometer on completion of the program to help them carry on achieving this target. The majority of participants (70%) reported they had included others (mainly family) in their walking activities. There were no factors cited by the employees as barriers to the implementation of the intervention, but the design of the questionnaire did not elicit this kind of information.

Factors cited by employers as facilitators or barriers to the implementation of walking interventions were not collected in any of the four studies.

#### Barriers

Two of the three studies on active travel interventions reported factors cited by the employees as barriers to the implementation of the intervention (Mutrie et al, 2002; Gatersleben & Appleton, 2007). Focus group discussions were conducted with walkers and cyclists from one study (Mutrie et al, 2002; n=87), and the barriers reported by the walkers were time constraints and the

expense of buying more equipment to walk in all weathers and carry work documents. The barriers cited by the cyclists included pollution, other road users, lack of covered cycle locking facilities, state of repair of cycle paths and safety. Barriers reported in the other study of a cycling intervention were related to bad experiences, traffic related issues and bicycle related problems (Gatersleben & Appleton, 2007; n=22). Respectively, these were: “bad weather, darkness, feeling tired, having to expend too much effort cycling up hills, and saddle soreness”; “other traffic, unsafe roads, and traffic fumes”; and “flat tyres, lack of cycle lanes makes cycling unsafe, and work and family commitments”.

Factors cited by the employers as barriers to the implementation of active travel interventions were not collected in either of the studies.

**Facilitators**

The same two studies also reported factors cited by the employees as facilitators to the implementation of the intervention. In one study these were identified as coping strategies and included buying waterproofs and rucksacks, and walking from work rather than to work when time pressure exists (Mutrie et al, 2002). Suggestions were also made as to how employers can encourage active commuting and these included: “encouraging flexible time to allow freedom of choice for commuting to work”; “provide a ‘points for miles’ scheme, like the supermarket incentives”; “give a mileage allowance for business journeys that include active commuting”; “conduct an active commuting campaign with a co-ordinator who provides resources and prompts, for example, internet reminders”; “campaigns should focus on accumulating 30-minutes of activity from inward and outward journeys. An example is parking 15 minutes from the workplace or alighting early from public transport. This will reduce exclusion for those who live too far away to actively commute the whole journey”; “construct safe covered cycle locking facilities”; and “provide on site changing areas, showers and locker facilities”. In the other study, the factors cited by the employees as facilitators to the intervention also included suggestions for employers, such as more changing and showering facilities at work (Gatersleben & Appleton, 2007). 95% of

respondents from this study also reported positive experiences of cycling, such as “enjoying the journey”; “a sense of achievement when cycling uphill”; “a feeling of thrill when cycling fast”; “being outside in the fresh air”; “nice weather”; “being able to overtake stationary traffic”; and “cycling along quiet, safe routes”.

Although these suggested strategies have implications for the employer, factors cited by the employers as facilitators to the implementation of active travel interventions were not collected in either of the studies.

### 3.5.4 Other interventions – including multi-component studies

#### Barriers

Two of the sixteen studies on other interventions reported factors cited by the employees as barriers to the implementation of the intervention (Rice & Saunders, 2001; Pert, 1997). Some participants from one qualitative study sample (n=10) cited that they preferred to exercise at home because of the convenience of the location (Rice & Saunders, 2001). The other study reported that 18% of employees who completed an evaluation questionnaire at the end of the study (n=28) thought they could have difficulty in keeping up the increased physical activity level, and cited “loss of interest” and “lack of time” as reasons (Pert, 1997). 39% of employees also reported that completing a diary was “too time-consuming each month”.

#### Facilitators

Three of the sixteen studies on other interventions reported factors cited by the employees as facilitators to the implementation of the intervention (Pert, 1997; Rice & Saunders, 2001; Lee & White, 2006). The location of the exercise setting was a relevant factor in one study, and some participants chose to exercise at work because of the convenience of the location (Rice & Saunders, 2002). Characteristics of the exercise setting that were reported as positively influencing the participants in this study included the continued monitoring through the fitness assessments and contact with a fitness professional. Employees from another study who completed an evaluation

questionnaire (n=28) offered positive and practical comments about how the employer could help them maintain or increase their levels of physical activity and these were: “put posters in all lifts to encourage stair use”; “offer annual fitness check-ups”; “ provide incentives to travel by bicycle”; “organise classes at the larger sites with discount prices for staff”; “continue this intervention on a regular basis”; “provide changing and shower facilities at all main sites and establish bicycle parking”; “provide lunchtime classes that are accessible to all interested staff and allow part of the time to attend”; “provide crèches for evening sessions”; “offer more women-only sessions at swimming pools”; and “subsidise the cost of facilities” (Pert, 1997). Additionally, 38% of employees rated the project as “extremely helpful” and 48% as “helpful” in encouraging them to increase their level of physical activity.

Factors cited by employers as facilitators or barriers to the implementation of other interventions were not collected in any of the studies.

### 3.5.5 Summary of evidence

- *What are the barriers and facilitators to implementation – for both employers and employees?*

**Evidence statement 14**

**Seven studies[1,2,3,4,5,6,7] reported employees perceived barriers to the implementation of work place physical activity interventions fell into two categories: negative perceptions and physical barriers. These included time, physical fitness levels and expense. Physical barriers to cycling to work were particularly pertinent including state and lack of cycle paths, weather, pollution and cycle locking facilities. No factors were cited by the employers as barriers to the implementation of physical activity interventions.**

**Evidence statement 15**

**Nine studies[1,2,3,4,5,6,7,8,9] gave details of employees' cited facilitators to the implementation of interventions that focus on physical environment (improvements in facilities and convenience of location); incentive schemes and flexible work practices. In three stair walking studies employees found the poster interventions encouraged stair walking, were a good idea and thought provoking. No factors were cited by the employers as facilitators to the implementation of physical activity interventions.**

[1]Kerr et al, 2001 (- before and after); [2]Adams and White, 2002 (+ control before and after); [3]Eves et al, 2006 (- before and after); [4]Mutrie et al, 2002 (+ individual RCT); [5]Gatersleben and Appleton, 2007 (- qualitative); [6]Rice and Saunders, 2001 (+ qualitative); [7]Pert, 1997 (- before and after); [8]Thomas et al, 2006 (- before and after); [9]Lee and White, 2006 (- individual RCT).

- *What are the key components of the intervention that motivate individuals to become more physically active?*

**Evidence statement 16**

**One study[1] reported that a motivating factor for becoming more physically active cited by employees was that the intervention was worthwhile and enjoyable.**

[1]Thomas et al, 2006 (- before and after)

- *How can employers be encouraged to promote physical activity at work?*

**Evidence statement 17**

**There were no opinions given by employers that explained how employers could promote physical activity in the workplace.**

Some interesting evidence is presented on what are perceived to be the barriers and facilitators of implementing physical activity interventions in the workplace which may be valuable in identifying ‘why’ an intervention is successful or not. However, overall relatively little information was collected on such ‘qualitative’ aspects of the intervention studies, and the information that was collected came from employees only. The major gap identified in the included literature was regarding perspectives of the employer.

**Table 15. (1) Stair Walking Interventions – Barriers Motivators and Facilitators**

| Author, Year | Study Design | Study Quality | Research Question | Description of Intervention | Employer/employee barriers to implementation of intervention | Employer/employee facilitators to implementation of intervention | Factors that motivate employers to promote PA at work |
|---|---|---|---|---|---|---|---|
| Marshall et al., 2002 | Interrupted time series | ++<br>B | Do signs promote the use of stairs in a health care facility? | Signs and vinyl 'footsteps' leading people to stairs. | None stated | None stated | None stated |
| Adams & White, 2002 | Control before and after | +<br>A | Do signs designed by employees, left in place long-term, have long term effects on stair climbing? | Signs near lift, in lift and in stairwells. | Employer: None stated<br>Employee: Perceived time and fitness constraints; time pressure; convenience of lifts; getting sweaty; laziness; injury or physical problems. | Employer: None stated<br>Employee: Reducing the convenience of lifts; improving the stair environment and décor; providing information on health and weight control benefits of regular exercise. | None stated |
| Kerr et al., 2001 | Before and after study | +<br>A | Can posters prompt stair use in a worksite environment? | Signs near lift entrance. | Employer: None stated<br>Employee: The messages made most employees feel lazy or guilty and could have discouraged stair use; employees on lower floors would be more likely to use the stairs. | Employer: None stated<br>Employee: Employees thought use of a poster prompt was a good idea. | None stated |
| Auweele et al., 2005 | Before and after study | –<br>B | Do health signs followed by a worksite doctor's email increase stair usage of female employees? | Week 1 health sign placed near lift and stairs on each floor<br>Week 2 doctors email promoting health benefits of stair climbing. | | | |
| Badland et al., 2005 | Control before and after | –<br>B | Do posters increase stair use and objectively measured PA? | Posters | None stated | None stated | None stated |

**Table 15. (2) Stair Walking Interventions – Barriers Motivators and Facilitators**

| Author, Year | Study Design | Study Quality | Research Question | Description of Intervention | Employer/employee barriers to implementation of intervention | Employer/employee facilitators to implementation of intervention | Factors that motivate employers to promote PA at work |
|---|---|---|---|---|---|---|---|
| Eves et al., 2006 | Before and after study | –<br>A | Do posters increase ascent and descent in stair climbing? | Health posters in lobby, fixed to stair rises and a point-of-choice prompt at lift. | Employer: None stated<br>Employee: Employees were not encouraged to climb the stairs by the posters in the elevator, but were encouraged by poster on the stairs. | None stated | None stated |
| Titze et al., 2001 | Before and after study | –<br>B | Does provision of written material on health benefits encourage stairs use rather than lifts use? | Written information re health benefits of stair climbing.<br>Incentives to stair use/<br>Disincentives to lift use | None stated | None stated | None stated |

**Table 16. Walking Interventions - Barriers Motivators and Facilitators**

| Author | Study Design | Study Quality | Research Question | Description of Intervention | Employer/ employee barriers to implementation of intervention | Employer/employee facilitators to implementation of intervention | Factors that motivate employers to promote PA at work |
|---|---|---|---|---|---|---|---|
| Chan et al 2004 | Before and after study | + B | What are the effects of a pedometer based physical activity intervention on activity and specific health indices | Led through curriculum which explained health benefits, and taught strategies for behaviour change and maintenance. Pedometers used to help participants monitor behaviour. | None stated | None stated | None stated |
| Gilson et al 2007 | RCT: individual | + A | What are the impacts of two different types of walking intervention on work day step counts and health status? | One group using promoted walk routes around grounds of worksite; the other group accumulating steps between occupational tasks. Weekly group emails sent. | None stated | None stated | None stated |
| Murphy et al 2006 | RCT: individual | – A | Can individuals achieve health benefits from outdoor walking with minimal time investment? | Progressive outdoor walking programme: 60 mins walking week 1 progressing to 90 mins in weeks 3-8. | None stated | None stated | None stated |
| Thomas et al 2006 | Before and after study | – B | Can individuals increase their walking to achieve 10,000 steps per day using a pedometer based PA activity programme? | Subsidised pedometers, progressive walking programme to reach 10,000 steps/day, email support also given. | None stated | Employer: None stated<br>Employee: 97% of participants felt that participating in the programme was worthwhile, with 54% stating the programme had increased their knowledge of the importance of physical activity and sufficient levels needed for good health. | None stated |

**Table 17. Active Travel – Barriers Motivators and Facilitators**

| Author | Study Design | Study Quality | Research Question | Description of Intervention | Employer/ employee barriers to implementation of intervention | Employer/employee facilitators to implementation of intervention | Factors that motivate employers to promote PA at work |
|---|---|---|---|---|---|---|---|
| Mutrie et al., 2002 | RCT: individual | + A | Does a self-help intervention increase active commuting? | Walk in to Work Out pack containing written information on transtheoretical model of behaviour change plus local information (safety, routes etc) | Employer: None stated<br>Employee: The expense of buying more equipment to walk in all weathers and carry work documents; barriers to cycling included pollution, other road users, lack of covered cycle locking facilities, state of repair of cycle paths, and safety. | Employer: None stated<br>Employee: Provide a points for miles incentive scheme; give a mileage allowance for business journeys that include active commuting; conduct and active commuting campaign/Buying waterproofs and rucksacks. | It was perceived that workplaces did little to encourage active commuting. |
| Gatersleben & Appleton, 2007 | Qualitative study | – A | What motivates/ impedes cycling to work for people who have never cycled before? | Cycling scheme with free bike as prize | Employer: None stated<br>Bad experiences were related to weather or darkness, followed by feeling tired, having to expend too much effort cycling up hills, and saddle soreness; traffic related issues such as other traffic, unsafe roads and traffic fumes; bicycle related problems such as flat tyres; lack of cycle lanes makes cycling unsafe; work and family commitments. | Employer: None stated Employee: More changing and showering facilities at work are needed/95% of respondents enjoyed their cycling journey referring to a sense of achievement when cycling uphill, a feeling of thrill when cycling fast or being outside in the fresh air; nice weather; being able to overtake stationary traffic; cycling along quiet safe routes. | None stated |
| Wen et al., 2005 | Before and after study | – B | Does a social marketing campaign modify behaviour in relation to active transport? | Social marketing strategy | None stated | None stated | None stated |

**Table 18. (1) Other Interventions Including Multi Component Interventions – Barriers Motivators and Facilitators**

| Author, Year | Study Design | Study Quality | Intervention Type | Research Question | Intervention Description | Employer/ employee barriers to implementation of intervention | Employer/ employee facilitators to implementation of intervention | Factors that motivate employers to promote PA at work |
|---|---|---|---|---|---|---|---|---|
| Marshall et al 2003 | RCT: individual | ++ B | Health promotion information | Does promotion of physical activity programmes delivered by print ,email and a website change PA and influence progression through the stages of motivational readiness? | Health promotion information (Active Living booklet) on trans-theoretical model of behaviour change plus letters to reinforce messages in booklets. | None stated | None stated | None stated |
| Proper et al., 2003<br><br>Proper et al ., 2004 | RCT: cluster | ++ B | Counselling/ motivational interview, Other | How effective is an individual counselling intervention at the worksite on physical activity, fitness and health using PACE protocols?<br>How effective is an individual counselling intervention at the worksite on physical activity, fitness, health and sick leave? | 7 x 20 minute counselling sessions using PACE protocols to provide a tailored plan of behaviour change. | None stated<br><br>None stated | None stated<br><br>None stated | None stated<br><br>None stated |
| Aittasalo et al ., 2004 | RCT: individual | + B | Counselling, motivational interview, health checks/ screening | Does counselling have long term effects on sedentary employees' leisure time PA (LTPA)? Does comprehensive fitness testing bring additional effects to counselling on LTPA? | Group 1: Counselling/ motivational interview, Group 2: Counselling/ motivational interview plus health checks/ screening | None stated | None stated | None stated |
| Cook et al., 2001 | RCT: individual | + B | Health checks /screening Health promotion workshops and literature | Can a relatively low intensity workplace intervention with male hourly paid workers could significantly improve dietary behaviours, increase PA and reduce blood pressure and body weight? | Health checks/screening, health promotion workshops and literature | None stated | None stated | None stated |

**Table 18. (2) Other Interventions Including Multi Component Interventions – Barriers Motivators and Facilitators**

| Author, Year | Study Design | Study Quality | Intervention Type | Research Question | Intervention Description | Employer/ employee barriers to implementation of intervention | Employer/ employee facilitators to implementation of intervention | Factors that motivate employers to promote PA at work |
|---|---|---|---|---|---|---|---|---|
| O'Loughlin et al., 1996 | Control before and after | + B | Health check/screening | | Health check/ screening plus multi-component programme of PA opportunities which were available, led by exercise professionals and supplemented with written materials. | None stated | None stated | None stated |
| Rice & Saunders, 2001 | Qualitative/extended interview | + B | Led sessions, Walking programme, fitness assessment, and health information | What are the motivating factors, and satisfaction gained, from taking part in a worksite health/active lifestyle programme? | Led sessions, walking programme, fitness assessment, and health information | Employer: None stated Employee: Some staff preferred to exercise out of work. | Employer: None stated Employee: Importance of the exercise setting, time and structure of exercise, contact with exercise professionals | None stated |
| Sjogren et al., 2006 | RCT: cluster | + B | Light resistance training | What are the effects of a workplace physical exercise intervention on subjective physical well-being, psychosocial functioning and general well-being of office workers? | Light resistance training | None stated | None stated | None stated |
| Titze et al 2001 | Control before and after | + B | Active travel – cycling, walking, Counselling/ motivational interview, Health checks/ screening, Health promotion, Led sessions, Stair walking, Subsidies incentives, Walking programme, | What impact does a lifestyle PA intervention have on stages of change and energy expenditure in sedentary employees? | Active travel – cycling, walking, Counselling/ motivational interview, Health checks/ screening/ promotion, Led sessions, Stair walking, Subsidies/ incentives, Walking programme | None stated | None stated | None stated |

**Table 18. (3) Other Interventions Including Multi Component Interventions – Barriers Motivators and Facilitators**

| Author, Year | Study Design | Study Quality | Intervention Type | Research Question | Intervention Description | Employer/ employee barriers to implementation of intervention | Employer/ employee facilitators to implementation of intervention | Factors that motivate employers to promote PA at work |
|---|---|---|---|---|---|---|---|---|
| Addley et al., 2001 | Cross sectional (survey) | – A | Health check/ screening, | Does a workplace lifestyle and PA activity programme influence the adoption of positive healthy lifestyle behaviours? | Health check/ screening carried out by occ health dept, tailored, written literature given post check in order to promote health behaviours, | None stated | None stated | None stated |
| Hanlon et al., 1998 | Cross sectional (survey) | – A | Health check/screening | Does attendance at a workplace health check change health behaviour? | Health check/ screening for cholesterol risk | None stated | None stated | None stated |
| Lee & White, 2006 | RCT: individual | – B | Led sessions low impact aerobic exercise combined with weekly activity (walking or exercise to music) and education session. | Does a minimal exercise programme impact on physical activity in middle-aged women? | Screening plus self-directed low impact aerobic exercise with education session. | None stated | None stated | None stated |
| Osteras & Hammer, 2006 | Before and after study | – B | Counselling, motivational interview, health checks/screening | Can PA levels be increased through a work -place PA programme? | Counselling, motivational interview, health checks/ screening | None stated | None stated | None stated |
| Perkio-Makela, 1999 | RCT: individual | – B | Led sessions, Group physical exercise, lectures on lifting, musculoskeletal disorders | What is the effect of exercise focused group activities on female farmers' PA, functional capacity, & work ability over 3 years? | Led sessions, Group physical exercise, lectures on lifting, musculoskeletal disorders | None stated | None stated | None stated |

**Table 18. (4) Other Interventions Including Multi Component Interventions – Barriers Motivators and Facilitators**

| Author, Year | Study Design | Study Quality | Intervention Type | Research Question | Intervention Description | Employer/ employee barriers to implementation of intervention | Employer/ employee facilitators to implementation of intervention | Factors that motivate employers to promote PA at work |
|---|---|---|---|---|---|---|---|---|
| Pert, 1997 | Before and after study | – A | Health promotion, Health check, | Can sedentary employees be influenced into becoming more physically active? | Health promotion, Health check on bicycle ergometer, | Employer: None stated<br>Employee: Some employees cited lack of interest and time barriers, and that diary sheets were helpful but too time consuming to fill out each month. | Employer: None stated<br>Employee: Posters in lifts to encourage stair use; annual fitness checks; incentives to travel by bike; organise classes at the larger sites with discounts for staff;<br>provide changing & shower facilities at all main sites & bicycle parking;<br>lunchtime classes that are accessible to all staff & allow part of the time to attend; crèches for evening sessions; women-only sessions at swimming pools; subsidise the cost of facilities | None stated |
| Plotnikoff et al., 2005 | Control before and after | – B | Email messages re active living | Does a 12-week workplace email intervention promote physical activity and nutrition behaviour? | Email messages re active living | None stated | None stated | None stated |
| Talvi et al 1999 | Control before and after | – B | Counselling/ motivational interview, Health checks/screening | What were the long term health effects of a workplace health promotion programme on oil refinery employees? What effect did health promotion counselling have on PA? | Health checks/ screening<br>Week 1-10 programme of PA at 60-70% HR max, 45 mins, 3 x week.<br>Week 11-20 programme of PA at 70-85% HR max, 50 mins, 4 x week. | None stated | None stated | None stated |

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### Appendix One: Search Strategies

# ABI inform

employ* or workplace or worksite AND exercise program* OR physical activit* OR health promotion activit* OR fitness program* OR bicycle* OR swim*

# Assia

1. TI=factory OR employee* or employer* or company or Companies
2. AB=factory OR employee* or employer* or company or companies
3. DE= workplaces OR employees
4. KW = workplace* or worksite* or human resources or small business
5. TI= worker* or AB= worker*))
6. #1 or #2 or #3 or #4 or #5
7. DE = exercise or aerobic exercise or yoga or structured exercise or physical fitness or running or physical activity or tennis or bicycles or team sports or swimming or gymnasia)
8. TI=active transport or active travel or active commut* or bicycle or physical education or fitness session* or fitness class* or fitness regime* or fitness program* or physical activ* or walking or physical training
9. AB=active transport or active travel or active commut* or bicycle or physical education or fitness session* or fitness class* or fitness regime* or fitness program* or physical activ* or walking or physical training
10. TI = (climb or us* or walk*) WITHIN 1 stair* or AB = (climb or us* or walk*) WITHIN 1 stair*
11. AB= ((exercise*) WITHIN 1 (physical* OR activ*)) or (TI= (exercise*) WITHIN 1 (physical* OR activ*))
12. KW = subsid* within 5 (gym or sport* or leisure* or swim*)
13. KW = voucher* within 5 (gym or sport* or leisure* or swim*)
14. KW = purchas* within 3 (bik* OR exercise* OR cycl* OR bicycle*)
15. KW = recreation* activ*)
16. KW = cycle within 5 (physical activ*) or KW = cycle within 5 (physical activ*)
17. KW = aerobics OR dance OR gym OR yoga OR walk* to work* OR physical inactivity OR lunchtime walk OR football session* OR keep* fit OR active at work OR aqua aerobic* OR trim trail* OR power walk OR exercise program* OR team* sport* OR pilates OR karate OR judo OR pedometer
18. #7 or #7 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17
19. #18 and #6
20. KW = (cycl* to work*) or (bik$ to work) or employee fitness program* or fitness at work* or thinkfit or move for health or walk for health
21. #19 or #20, limit to 1990-2007

    168 hits

# CDSR, Central, DARE

1 active transport.ti,ab,tw.
2 active travel.tw,ti,ab.
3 active commut$.ti,ab,tw.
4 bicycle$.tw,ti,ab.
5 (cycle adj5 physical activ:).mp,af.
6 (cycling adj activit$).mp,af.
7 dance$.mp,af.
8 gym.mp.
9 sport.tw.
10 yoga.mp.

11 walk: to work:.mp.
12 physical inactivity.mp.
13 lunchtime walk:.mp.
14 (cycling adj5 leisure).mp.
15 football session:.mp.
16 physical education.tw.
17 keep: fit.mp.
18 active at work:.mp.
19 (fitness adj2 (session$ or class$ or regime$ or program$)).tw.
20 aerobic$ class$.mp.
21 aqua aerobic$.mp.
22 trim trail$.mp.
23 power walk$.mp.
24 (bicycl$ adj5 (leisure or recreation)).mp.
25 lunch$ walk$.mp.
26 sport$ session$.mp.
27 exercise program$.mp.
28 team$ sport$.mp.
29 pilates.mp.
30 karate.mp.
31 judo.mp.
32 ((climb: or us: or walk:) adj1 stair:).tw.
33 physical activ$.tw.
34 walking.tw.
35 (exercise$ adj1 (physical$ or activ$)).tw.
36 pedometer$.mp.
37 (subsid: adj5 (gym or sport: or leisure: or swim:)).mp.
38 (voucher: adj5 (gym or sport: or leisure: or swim:)).mp.
39 leisure pass$.mp.
40 (subsidis adj3 (bik: or exercise: or cycl: or bicycle:)).mp.
41 (purchas$ adj3 (bik: or exercise: or cycl: or bicycle:)).mp.
42 physical training.ti,ab.
43 (exercise$ adj3 (physical$ or activ$)).tw.
44 recreation$ activ$.mp.
45 aerobics.mp.
46 or/1-45
47 motor activity.kw.
48 exercise/
49 exercise.kw.
50 motor activity/
51 yoga.kw. or yoga/
52 walking/ or walking.kw.
53 physical fitness/ or physical fitness.kw.
54 leisure activities/ or leisure activities.kw.
55 jogging/ or jogging.kw.
56 football/ or football.kw.
57 racquet sports/ or racquet sports.kw.
58 swimming/ or swimming.kw.
59 running/ or running.kw.
60 or/1-59
61 workplace/ or workplace.kw.
62 occupational health/
63 occupational health.kw.
64 workplace$.mp.
65 worksite$.mp.
66 (working adj3 office).mp.
67 (employee$ or employer$).ti,ab.
68 (company or companies).ti,ab.
69 factory.ti,ab.
70 worker$.ti,ab.

71 or/61-70
72 71 and 60
73 cycl$ to work:.mp.
74 bik$ to work:.mp.
75 employee fitness program$.mp.
76 fitness at work$.mp.
77 thinkfit.mp.
78 move for health.mp.
79 walk for health.mp.
80 or/73-79
81 80 or 72
82 limit 81 to yr="1990 - 2007" [Limit not valid in: DARE; records were retained]

**CDSR = 59, Central = 202, DARE = 29 hits**

# Cinahl

1 exercise/
2 group exercise/
3 *RUNNING/
4 *LEISURE ACTIVITIES/
5 *Physical Activity/
6 *Physical Fitness/
7 *Racquet Sports/
8 *SOCCER/
9 jogging/
10 Bicycles/
11 Cycling/
12 yoga/
13 Team Sports/
14 active transport.ti,ab.
15 active travel.tw.
16 active commut$.ti,ab.
17 bicycle$.tw.
18 (cycle adj5 physical activ:).mp.
19 (cycling adj activit$).mp.
20 dance$.mp.
21 gym.mp.
22 sport.tw.
23 yoga.mp.
24 walk: to work:.mp.
25 physical inactivity.mp.
26 lunchtime walk:.mp.
27 (cycling adj5 leisure).mp.
28 football session:.mp.
29 physical education.tw.
30 keep: fit.mp.
31 active at work:.mp.
32 (fitness adj2 (session$ or class$ or regime$ or program$)).tw.
33 aerobic$ class$.mp.
34 aqua aerobic$.mp.
35 trim trail$.mp.
36 power walk$.mp.
37 (bicycl$ adj5 (leisure or recreation)).mp.
38 lunch$ walk$.mp.
39 sport$ session$.mp.
40 exercise program$.mp.
41 team$ sport$.mp.
42 pilates.mp.
43 karate.mp.

44 judo.mp.
45 ((climb: or us: or walk:) adj1 stair:).tw.
46 physical activ$.tw.
47 walking.tw.
48 (exercise$ adj1 (physical$ or activ$)).tw.
49 pedometer$.mp.
50 (subsid: adj5 (gym or sport: or leisure: or swim:)).mp.
51 (voucher: adj5 (gym or sport: or leisure: or swim:)).mp.
52 leisure pass$.mp.
53 (subsidis adj3 (bik: or exercise: or cycl: or bicycle:)).mp.
54 (purchas$ adj3 (bik: or exercise: or cycl: or bicycle:)).mp.
55 physical training.ti,ab.
56 (exercise$ adj3 (physical$ or activ$)).tw.
57 recreation$ activ$.mp.
58 aerobics.mp.
59 or/1-58
60 factory.tw.
61 workplace$.mp.
62 worksite$.mp.
63 (working adj3 office).mp.
64 human resources.mp.
65 (employee$ or employer$).tw.
66 small business$.mp.
67 worker$.tw.
68 *Occupational Health/
69 *Work Environment/
70 (company or companies).tw.
71 or/60-70
72 71 and 59
73 cycl$ to work:.mp.
74 bik$ to work:.mp.
75 employee fitness program$.mp.
76 fitness at work$.mp.
77 thinkfit.mp.
78 move for health.mp.
79 walk for health.mp.
80 or/73-79
81 80 or 72
82 limit 81 to (English and yr="1990 - 2007")
887 hits

# Embase

1. active transport.ti,ab.
2. active travel.ti,ab.
3. active commut$.ti,ab.
4. bicycle$.tw,ti,ab.
5. (cycle adj5 physical activ:).mp
6. (cycling adj activit$).mp
7. dance$.mp
8. gym.mp.
9. sport.tw.
10. yoga.mp.
11. walk: to work:.mp.
12. physical inactivity.mp.
13. lunchtime walk:.mp.
14. (cycling adj5 leisure).mp.
15. football session:.mp.
16. physical education.tw.

17. keep: fit.mp.
18. active at work:.mp.
19. (fitness adj2 (session$ or class$ or regime$ or program$)).tw.
20. aerobic$ class$.mp.
21. aqua aerobic$.mp.
22. trim trail$.mp.
23. power walk$.mp.
24. (bicycl$ adj5 (leisure or recreation)).mp.
25. lunch$ walk$.mp.
26. sport$ session$.mp.
27. exercise program$.mp.
28. team$ sport$.mp.
29. pilates.mp.
30. karate.mp.
31. judo.mp.
32. ((climb: or us: or walk:) adj1 stair:).tw.
33. physical activ$.tw.
34. walking.tw.
35. (exercise$ adj1 (physical$ or activ$)).tw.
36. pedometer$.mp.
37. (subsid: adj5 (gym or sport: or leisure: or swim:)).mp.
38. (voucher: adj5 (gym or sport: or leisure: or swim:)).mp.
39. leisure pass$.mp.
40. (subsidis adj3 (bik: or exercise: or cycl: or bicycle:)).mp.
41. (purchas$ adj3 (bik: or exercise: or cycl: or bicycle:)).mp.
42. physical training.ti,ab.
43. (exercise$ adj3 (physical$ or activ$)).tw.
44. recreation$ activ$.mp.
45. aerobics.mp.
46. or/1-45
47. workplace/
48. *Occupational Health/
49. employee/
50. employer/
51. scientist/
52. worker/
53. factory.tw.
54. workplace$.mp.
55. worksite$.mp.
56. (working adj3 office).mp.
57. human resources.mp.
58. (employee$ or employer$).tw.
59. small business$.mp.
60. compan$.tw.
61. *work environment/
62. *staff/
63. worker$.tw.
64. *administrative personnel/
65. *female worker/
66. *foreign worker/
67. *manager/
68. *office worker/
69. *personnel/
70. *scientist/
71. *shift worker/
72. *voluntary worker/
73. or/47-72
74. 46 and 73
75. cycl$ to work:.mp.
76. bik$ to work:.mp.

77. employee fitness program$.mp.
78. fitness at work$.mp.
79. thinkfit.mp.
80. move for health.mp.
81. walk for health.mp.
82. or/75-82
83. 82 or 74
84. letter.pt or editorial.pt
85. 83 NOT 84

Limit to 1990-2007, English Language

Hits= 1370

## Medline

1. compan$.tw.
2. factory.tw.
3. workplace$.mp.
4. worksite$.mp.
5. (working adj3 office).mp.
6. workplace/
7. worker$.mp.
8. small business$.mp.
9. *"occupational health"/
10. human resources.mp.
11. (employee$ or employer$).tw.
12. Or/1-11
13. active transport.ti,ab.
14. active travel.ti,ab.
15. active commut$.ti,ab.
16. bicycle$.tw.
17. (cycle adj5 physical activ:).mp.
18. (cycling adj activit$).mp.
19. dance$.mp.
20. gym.mp.
21. recreation: activ:.mp.
22. *"Running"/
23. sport.tw.
24. *"leisure activities"/
25. yoga.mp.
26. physical activity/
27. walk: to work:.mp.
28. physical inactivity.mp.
29. *"physical fitness"/
30. *"racquet sports"/
31. *"soccer"/
32. jogging/
33. lunchtime walk:.mp.
34. (cycling adj5 leisure).mp.
35. football session:.mp.
36. (aerobics or physical training).mp. or physical education.tw.
37. (exercise$ adj3 (physical$ or activ$)).tw.
38. bicycle/
39. bicycling/
40. keep: fit.mp.
41. active at work.mp.
42. (fitness adj2 (session$ or class$ or regime$ or program$)).tw.
43. aerobic$ class$.mp.
44. aqua aerobic$.mp.
45. trim trail$.mp.

46. power walk$.mp.
47. (bicycl$ adj5 (leisure or recreation)).mp.
48. physical fitness/
49. lunch$ walk$.mp.
50. sport$ session$.mp.
51. exercise program$.mp.
52. team$ sport$.mp.
53. yoga/
54. pilates.mp.
55. karate.mp.
56. judo.mp.
57. ((climb: or us: or walk:) adj1 stair:).tw.
58. physical activ:.tw.
59. walking.tw.
60. (exercise$ adj1 (physical$ or activ$)).tw.
61. pedometer:.mp.
62. exercise/
63. (subsid: adj5 (gym or sport: or leisure: or swim:)).mp.
64. (voucher: adj5 (gym or sport: or leisure: or swim:)).mp.
65. (subsidis: adj3 (bik: or exercise: or cycl: or bicycle:)).mp.
66. (purchas$ adj3 (bik: or exercise: or cycl: or bicycle:)).mp.
67. Leisure pass$.mp.
**68. or/13-67**
69. cycl$ to work$.mp.
70. bik$ to work$.mp.
71. employee fitness program$.mp.
72. fitness at work.mp.
73. thinkfit.mp.
74. move for health.mp.
75. walk for health.mp.
**76. or/69-75**
**77. 12 AND 68**
**78. 76 or 77**
**79.** limit 78 to (humans and english language and yr="1990 - 2007")
**80.** (letter or editorial).pt.
**81. 79 NOT 80**
**Hits= 1741**

# Psycinfo

1. lunchtime walk:.mp.
2. (cycling adj5 leisure).mp.
3. football session:.mp.
4. physical education.tw.
5. keep: fit.mp.
6. active at work:.mp.
7. (fitness adj2 (session$ or class$ or regime$ or program$)).tw.
8. aerobic$ class$.mp.
9. aqua aerobic$.mp.
10. trim trail$.mp.
11. power walk$.mp.
12. (bicycl$ adj5 (leisure or recreation)).mp.
13. lunch$ walk$.mp.
14. sport$ session$.mp.
15. exercise program$.mp.
16. team$ sport$.mp.
17. pilates.mp.
18. karate.mp.

19. judo.mp.
20. ((climb: or us: or walk:) adj1 stair:).tw.
21. physical activ$.tw.
22. walking.tw.
23. (exercise$ adj1 (physical$ or activ$)).tw.
24. pedometer$.mp.
25. (subsid: adj5 (gym or sport: or leisure: or swim:)).mp.
26. (voucher: adj5 (gym or sport: or leisure: or swim:)).mp.
27. leisure pass$.mp.
28. (subsidis adj3 (bik: or exercise: or cycl: or bicycle:)).mp.
29. (purchas$ adj3 (bik: or exercise: or cycl: or bicycle:)).mp.
30. physical training.ti,ab.
31. (exercise$ adj3 (physical$ or activ$)).tw.
32. recreation$ activ$.mp.
33. aerobics.mp.
34. Exercise/ or Aerobic Exercise/
35. Running/
36. baseball/ or basketball/ or football/ or judo/ or martial arts/ or soccer/ or swimming/ or tennis/ or weightlifting/ or athletic participation/
37. *sports/
38. Motor Processes/
39. *Physical Fitness/
40. Yoga/
41. or/1-40
42. workplace$.mp.
43. worksite$.mp.
44. (working adj3 office).mp.
45. human resources.mp.
46. (employee$ or employer$).tw.
47. small business$.mp.
48. worker$.tw.
49. Organizational Climate/
50. working conditions/
51. *Personnel/
52. factory.tw.
53. work teams/
54. (company or companies).tw.
55. or/42-54
56. 55 and 41
57. cycl$ to work:.mp.
58. bik$ to work:.mp.
59. employee fitness program$.mp.
60. fitness at work$.mp.
61. thinkfit.mp.
62. move for health.mp.
63. walk for health.mp.
64. or/57-63
65. 64 or 56
Limit to 1990-2007, English, Human
**691 hits**

# Social Policy and Practice

#25 ((((cycle path and (PY:1M = 1990-2007)) or (walk for health and (PY:1M = 1990-2007)) or (move for health and (PY:1M = 1990-2007)) or ("fitness in work" and (PY:1M = 1990-2007)) or (power walk* and (PY:1M = 1990-2007)) or (active transport and (PY:1M = 1990-2007)) or (active commut* and (PY:1M = 1990-2007)) or ("active travel" and (PY:1M = 1990-2007))) and (PY:1M = 1990-2007)) or (((((football or judo or swim*) and (PY:1M = 1990-2007)) or (health promotion program* and (PY:1M = 1990-2007)) or (fitness program* and (PY:1M = 1990-2007)) or (exercise program* and

(PY:1M = 1990-2007)) or (((physical exercise) in DE) and (PY:1M = 1990-2007)) or (((physical activit*) in DE) and (PY:1M = 1990-2007)) or (((bicycl* ) in DE) and (PY:1M = 1990-2007)) or (((aerobic*) in DE) and (PY:1M = 1990-2007)) or (((soccer) in DE) and (PY:1M = 1990-2007))) and (PY:1M = 1990-2007)) and ((((employee or employer) and (PY:1M = 1990-2007)) or ((workplace or worksite) and (PY:1M = 1990-2007))) and (PY:1M = 1990-2007)) and (PY:1M = 1990-2007))) and (PY:1M = 1990-2007)(61 records)
#24 ((cycle path and (PY:1M = 1990-2007)) or (walk for health and (PY:1M = 1990-2007)) or (move for health and (PY:1M = 1990-2007)) or ("fitness in work" and (PY:1M = 1990-2007)) or (power walk* and (PY:1M = 1990-2007)) or (active transport and (PY:1M = 1990-2007)) or (active commut* and (PY:1M = 1990-2007)) or ("active travel" and (PY:1M = 1990-2007))) and (PY:1M = 1990-2007)(45 records)
#23 cycle path and (PY:1M = 1990-2007)(14 records)
#22 move for health and (PY:1M = 1990-2007)(9 records)
#21 power walk* and (PY:1M = 1990-2007)(1 records)
#20 walk for health and (PY:1M = 1990-2007)(5 records)
#19 "fitness in work" and (PY:1M = 1990-2007)(5 records)
#18 active transport and (PY:1M = 1990-2007)(1 records)
#17 active commut* and (PY:1M = 1990-2007)(1 records)
#16 "active travel" and (PY:1M = 1990-2007)(10 records)
#15 ((((football or judo or swim*) and (PY:1M = 1990-2007)) or (health promotion program* and (PY:1M = 1990-2007)) or (fitness program* and (PY:1M = 1990-2007)) or (exercise program* and (PY:1M = 1990-2007)) or (((physical exercise) in DE) and (PY:1M = 1990-2007)) or (((physical activit*) in DE) and (PY:1M = 1990-2007)) or (((bicycl* ) in DE) and (PY:1M = 1990-2007)) or (((aerobic*) in DE) and (PY:1M = 1990-2007)) or (((soccer) in DE) and (PY:1M = 1990-2007))) and (PY:1M = 1990-2007)) and ((((employee or employer) and (PY:1M = 1990-2007)) or ((workplace or worksite) and (PY:1M = 1990-2007))) and (PY:1M = 1990-2007)) and (PY:1M = 1990-2007)(16 records)
#14 (((football or judo or swim*) and (PY:1M = 1990-2007)) or (health promotion program* and (PY:1M = 1990-2007)) or (fitness program* and (PY:1M = 1990-2007)) or (exercise program* and (PY:1M = 1990-2007)) or (((physical exercise) in DE) and (PY:1M = 1990-2007)) or (((physical activit*) in DE) and (PY:1M = 1990-2007)) or (((bicycl* ) in DE) and (PY:1M = 1990-2007)) or (((aerobic*) in DE) and (PY:1M = 1990-2007)) or (((soccer) in DE) and (PY:1M = 1990-2007))) and (PY:1M = 1990-2007)(858 records)
#13 ((bicycl* ) in DE) and (PY:1M = 1990-2007)(98 records)
#12 ((aerobic*) in DE) and (PY:1M = 1990-2007)(5 records)
#11 ((soccer) in DE) and (PY:1M = 1990-2007)(2 records)
#10 (football or judo or swim*) and (PY:1M = 1990-2007)(316 records)
#9 health promotion program* and (PY:1M = 1990-2007)(70 records)
#8 fitness program* and (PY:1M = 1990-2007)(13 records)
#7 exercise program* and (PY:1M = 1990-2007)(94 records)
#6 ((physical exercise) in DE) and (PY:1M = 1990-2007)(206 records)
#5 ((physical activit*) in DE) and (PY:1M = 1990-2007)(100 records)
#4 (((employee or employer) and (PY:1M = 1990-2007)) or ((workplace or worksite) and (PY:1M = 1990-2007))) and (PY:1M = 1990-2007)(3123 records)
#3 (employee or employer) and (PY:1M = 1990-2007)(1719 records)
#2 occupational health and (PY:1M = 1990-2007)(431 records)
#1 (workplace or worksite) and (PY:1M = 1990-2007)(1694 records)

# Social Science Citation Index

#41 #40 OR #33
DocType=All document types; Language=All languages; Database=SSCI; Timespan=1990-2007
#40 #39 AND #34
#39 #38 OR #37 OR #36 OR #35
#38 TS=(gym)
#37 TS=("racquet sport")
#36 TS=(aerobic* or keep fit or football)
#35 TS=(swim* or jog* or walk)
#34 TS=(workplace or worksite or small business)

#33 #32 OR #31 OR #30 OR #29 OR #28 OR #27 OR #26 OR #25 OR #24 OR #23 OR #22 OR #21 OR #20 OR #19 OR #18 OR #17 OR #16 OR #15 OR #14 OR #13 OR #12 OR #11 OR #10 OR #9 OR #8 OR #7 OR #6 OR #5 OR #4 OR #3 OR #2 OR #1
#32 TS=(fitness NEAR swim*)
#31 TS=(physical activity NEAR swim*)
#30 TS=(workplace NEAR swim*)
#29 TS=(employee* NEAR swim*)
#28 TS=(worksite NEAR bicycl*)
#27 TS=(workplace NEAR bicycl*)
#26 TS=(employee* NEAR bicycl*)
#25 TS=(employee* NEAR "physical exercise")
#24 TS=(employee* NEAR exercise)
#23 TS=(employee* NEAR "health promotion activit*")
#22 TS=(employee* NEAR "physical activit*")
#21 TS=(bicycl* NEAR fitness)
#20 TS=("active transport")
#19 TS=("active travel")
#18 TS=(worksite NEAR "fitness program*")
#17 TS=(workplace NEAR "fitness program*")
#16 TS=(workplace NEAR "exercise program*")
#15 TS=(worksite NEAR "exercise program*")
#14 TS=(employ* NEAR "exercise program*")
#13 TS=(employ* NEAR "fitness program*")
#12 TS=(employer NEAR "health promotion activit*")
#11 TS=(employer NEAR "physical activit*")
#10 TS=(workplace* NEAR "physical activit*")
#9 TS=(workplace* NEAR "health promotion activit*")
#8 TS=(worksite* NEAR "health promotion activit*")
#7 TS=(worksite* NEAR "physical activit*")
#6 TS=("fitness at work")
#5 TS=("move for health")
#4 TS=("cycl* to work")
#3 TS=("walk for health")
#2 TS=("walk* to work")
#1 TS=("employee fitness program*")

## Sportsdiscus

1 RUNNING/
2 PHYSICAL FITNESS/
3 TENNIS/
4 SWIMMING/
5 SOCCER/
6 JOGGING/
7 CYCLING/
8 yoga/
9 EXERCISE/
10 WALKING/
11 active transport.ti,ab.
12 active travel.tw.
13 active commut$.ti,ab.
14 (cycle adj5 physical activ:).mp.
15 (cycling adj activit$).mp.
16 gym.mp.
17 yoga.mp.
18 walk: to work:.mp.
19 physical inactivity.mp.
20 lunchtime walk:.mp.

21 (cycling adj5 leisure).mp.
22 football session:.mp.
23 keep: fit.mp.
24 active at work:.mp.
25 aerobic$ class$.mp.
26 aqua aerobic$.mp.
27 trim trail$.mp.
28 power walk$.mp.
29 (bicycl$ adj5 (leisure or recreation)).mp.
30 pedometer$.mp.
31 (subsid: adj5 (gym or sport: or leisure: or swim:)).mp.
32 (voucher: adj5 (gym or sport: or leisure: or swim:)).mp.
33 leisure pass$.mp.
34 (subsidis adj3 (bik: or exercise: or cycl: or bicycle:)).mp.
35 (purchas$ adj3 (bik: or exercise: or cycl: or bicycle:)).mp.
36 physical training.ti,ab.
37 aerobics.mp.
38 physical education.ti,ab.
39 recreation$ activ$.ti,ab.
40 (exercise$ adj1 (physical$ or activ$)).ti,ab.
41 ((climb: or us: or walk:) adj1 stair:).ti,ab.
42 team$ sport$.ti,ab.
43 exercise program$.ti,ab.
44 sport$ session$.ti,ab.
45 lunch$ walk$.ti,ab.
46 judo.ti,ab.
47 pilates.ti,ab.
48 karate.ti,ab.
49 (fitness adj2 (session$ or class$ or regime$ or program$)).ti,ab.
50 physical activ$.ti,ab.
51 walking.ti,ab.
52 sport.ti,ab.
53 bicycle$.ti,ab.
54 (exercise$ adj3 (physical$ or activ$)).ti,ab.
55 worker$.ti,ab.
56 workplace$.mp.
57 worksite$.mp.
58 (working adj3 office).mp.
59 (employee$ or employer$).ti,ab.
60 ((company or companies) adj5 (workplace or work or office$ or job or staff)).ti,ab.
61 or/1-54
62 or/55-60
63 61 and 62
64 limit 63 to (english language and yr="1990 - 2007")
65 cycl$ to work.ti,ab.
66 bik$ to work.ti,ab.
67 employee fitness program$.mp.
68 thinkfit.mp.
69 move for health.mp.
70 walk for health.mp.
71 or/65-70
72 71 or 64
73 limit 72 to yr="1990 - 2007"
74 limit 73 to English language
75 from 74 keep 1-459

**459 hits**

# Transport

((((workplace* or worksite* or human resources or employee* or employer* or small business* or worker*)) or ((occupational health) in TI) or ((occupational health) in DE,SC) or ((factory) in DE,SC)) and (((bicycl*) in TI) or (( bicycl*) in DE,SC) or (gym or yoga or walk* to work) or (physical activity) or (football session* or lunchtime walk* or physical inactivity) or (physical education) or ((sport or exercise or football) in TI) or (walk* stair* or us* stair* or climb* stair* or pilates or karate or judo or team* sport*) or ((sport or exercise or football) in DE,SC) or (active at work* or keep* fit or bike or leisure pass* or pedometer* or walking) or (physical training or sport* session* or power walk* or trim trail* or aerobics or aerobic* class*) or (fitness session* or fitness class* or fitness regime* or fitness program*) or (active transport or active travel or active commut* or recreation* activ*))) or (bik* to work or cycl* to work or employee fitness program* or fitness at work* or thinkfit or move for health or walk for health)

268 records

## Appendix Two: References for full papers obtained and screened

- **Included in the final review (n= 38)**

  **Number of studies (n=33)**


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- **Excluded because a cost effectiveness paper (n= 1):**

PROPER, K. I., DE BRUYNE, M. C., HILDEBRANDT, V. H., VAN DER BEEK, A. J., MEERDING, W. J. & VAN, M. W. (2004) Costs, benefits and effectiveness of worksite physical activity counselling from the employer's perspective. *Scandinavian Journal of Work, Environment & Health*, 30, 36-46.

- **Excluded reviews because all references prior to 1996 (n= 2):**

GRIFFITHS, A. (1996) The benefits of employee exercise programmes: A review. *Work and Stress*, 10, 5-23.

MARCUS, B. H. (1998) Adherence to physical activity: Recommendations and interventions. IN SHUMAKER, S. A., SCHRON, E. B., OCKENE, J. K. & MCBEE, W. L. (Eds.) The Handbook of Health Behavior Change. 2nd ed. New York, NY, US, Springer Publishing Co.

**Appendix Three: Data Extraction Template**

| **Data Extraction Form** | Ref ID<br>**[this will be the reference manager ID number assigned after the literature search]** |
|---|---|
| **Authors/ Title/ Source**<br>**[Insert reference manager citation from literature search]** | |
| Project: | |
| Data extracted by: | Date of extraction: |

Describe the study:

| | |
|---|---|
| Systematic review (including at least one RCT) | ☐ |
| Systematic review of experimental studies | ☐ |
| Systematic review of observational studies | ☐ |
| Randomised controlled trial: Individual | ☐ |
| Randomised controlled trial: Cluster | ☐ |
| Controlled non-randomised trial | ☐ |
| Controlled before-and-after | ☐ |
| Interrupted time series | ☐ |
| Before and after study | ☐ |
| Cross sectional (survey) | ☐ |
| Audit/Evaluation | ☐ |
| Economic analysis | ☐ |
| Case study | ☐ |
| Local practice report | ☐ |
| Qualitative study | ☐ |
| Focus group(s) | ☐ |
| Brief interview | ☐ |
| Extended interview | ☐ |
| Semi-structured interview | ☐ |
| Document Analysis | ☐ |
| Observation (Passive/Participant) | ☐ |
| Other (please state) | ☐ |

What was the research question?

**Review parameters (if applicable):**

**Describe the search method:**
**Databases/sources searched:**
**Years searched:**

**Study selection criteria:**
**Inclusion:**

**Exclusion:**

**Number of studies and participants included:**

**What data was extracted?**

**How was the data synthesised?**

**Was there heterogeneity across studies?**

**Describe the method of analysis (meta-analysis/narrative synthesis etc):**

**Other study parameters:**

**Setting**:
Geographical (City/country):
Date of study (to/from):

Type of Workplace:

| | |
|---|---|
| Public Sector | |
| Private Sector | |
| Voluntary Sector | |
| Other | |

Size of organisation NB: this definition is based on the most recent EU definition. In the papers it may be different, if so follow the definition of the paper but note if this is the case.

| | |
|---|---|
| Micro < 10 employees | |
| Small < 50 | |
| Medium < 250 | |
| Large 250 + | |

Number of organisations involved in study:

**Participants**:
Age Range:

Gender: male/female
Active/Sedentary:
Blue collar/White collar:
Urban/Rural/Other:
Ethnic minority:

Number of participants:

Invited:
Baseline (response rate):
Post intervention:
Follow up:

Selection criteria:
Inclusion:

Exclusion:

Method of recruitment/enrolment:

Were intervention groups balanced at baseline?:
Comments:

---

**Intervention**
**Type of intervention:**

| | |
|---|---|
| **Counselling/motivational interview** | |
| **Health checks/health screening** | |
| **Active travel – cycling** | |
| **Active travel – walking** | |
| **Health promotion initiatives/ campaigns** | |
| **Subsidies and incentive schemes** | |
| **Stair walking** | |
| **Led physical activity sessions** | |
| **Walking programme** | |
| **Other** | |

Description of physical activity (including content, delivery, mode, provider, length, duration and intensity of the intervention):

Aim/objective of intervention:

Description of the Intervention:

Description of the comparator(s):

Method/mode of delivery (for example, peer education):

Providers/deliverers of the intervention:

Were employees involved in the planning, implementation and review of the intervention: Yes/No? If yes describe

Time to follow-up (average/median):

For non-completers, were the reasons for non-completion described?

---

**Outcomes**:

How are physical activity outcomes measured?

Name of measurement tool/instrument(s), unit of measurement, time period (e.g. last 3 days, last 7 days, per week):

NB: Add rows if necessary

| Measurement tool/instrument | Unit of Measurement | Time period |
|---|---|---|
| 1. | | |
| 2. | | |
| 3. | | |
| 4. | | |
| 5. | | |
| 6. | | |
| 7. | | |

Intensity of physical activity measured:

| | |
|---|---|
| light | |
| moderate | |
| vigorous | |

Extent of physical activity measured:

| | |
|---|---|
| Leisure physical activity only | |

| | |
|---|---|
| Occupational physical activity only | |
| All physical activity | |
| Other | |

Health and Social outcome measure(s):

Mortality ☐
Morbidity ☐
Quality of life ☐
Other ☐
Describe:
Were baseline measurements of outcomes assessed?
Yes ☐ No ☐

Were the outcome measure(s) validated?
Yes ☐ No ☐ Not clear ☐
If yes, how?

**Analyses:**
Data collection methods used:

**Method of allocation to intervention:**
Was allocation concealed? Yes ☐ No ☐ Not clear ☐

Describe methods used (intention to treat, descriptive statistics, qualitative analysis etc):

Unit of analysis:
Individual ☐ Group ☐ Organisation/institution ☐
Community/environment ☐ Policy/socio-political ☐
Other (describe) ☐

**Power**
Was a power calculation presented? Yes ☐ No ☐
If yes, describe:
Was the study powered to detect an effect if one exists?
Yes ☐ No ☐ Not clear ☐

Any other process details:

**Results:**

Does the paper address or offer any evidence of effect?

Yes ☐ No ☐ Not clear ☐

If so, please ensure that evidence is presented in results below.

Does the paper address or offer any evidence of effect in the following groups? If so, please ensure that evidence is presented in results below.

| | | | |
|---|---|---|---|
| Older workers | Yes ☐ | No ☐ | Not clear ☐ |
| Younger workers | Yes ☐ | No ☐ | Not clear ☐ |
| Gender – male | Yes ☐ | No ☐ | Not clear ☐ |
| Gender - female | Yes ☐ | No ☐ | Not clear ☐ |
| Black and minority ethnic groups | Yes ☐ | No ☐ | Not clear ☐ |
| Lower socio-economic status | Yes ☐ | No ☐ | Not clear ☐ |
| Sedentary workers | Yes ☐ | No ☐ | Not clear ☐ |
| Active workers | Yes ☐ | No ☐ | Not clear ☐ |
| Blue collar workers | Yes ☐ | No ☐ | Not clear ☐ |
| White collar workers | Yes ☐ | No ☐ | Not clear ☐ |
| Other (please specify): | Yes ☐ | No ☐ | Not clear ☐ |

Briefly describe the results for each of the main outcomes, paying particular attention to issues relating to health inequalities and cost effectiveness:

Are there any key criticisms of the conclusions drawn by the author's?

Does the paper demonstrate any evidence of harms or adverse effects associated with the intervention? Yes/no. If yes describe

| |
|---|
| Do the authors identify any strengths and/or weaknesses of the evidence presented?<br><br>Strengths:<br><br>Weaknesses:<br><br>In your opinion what are the strengths and weaknesses of the study?<br><br>Strengths:<br><br>Weaknesses: |
| In your opinion, are the results generalisable to the UK?<br>Yes ☐ No ☐ Not clear ☐<br><br>Why: |
| Do the authors identify any evidence gaps or make any recommendations for further research? |
| Are there implications of the work?<br><br>Policy:<br><br>Practice:<br><br>Cultural diversity:<br><br>Costs, cost effectiveness and resource needs: |
| Does the study identify barriers to implementation of the intervention for:<br><br>Employers Yes ☐ No ☐ Not clear ☐<br>If yes, please give details |

Employees Yes ☐ No ☐ Not clear ☐
If yes, please give details

Does the study identify facilitators to implementation of the intervention for:
Employers Yes ☐ No ☐ Not clear ☐
If yes, please give details

Employees Yes ☐ No ☐ Not clear ☐
If yes, please give details

Does the study identify factors that motivate/encourage employers to promote physical activity at work:

Yes ☐ No ☐ Not clear ☐
If yes, please give details

Pass to other reviewer for second opinion?

Comment: